CONTRACT DOCUMENTS

NEW RIVER REGIONAL WATER AUTHORITY
WATER TREATMENT PLANT EXPANSION

EDA PROJECT NO.: 01-01-15370

March 12, 2024

Prepared for:
New River Regional Water Authority
289 Kohler Ave.
Austinville, VA 24312

Prepared by:
PEED & BORTZ, LLC
Civil and Environmental Engineers
20 Midway Plaza Drive
Christiansburg, Virginia
22-18

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SECTION 00130 ADVERTISEMENT FOR BIDS

Owner:
New River Regional Water Authority(NRRWA), Austinville, VA

Separate sealed Bids will be received for the NRRWA Water Treatment Plant Expansion at the existing facility located at 289 Kohler Ave. Austinville, VA 24312 to expand capacity from 4.0 to 6.33 MGD. Work includes replacement of chemical feed pumps, installation of sedimentation basin sludge collectors and tube settlers, development of a fourth gravity sand filter and refurbishment of existing filters, installation of an additional finished water pump, construction of sludge thickener tanks, and construction of sludge dewatering facilities. Work also includes pump replacement and improvements at the remote raw water intake on the New River at 243 Store Hill Rd.

Bids will be received by Michael Watson, Chairperson, at:

New River Regional Water Authority
289 Kohler Ave.
Austinville, VA 24312

until **2:00 PM** local prevailing time on **Thursday May 9, 2024**, and then publicly opened and read aloud at said location.

The Contract Documents may be examined at the following locations:
Peed & Bortz, LLC, Civil & Environmental Engineers, 20 Midway Plaza Drive, Ste. 100 Christiansburg, VA 24073
Austinville Water Treatment Plant, 289 Kohler Ave. Austinville, VA 24312

Digital copies of Bidding Documents may be obtained at no charge from the Peed & Bortz website at http://peed-bortz.com/request-for-bids/. Prospective Bidders are urged to register with Peed & Bortz, LLC as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with addenda and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained or omitted from sources other than the designated website.

A Pre-Bid Conference shall be held at 1:00 PM local prevailing time Thursday April 18, 2024 at the Austinville Water Treatment Plant, 289 Kohler Ave. Austinville, VA 24312. Attendance at the pre-bid conference is encouraged, but not required.

Withdrawal of bids due to error shall be in accordance with Virginia Code Section 2.2-4430.B.1.

Should the apparent low bid exceed available funds, the Owner reserves the right to negotiate with the apparent low bidder to obtain a contract price within available funds.

Bidders shall comply with Virginia Code Section 54.1-1112 regarding information required with bid. Envelopes containing bids shall be clearly marked with the Bidder's contractor license number.

This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations associated with that program. Contractor will be required to maintain an active SAM.gov account throughout the project.

By: Michael Watson, Chairperson
Date: March 25, 2024

Instructions to Bidders

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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 which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). It is Bidder's responsibility to determine that it is using a complete set of documents

in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances. Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant.

2.04 Deleted

2.05 Deleted

2.06 Electronic Documents

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 9 or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents; however, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06A above; however, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within 2 days of Owner's request, Bidder must submit the following information:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

C. Bidder's state or other contractor license number, if applicable.

D. Subcontractor and Supplier qualification information.

E. Other required information regarding qualifications.

3.02 Deleted

3.03 Deleted

3.04 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.05 No requirement in this Article to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

4.01 *Deleted*

4.02 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.

4.03 *Deleted*

4.04 *Deleted*

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 Site and Other Areas

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 Existing Site Conditions

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

   a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

   b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

   c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

   d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

4. *Deleted*

B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 Other Site-related Documents

A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

1. Record Drawings – New River Regional Water Authority Austinville Water Treatment Plant (Division I) – For Bid Plan Set Dated October 20, 2006.

Owner will make copies of these other Site-related documents available to any Bidder on request.

B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.

C. The other Site-related documents are not part of the Contract Documents.

D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.

E. No other Site-related documents are available.

5.04 Site Visit and Testing by Bidders

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. A Site visit is scheduled following the pre-bid conference.

C. Deleted

D. Deleted

E. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the Owner or Engineer. Bidder must conduct the required Site visit during normal working hours.

F. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

G. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

H. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

I. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 Owner's Safety Program

A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 Other Work at the Site

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Express Representations and Certifications in Bid Form, Agreement

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing.

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of [number] percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents. **Bid security must be at least 5% of the Bidder's maximum Bid price.**

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 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, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

9.02 Deleted

9.03 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

10.01 Deleted

10.02 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. 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 such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner. Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.05 and 7.06 of the General Conditions after the Effective Date of the Contract.

10.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.01 Deleted

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within five days after Bid opening:

A. None

11.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a 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.

11.04 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 and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, 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 subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

11.05 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.07A.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.

12.04 A Bid by a partnership must 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 must be shown.

12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person 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.

12.06 A Bid by an individual must show the Bidder's name and official address.

12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

12.08 All names must be printed in ink below the signatures.

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

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 Deleted

13.02 Base Bid with Alternates

A. Bidders must 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 and 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.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.

13.03 Deleted

13.04 Deleted

13.05 Deleted

13.06 Deleted

13.07 Deleted

ARTICLE 14—SUBMITTAL OF BID

14.01 The Bidding Documents include one separate unbound copy (or digital copy) of the Bid Form, and, if required, the Bid Bond Form. The unbound (or printed digital) copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must 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 must 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 must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 A Bid may be modified or withdrawn only in accordance with the Code of Virginia.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

15.03 If, as a result of bid withdrawal, the Work is rebid or negotiated, Bidder or Bidders withdrawing a bid will be disqualified from further bidding or negotiating on the Work.

ARTICLE 16—OPENING OF BIDS

16.01 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.

16.02 Deleted

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 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 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether 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.

B. In the comparison of Bids, deductive alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a "Base Bid with alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes, Base Bids will first be evaluated to identify if the lowest responsive Base Bid is within the announced budget; otherwise, Bids will continue to be reevaluated with each deductive alternate, following the order of priority established in the Bid Form, until an apparent responsive low bidder is within the announced budget, or all deductive alternates have been considered. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its deductive alternate Bids for which Owner determines funds will be available at the time of award.

C. Deleted

D. Deleted

E. Deleted

F. Deleted

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the

Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

21.01 This project is NOT exempt from sales tax. Bidders must include all sales tax in their Bid.

ARTICLE 22—CONTRACTS TO BE ASSIGNED

22.01 Deleted

ARTICLE 23—FEDERAL REQUIREMENTS

23.01 If the contract price is in excess of $100,000, provisions of the Contract Work Hours and Safety Standards Act at 29 CFR 5.5(b) apply.

23.02 Federal requirements at Article 19 of the Supplementary Conditions apply to this Contract.

23.03 This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations associated with that program.

BID FORM

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

New River Regional Water Authority
Attn: Michael Watson, Chairperson
289 Kohler Ave.
Austinville, VA 24312

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—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

C. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 Lump Sum Bids

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s). The Deductive Alternate amounts are the amounts subtracted from the Base Bid amount to delete the work associated with that item. Refer to Section 01100 – Summary of Work for additional details on scope of Base Bid and Deductive Alternates.

1. Deleted

2. Lump Sum Price (Base Bid and Deductive Alternates)

Lump Sum Bid Price for Base Bid (All Work)	**$**
Deductive Alternate #1 **[Deductive Amount for Deleting Centrifuge & Conveyor]**	**- $**
Deductive Alternate #2 **[Deductive Amount for Deleting Dry Solids Shelter]**	**- $**

ARTICLE 4—DELETED

ARTICLE 5—DELETED

ARTICLE 6—TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Deleted

6.03 Deleted

6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

7.01 Bid Acceptance Period

A. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

7.02 Instructions to Bidders

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 Receipt of Addenda

A. Bidder hereby acknowledges receipt of the following Addenda: **[Bidder is to complete table.]**

Addendum Number	Addendum Date

ARTICLE 8—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

8.01 Bidder's Representations

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Bidder has considered the information known to Bidder itself; 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 Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no 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.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8.02 Bidder's Certifications

A. The Bidder certifies the following:

1. 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.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
    a. 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.
    b. 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 artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
    c. 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.
    d. 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.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

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

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name: **[Full formal name of Bidder]** Address *(principal place of business)*: **[Address of Bidder's principal place of business]**	Name: **[Full formal name of Surety]** Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner Name: **New River Regional Water Authority** Address *(principal place of business)*: **289 Kohler Ave.** **Austinville, VA 24312**	**Bid** Project *(name and location)*: **New River Regional Water Authority** **Water Treatment Plant Expansion** **Austinville, VA** Bid Due Date: **[Enter date bid is due]**
Bond Penal Sum: **[Amount]** Date of Bond: **[Date]**	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:
Notes: (1) Note: Addresses are to be used for giving any required notice. (2) 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 will be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder occurs 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 will 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 does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action will 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 the Bid due date.

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

8. Notices required hereunder must 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 Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will 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 will 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 governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.

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

QUALIFICATIONS STATEMENT

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation		
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:			
	1.		
	2.		
	3.		
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?	☐ Yes ☐ No ☐ Pending		

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

1.04 Provide information regarding the Business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

3.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

ARTICLE 4—SAFETY

4.01 Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

4.02 Provide Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

5.01 Provide information regarding the Business's financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business's most recent financial statement:		☐ Attached
Date of Business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		

ARTICLE 6—SURETY INFORMATION

6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?		☐ Yes ☐ No	
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? ☐ Yes ☐ No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 7—INSURANCE

7.01 Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?		☐ Yes ☐ No	
Does provider have an A.M. Best Rating of A-VII or better?		☐ Yes ☐ No	
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 8—CONSTRUCTION EXPERIENCE

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business's previous contracting experience.

Years of experience with projects like the proposed project:				
As a general contractor:		As a joint venturer:		
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business's experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business's key leaders as well.

ARTICLE 9—REQUIRED ATTACHMENTS

9.01 Provide the following information with the Statement of Qualifications:

A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.

B. Diverse Business Certifications if required by Paragraph 3.01.

C. Certification of Business's safety performance if required by Paragraph 4.02.

D. Financial statements as required by Paragraph 5.01.

E. Attachments providing additional information as required by Paragraph 8.02.

F. Schedule A (Current Projects) as required by Paragraph 8.03.

G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.

H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.

I. Additional items as pertinent.

This Statement of Qualifications is offered by:

Business: _____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

Schedule A—Current Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule B—Previous Experience with Similar Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule B—Previous Experience with Similar Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

NOTICE OF AWARD

Date of Issuance:			
Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			
Bidder:			
Bidder's Address:			

You are notified that Owner has accepted your Bid dated **[date]** for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

[Describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is $**[Contract Price]**. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

[4] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☒ Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner **[4]** counterparts of the Agreement, signed by Bidder (as Contractor).

2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.

3. Other conditions precedent (if any): **[Describe other conditions that require Successful Bidder's compliance]**

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 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **New River Regional Water Authority**

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Copy: Engineer

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **New River Regional Water Authority** ("Owner") and **[name of contracting entity]** ("Contractor").

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **All work as a single contract for the New River Regional Water Authority Water Treatment Plant Expansion project in Austinville, VA as described below.**

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Expansion of the existing 4.0 MGD water treatment plant to 6.33 MGD capacity including improvements to the raw water intake, chemical feed and mixing systems, sedimentation and sludge collection systems, gravity filters, finished water pumping system, solids handling basins, and electrical and control systems; and construction of new solids handling and sludge dewatering facilities.**

ARTICLE 3—ENGINEER

3.01 The Owner has retained **Peed & Bortz, LLC** ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by **Engineer**.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is 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 Deleted

4.03 *Contract Times: Days*

A. The work will be considered partially substantially complete within **365** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, when the treatment plant capacity is increased. Refer to Section 01100 – Summary of the Work for additional description of the elements of the project included in the partial substantial completion scope. The full project Work will be substantially complete within **545** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **590** days after the date when the Contract Times commence to run.

4.04 Deleted

4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. 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):

1. *Substantial Completion:* Contractor shall pay Owner $**500** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $**250** for each day that expires after such time until the Work is completed and ready for final payment.

3. Deleted

4. Liquidated damages for failing to timely attain Substantial Completion, and final completion are not additive, and will not be imposed concurrently.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

C. Deleted

4.06 *Deleted*

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work other than Unit Price Work, a lump sum of $**[number]**.

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

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

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the **5th** day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in 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 elsewhere in the Contract.

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 Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. **95** percent of the value of the Work completed (with the balance being retainage).

b. **95** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion **of the entire construction to be provided under the construction Contract Documents**, Owner shall pay an amount sufficient to increase total payments to Contractor to **100** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **200** percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

A. All amounts not paid when due will bear interest at the rate of **4** percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

A. The Contract Documents consist of all of the following:

1. This Agreement.

2. Bonds:

a. Performance bond (together with power of attorney).

b. Payment bond (together with power of attorney).

3. General Conditions.

4. Supplementary Conditions.

5. Specifications as listed in the table of contents of the project manual (copy of list attached).

6. Drawings (not attached but incorporated by reference) consisting of **[number]** sheets with each sheet bearing the following general title: **New River Regional Water Authority Water Treatment Plant Expansion**.

7. Deleted

8. Addenda (numbers **[number]** to **[number]**, inclusive).

9. Exhibits to this Agreement (enumerated as follows):

    a. **[list exhibits]**

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

    a. Notice to Proceed.

    b. Work Change Directives.

    c. Change Orders.

    d. Field Orders.

    e. Warranty Bond, if any.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Contractor has considered the information known to Contractor itself; 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 Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no 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.

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

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

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

11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *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 8.02:

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 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.

8.03 *Standard General Conditions*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on **[indicate date on which Contract becomes effective]** (which is the Effective Date of the Contract).

Owner:

New River Regional Water Authority
(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

*(If **[Type of Entity]** is a corporation, attach evidence of authority to sign. If **[Type of Entity]** is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*

Contractor:

_____
(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

*(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

License No.: _____
(where applicable)

State: _____

NOTICE TO PROCEED

Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Contractor:		Contractor's Project No.:	
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			
Effective Date of Contract:			

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement: **[Select one of the following two alternatives, insert dates or number of days, and delete the other alternative.]**

The number of days to achieve Partial Substantial Completion is **[number of days, from Agreement]** from the date stated above for the commencement of the Contract Times, resulting in a date for Partial Substantial Completion of **[date, calculated from commencement date above]**; the number of days to achieve Full Project Substantial Completion is **[number of days, from Agreement]** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**;and the number of days to achieve readiness for final payment is **[number of days, from Agreement]** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

Owner:	**New River Regional Water Authority**
By *(signature)*:	
Name *(printed)*:	
Title:	
Date Issued:	

Copy: Engineer

PERFORMANCE BOND

Contractor Name: **[Full formal name of Contractor]** Address *(principal place of business)*: **[Address of Contractor's principal place of business]**	**Surety** Name: **[Full formal name of Surety]** Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner Name: **New River Regional Water Authority** Mailing address *(principal place of business)*: **289 Kohler Ave.** **Austinville, VA 24312**	**Contract** Description *(name and location)*: **New River Regional Water Authority** **Water Treatment Plant Expansion** **Austinville, VA** Contract Price: **[Amount from Contract]** Effective Date of Contract: **[Date from Contract]**

Bond

Bond Amount: **[Amount]**

Date of Bond: **[Date]**

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 16

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

Contractor as Principal	Surety
_____ *(Full formal name of Contractor)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature)(Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

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

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:

   3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;

   3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

   3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

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

   5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

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

   5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

      5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

      5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

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

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

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

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

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the 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 periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

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

14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

PAYMENT BOND

Contractor Name: **[Full formal name of Contractor]** Address *(principal place of business)*: **[Address of Contractor's principal place of business]**	**Surety** Name: **[Full formal name of Surety]** Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner Name: **New River Regional Water Authority** Mailing address *(principal place of business)*: **289 Kohler Ave.** **Austinville, VA 24312**	**Contract** Description *(name and location)*: **New River Regional Water Authority** **Water Treatment Plant Expansion** **Austinville, VA** Contract Price: **[Amount from Contract]** Effective Date of Contract: **[Date from Contract]**

Bond

Bond Amount: **[Amount]**

Date of Bond: **[Date]**

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 18

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

Contractor as Principal	Surety
_____ *(Full formal name of Contractor)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature)(Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

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

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond will arise after the following:

    5.1. Claimants who do not have a direct contract with the Contractor

        5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2. Pay or arrange for payment of any undisputed amounts.

    7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this

Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

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

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

    16.1. *Claim*—A written statement by the Claimant including at a minimum:

        16.1.1. The name of the Claimant;

        16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

        16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

        16.1.4. A brief description of the labor, materials, or equipment furnished;

        16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

        16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

        16.1.7. The total amount of previous payments received by the Claimant; and

        16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

    16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the 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.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

Contractor's Application for Payment

Owner:	New River Regional Water Authority	**Owner's Project No.:**	
Engineer:	Peed & Bortz, LLC	**Engineer's Project No.:**	22-18
Contractor:		**Contractor's Project No.:**	
Project:	NRRWA Water Treatment Plant Expansion		
Contract:			
Application No.:		**Application Date:**	
Application Period:	**From**	**to**	

1. Original Contract Price					$ -
2. Net change by Change Orders					$ -
3. Current Contract Price (Line 1 + Line 2)					$ -
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)					$ -
5. Retainage					
a.	X	$ -	Work Completed =	$ -	
b.	X	$ -	Stored Materials =	$ -	
c. Total Retainage (Line 5.a + Line 5.b)					$ -
6. Amount eligible to date (Line 4 - Line 5.c)					$ -
7. Less previous payments (Line 6 from prior application)					
8. Amount due this application					$ -
9. Balance to finish, including retainage (Line 3 - Line 4 + Line 5.c)					$ -

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(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 the Work covered by prior Applications for Payment;
(2) Title to 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 the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor: _____

Signature: _____ **Date:** _____

Recommended by Engineer		**Approved by Owner**	
By:		**By:**	
Title:		**Title:**	
Date:		**Date:**	
Approved by Funding Agency			
By:		**By:**	
Title:		**Title:**	
Date:		**Date:**	

Progress Estimate - Lump Sum Work **Contractor's Application for Payment**

Owner:	New River Regional Water Authority	**Owner's Project No.:**	
Engineer:	Peed & Bortz, LLC	**Engineer's Project No.:**	22-18
Contractor:		**Contractor's Project No.:**	
Project:	NRRWA Water Treatment Plant Expansion		
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
Original Contract								
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
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						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
Original Contract Totals		$ -	$ -	$ -	$ -	$ -		$ -
Change Orders								
						-		-
						-		-
						-		-
						-		-
						-		-
Change Order Totals		$ -	$ -	$ -	$ -	$ -		$ -
Original Contract and Change Orders								
Project Totals		$ -	$ -	$ -	$ -	$ -		$ -

Stored Materials Summary **Contractor's Application for Payment**

Owner:	New River Regional Water Authority	**Owner's Project No.:**	
Engineer:	Peed & Bortz, LLC	**Engineer's Project No.:**	22-18
Contractor:		**Contractor's Project No.:**	
Project:	NRRWA Water Treatment Plant Expansion		
Contract:			

Application No.: ______ **Application Period:** From ______ to ______ **Application Date:** ______

A	B	C	D	E	F	G	H	I	J	K	L	M
						Materials Stored			Incorporated in Work			
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Previous Amount Stored ($)	Amount Stored this Period ($)	Amount Stored to Date (G+H) ($)	Amount Previously Incorporated in the Work ($)	Amount Incorporated in the Work this Period ($)	Total Amount Incorporated in the Work (J+K) ($)	Materials Remaining in Storage (I-L) ($)
								-			-	-
								-			-	-
								-			-	-
								-			-	-
								-			-	-
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								-			-	-
								-			-	-
					Totals	$ -	$ -	$ -	$ -	$ -	$ -	$ -

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Contractor:		Contractor's Project No.:	
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

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 Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. 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.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

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.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

NOTICE OF ACCEPTABILITY OF WORK

Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Contractor:		Contractor's Project No.:	
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			
Notice Date:		Effective Date of the Construction Contract:	

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated **[date of professional services agreement]** ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.

2. This Notice reflects and is an expression of the Engineer's professional opinion.

3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.

4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.

5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.

6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. 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, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

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

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document 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, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

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

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

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

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

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice 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.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

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

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

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

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *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.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *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, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *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.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *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 of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, 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 a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

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

49. *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; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: 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 Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

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

3. 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 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means 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, means 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, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide,"

then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. 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 Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), 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;

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.

2.04 *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 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, 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 and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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 the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document 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.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will 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.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

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

3.02 *Reference Standards*

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

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract 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, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer 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 part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or 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) actual field conditions, (c) any standard

specification, manual, reference standard, or code, or (d) 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 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

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 part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); 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 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers 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 versions, or 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; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract 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 Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

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

4.03 *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.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 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 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, 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 Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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.

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 permanent improvements are to be made 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.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, 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 any such claim, and against all 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 directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will 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 and adjacent

areas 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 of 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on 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;

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

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

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 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, 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 fall within any one or more of the categories described in Paragraph 5.04.A;

   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 Paragraph 13.03; and,

   c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

   a. Contractor knew of the existence of such condition at the time Contractor made a 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 otherwise;

   b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then 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 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. 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 Paragraph 13.03;

   b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

   c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on 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;

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 removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) 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 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. 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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. 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, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. 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, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. 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 failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond 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 must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, 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.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is 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; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or

supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the 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, risks, 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 Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, 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.

2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. 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 all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, 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 fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in

progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *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.

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

7.03 *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 maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. 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 will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *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, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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 must 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.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item 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 is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

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

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

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

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer

will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

a. will certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design;

2) be similar in substance to the item specified; and

3) be suited to the same use as the item specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

2) 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

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from the item specified; and

2) available engineering, sales, maintenance, repair, and replacement services.

d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. 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.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely

on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

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

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed 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.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *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.

7.11 *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. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and 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 such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

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

7.13 *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.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. 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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.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 at its expense (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).

E. 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.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. 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.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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.

7.15 *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 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

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

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must 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 7.16.C.

2. *Samples*

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall 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 7.16.C.

3. 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. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.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 will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

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.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor

shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *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 is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, 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.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

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;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, 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 losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage 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 7.18.A will 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.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. 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.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

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

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary

measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) 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 any such claims, and against all 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 damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *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.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *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 (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

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.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *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.

10.02 *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 10.07. 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.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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, will 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 Contractor under Paragraph 15.06.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 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in 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;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes 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. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-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. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *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, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. 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, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will 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 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

   a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

   b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

   The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *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.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will 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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

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

5. Other costs consisting of 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, 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.

        1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

    c. *Construction Equipment Rental*

        1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

        2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

        3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on 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, must cease to accrue when the use thereof is no longer necessary for the changed 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 communication 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 that Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

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

5. 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.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *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*: Contractor agrees that:

1. 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

2. 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 for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *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. Payments to Contractor for Unit Price Work will be based on actual quantities.

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. 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

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

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction 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 with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

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

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

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, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. 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. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages 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. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

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

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. 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, 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *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, then 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 will 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.

14.07 *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 defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, 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, 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 incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *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.

2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

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

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, 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 13.03, 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; 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;

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

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; 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 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

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

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

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

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. 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; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

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 preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. 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 punch list.

15.04 *Partial Use or Occupancy*

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. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be 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 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work 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 15.03 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 6.04 regarding builder's risk or other property insurance.

15.05 *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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *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, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

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

   a. all documentation called for in the Contract Documents;

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

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all duly pending Change Proposals and Claims; and

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

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: 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 have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *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 Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;

2. correct such defective Work;

3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, 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. Contractor shall pay all 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). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. 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.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *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 written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and 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);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.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 the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds 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.

F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 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; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 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 16.03.

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, 7 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 are not intended to preclude Contractor from submitting a Change Proposal 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 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

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

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract 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.

18.03 *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. 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.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, “Paragraph SC-4.05.”

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC-1.01.A.8 – Add the following at the end of the Paragraph:

The Change Order form to be used on this Project is EJCDC C-941 (2018). Agency approval is required before Change Orders are effective.

SC-1.01.A.30 – Add the following at the end of the Paragraph:

For the purposes of the EDA, this term is synonymous with the term “applicant” as defined in 7 CFR 1780.7 (a) (1), (2) and (3) and is an entity receiving financial assistance from the federal programs.

SC-1.01.A.50 – Add the following at the end of the Paragraph:

The Work Change Directive form to be used on this Project is EJCDC C-940 (2018). Agency approval is required before a Work Change Directive is issued.

SC-1.01.A.51 – Add the following new paragraph immediately after Paragraph 1.01.A.50:

51. Agency - The Project is financed in whole or in part by U.S. Department of Commerce Economic Development Administration; therefore, the Agency for these documents is the Economic Development Administration (EDA).

ARTICLE 2—PRELIMINARY MATTERS

2.06 *Electronic Transmittals*

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

D. *Requests by Contractor for Electronic Documents in Other Formats*

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.

2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:

   a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer's purposes solely, and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application, or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.

   b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.

   c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys' fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.

   d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.

3. In the event that Owner elects to provide or directs the Engineer to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis (at $**150** per hour) for any engineering costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Engineer.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01.A – Delete the last sentence of paragraph.

4.05 *Delays in Contractor's Progress*

SC-4.05 Amend Paragraph 4.05.C by adding the following subparagraphs:

5. *Weather-Related Delays*

a. When establishing the contract time, an allowance will be made for four (4) calendar days of work lost per month due to inclement weather conditions. The Contractor, at the time of each periodic pay request, shall submit to the Engineer and Owner for approval a list of all working days lost due to either inclement weather or site conditions caused by inclement weather for the period. Accompanying his list should be a summary of the specific conditions which caused the loss. This request will be reviewed by the Engineer considering observations made by the Engineer, Owner, and resident inspector. Approval of the periodic payment estimate by the Engineer, Owner, and Agency will also include approval of the weather delay request. After substantial completion, and not until then, a change order must be executed if a time extension for weather related delays is requested by the Contractor. The time extension must be based solely on the time requested within the periodic payment estimates. Subtracted from this time will be the four (4) days per month allowance assumed in the contract. There cannot be a decrease in contract length if the allowance for inclement weather exceeds the actual number of days lost due to inclement weather. To convert working days into calendar days, multiply the working days by seven (7) and divide by the number of working days in a typical work week.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.03 *Subsurface and Physical Conditions*

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
NRRWA Water Treatment Plant Geotechnical Engineering Report, Rev. 1 ECS Mid-Atlantic, LLC	January 23, 2024	Boring Logs

F. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except

Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Technical Data
Record Drawings New River Regional Water Authority Austinville Water Treatment Plant (Division I)	**N/A**

5.06 *Hazardous Environmental Conditions*

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

   None

5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

   None

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition).

2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition).

6.03 *Contractor's Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following:

Owner: New River Regional Water Authority
Engineer: Peed & Bortz, LLC

E. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	**Policy limits of not less than:**
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Each accident	$1,000,000
Each employee	$1,000,000
Policy limit	$1,000,000

F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,

2. damages insured by reasonably available personal injury liability coverage, and

3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.

   a. Such insurance must be maintained for three years after final payment.

   b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Severability of interests and no insured-versus-insured or cross-liability exclusions.

4. Underground, explosion, and collapse coverage.

5. Personal injury coverage.

6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).

2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.

4. Any exclusion of coverage relating to earth subsidence or movement.

5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).

6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	**Policy limits of not less than:**
General Aggregate	$2, 000,000
Products—Completed Operations Aggregate	$1,000,000
Personal and Advertising Injury	$1,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance 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. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	$1,000,000
Each Accident	$1,000,000
Property Damage	
Each Accident	$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000

K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$10,000,000
General Aggregate	$10,000,000

L. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	$500,000
General Aggregate	$500,000

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).

    a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.

    b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such

insurance will be provided through other insurance policies acceptable to Owner and Contractor.

2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).

4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

5. extend to cover damage or loss to insured property while in transit.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.

9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.

10 include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds."

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 *Labor; Working Hours*

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be 7:00 a.m. – 7:00 p.m.

SC-7.07.A – Amend by adding the following to the end of the paragraph:

The total amount of work subcontracted by the Contractor shall not exceed fifty percent of the Contract price without prior approval from the Owner, Engineer and Agency.

SC-7.07.B – Delete paragraph in its entirety and insert ”Deleted”.

SC-7.07.E – Delete the second sentence of paragraph and insert the following in its place:

Owner may not require that Contractor use a specific replacement.

SC-7.12.A Amend paragraph by adding the following after “written interpretations and clarifications,”:

Manufacturers’ Certifications,

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

SC-10.03 Add the following new subparagraph immediately after Paragraph 10.03.A:

1. On this Project, by agreement with the Owner, the Engineer will not furnish a Resident Project Representative to represent Engineer at the Site or assist Engineer in observing the progress and quality of the Work.

ARTICLE 11—CHANGES TO THE CONTRACT

SC-11.02.C – Add new paragraph immediately after Paragraph 11.02.B:

C. The Engineer or Owner shall contact the Agency for concurrence on each Change Order prior to issuance. All Contract Change Orders must be concurred on (signed) by Agency before they are effective.

SC-11.03.A.2 - Add new Paragraph 11.03.A.2 immediately after Paragraph 11.03.A, which shall be renamed Paragraph 11.03.A.1:

2. The Engineer or Owner shall contact the Agency for concurrence on each Work Change Directive prior to issuance. Once authorized by Owner, a copy of each Work Change Directive shall be provided by Engineer to the Agency.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

15.01 *Progress Payments*

SC-15.01.B.4 – Add the following language at the end of paragraph:

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage or invest the retainage for the benefit of the Contractor.

SC-15.01.B.5 – Add new paragraph immediately after Paragraph 15.01.B.4:

5. The Application for Payment form to be used on this Project is EJCDC® C-620. The Agency must approve all Applications for Payment before payment is made.

SC-15.01.D.1 – Delete paragraph in its entirety and insert the following in its place:

The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due thirty (30) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC-15.02.A – Amend paragraph by striking out the following text: "7 days after".

15.03 *Substantial Completion*

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

SC-19 – Add the following new Article 19 immediately after Article 18:

ARTICLE 19— FEDERAL REQUIREMENTS

19.01 *Agency Not a Party*

A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees, is a party to this Contract.

19.02 *Contract Approval*

A. Agency concurrence is required on both the Bid and the Contract before the Contract is effective.

19.03 *Conflict of Interest*

A. Contractor may not knowingly contract with a Supplier or Manufacturer if the individual or entity who prepared the Drawings and Specifications has a corporate or financial affiliation with the Supplier or Manufacturer. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest or other interest in or a tangible personal benefit from the Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

19.04 *Gratuities*

A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

B. In the event this Contract is terminated as provided in paragraph 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

19.05 *Small, Minority and Women's Businesses*

A. If Contractor intends to let any subcontracts for a portion of the work, Contractor will take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps will include:

1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;

4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

5. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

19.06 *Anti-Kickback*

A. Contractor shall comply with the Copeland Anti-Kickback Act (40 USC 3145) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

19.07 *Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended*

A. Contractor to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

19.08 *Equal Employment Opportunity*

A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

19.09 *Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)*

A. Contractors that apply or bid for an award exceeding $100,000 must file the required certification form CD-512. The Contractor certifies to the Owner and every subcontractor certifies to the Contractor that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

19.10 Environmental Requirements

A. When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:

1. Wetlands – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.

2. Floodplains – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert 100-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.

3. Historic Preservation - Applicants shall ensure that Contractors maintain a copy of the following inadvertent discovery plan onsite for review:

a. If during the course of any ground disturbance related to any Project, any post review discovery, including but not limited to, any artifacts, foundations, or other indications of past human occupation of the area are uncovered, shall be protected by complying with 36 CFR § 800.13(b)(3) and (c) and shall include the following:

i. All Work, including vehicular traffic, shall immediately stop within a 50 ft. radius around the area of discovery. The Contractor shall ensure barriers are established to protect the area of discovery and notify the Engineer to contact the appropriate agency personnel.

ii. The personnel shall notify the appropriate environmental agencies, the Federal Preservation Officer (FPO), and State Historic Preservation Office (SHPO) immediately. Indian tribe(s) or Native Hawaiian Organization (NHOs) that have an interest in the area of discovery shall be contacted immediately. The SHPO may require additional tribes or NHOs who may have an interest in the area of discovery also be contacted. The notification shall include an assessment of the discovery provided by the SOI qualified professional archeologist.

iii. When the discovery contains burial sites or human remains, the Contractor shall immediately notify the appropriate agency personnel who will contact the environmental staff members, FPO, and the SHPO. The relevant law enforcement authorities shall be immediately contacted by onsite personnel to reduce delay times, in accordance with tribal, state, or local laws including 36 CFR Part 800.13; 43 CFR Part 10, Subpart B; and the Advisory Council on Historic Preservation's Policy Statement Regarding treatment of Burial Sites, Human Remains, or Funerary Objects (February 23, 2007).

iv. When the discovery contains burial sites or human remains, all construction activities, including vehicular traffic shall stop within a 100 ft. radius of the discovery and barriers shall be established. The evaluation of human remains shall be conducted at the site of discovery by a SOI qualified professional. Remains that have been removed from their primary context and where that context may be in question may be retained in a secure location, pending further decisions on treatment and disposition. Agencies may expand this radius based on the SOI professional's assessment of the discovery and establish broader barriers if further subsurface burial sites, or human remains can reasonably be expected to occur. Appropriate agencies, in consultation with the SHPO and interested tribes or NHOs, shall develop a plan for the treatment of native human remains.

v. Work may continue in other areas of the undertaking where no historic properties, burial sites, or human remains are present. If the inadvertent discovery appears to be a consequence of illegal activity such as looting, the onsite personnel shall contact the appropriate legal authorities immediately if the landowner has not already done so.

vi. Work may not resume in the area of the discovery until a notice to proceed has been issued by the appropriate agency after having determined that appropriate local protocols and consulting parties have been consulted.

vii. Inadvertent discoveries on federal and tribal land shall follow the processes required by the federal or tribal entity.

4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

19.11 *Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708)*

A. Where applicable, for contracts awarded by the Owner in excess of $100,000 that involve the employment of mechanics or laborers, the Contractor will comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, the Contractor will compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic will be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

19.12 *Debarment and Suspension (Executive Orders 12549 and 12689)*

A. A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

19.13 *Procurement of recovered materials*

A. The Contractor will comply with 2 CFR Part 200.322, "Procurement of recovered materials."

U.S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION (EDA)
CONTRACT INSERTS

- **EDA Contracting Provisions for Construction Projects**
- **Project Sign Specifications**
- **Form CD-512 Certification Regarding Lobbying**
- **Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity**
- **Davis Bacon Wage Rate Determination**

OMB Number: 0610-0096
Expiration Date: 01/31/2025

U. S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

EDA CONTRACTING PROVISIONS
FOR CONSTRUCTION PROJECTS

These EDA Contracting Provisions for Construction Projects (EDA Contracting Provisions) are intended for use by recipients receiving federal assistance from the U. S. Department of Commerce - Economic Development Administration (EDA). They contain provisions specific to EDA and other federal provisions not normally found in non-federal contract documents. The requirements contained herein must be incorporated into all construction contracts and subcontracts funded wholly or in part with federal assistance from EDA.

TABLE OF CONTENTS

1. DEFINITIONS

Agreement – The written instrument that is evidence of the agreement between the Owner and the Contractor overseeing the Work.

Architect/Engineer - The person or other entity engaged by the Recipient to perform architectural, engineering, design, and other services related to the work as provided for in the contract.

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

Contract Documents – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents.

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

Drawings or Plans – That part of the Contract Documents prepared or approved by the Architect/Engineer that graphically shows the scope, extent, and character of the Work to be performed by the Contractor.

EDA - The United States of America acting through the Economic Development Administration of the U.S. Department of Commerce or any other person designated to act on its behalf. EDA has agreed to provide financial assistance to the Owner, which includes assistance in financing the Work to be performed under this Contract. Notwithstanding EDA's role, nothing in this Contract shall be construed to create any contractual relationship between the Contractor and EDA.

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

Project – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

Recipient – A non-Federal entity receiving a Federal financial assistance award directly from EDA to carry out an activity under an EDA program, including any EDA-approved successor to the entity.

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.

Subcontractor – An individual or entity having direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

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.

2. APPLICABILITY

The Project to which the construction work covered by this Contract pertains is being assisted by the United States of America through federal assistance provided by the U.S. Department of Commerce - Economic Development Administration (EDA). Neither EDA, nor any of its departments, entities, or employees is a party to this Contract. The following EDA Contracting Provisions are included in this Contract and all subcontracts or related instruments pursuant to the provisions applicable to such federal assistance from EDA.

3. FEDERALLY REQUIRED CONTRACT PROVISIONS

(a) All contracts in excess of the simplified acquisition threshold - currently fixed at $150,000 (*see* 41 U.S.C. §§ 134 and 1908) must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate.

(b) All contracts in excess of $10,000 must address termination for cause and for convenience by the Recipient including the manner by which it will be effected and the basis for settlement.

(c) All construction contracts awarded in excess of $10,000 by recipients of federal assistance and their contractors or subcontractors shall contain a provision requiring compliance with Executive Order 11246 of September 24, 1965, *Equal Employment Opportunity*, as amended by Executive Order 11375 of October 13, 1967, and Department of Labor implementing regulations at 41 C.F.R. part 60.

(d) All prime construction contracts in excess of $2,000 awarded by Recipients must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3148) as supplemented by Department of Labor regulations at 29 C.F.R. part 5. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations at 29 C.F.R. part 3.

(e) All contracts awarded by the Recipient in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704 (the Contract Work Hours and Safety Standards Act) as supplemented by Department of Labor regulations at 29 C.F.R. part 5.

(f) All contracts must include EDA requirements and regulations that involve a requirement on the contractor or sub-contractor to report information to EDA, the Recipient or any other federal agency.

(g) All contracts must include EDA requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.

(h) All contracts must include EDA requirements and regulations pertaining to copyrights and rights in data.

(i) All contracts and subgrants in excess of $150,000 must contain a provision that requires compliance with all applicable standards, orders, or requirements issued under the Clean Air Act (42 U.S.C. § 7401 *et seq.*) and the Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. § 1251 *et seq.*), and Executive Order 11738, *Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act With Respect to Federal Contracts, Grants, or Loans*.

(j) Contracts must contain mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C.§ 6201).

(k) Contracts must contain a provision ensuring that contracts are not to be made to parties on the government wide Excluded Parties List System in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. part 180.

(l) Contracts must contain a provision ensure compliance with the Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352) under which contractors that apply or bid for an award of $100,000 or more must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. § 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

(m) If the Recipient is a state agency or agency of a political subdivision of a state, any contract awarded must contain a provision ensuring compliance with section 6002 of the Solid Waste Disposal Act (42 U.S.C. § 6962), as amended by the Resource Conservation and Recovery Act related to the procurement of recovered materials.

4. REQUIRED PROVISIONS DEEMED INSERTED

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

5. INSPECTION BY EDA REPRESENTATIVES

The authorized representatives and agents of EDA shall be permitted to inspect all work, materials, payrolls, personnel records, invoices of materials, and other relevant data and records.

6. EXAMINATION AND RETENTION OF CONTRACTOR'S RECORDS

(a) The Owner, EDA, or the Comptroller General of the United States, or any of their duly authorized representatives shall, generally until three years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders that do not exceed $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Owner, EDA, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

7. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule. The Contractor also shall furnish the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only to determine the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

8. CONTRACTOR'S TITLE TO MATERIAL

No materials, supplies, or equipment for the work shall be purchased by the Contractor or by any subcontractor that is subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants and guarantees that he/she has good title to all work, materials, and equipment used by him/her in the Work, free and clear of all liens, claims, or encumbrances.

9. INSPECTION AND TESTING OF MATERIALS

All materials and equipment used in the completion of the Work shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. Materials of construction, particularly those upon which the strength and durability of any structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for intended uses.

10. "OR EQUAL" CLAUSE

Whenever a material, article, or piece of equipment is identified in the Contract Documents by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard. Any material, article, or equipment of other manufacturers and vendors that will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Architect/Engineer, of equal substance and function. However, such substitution material, article, or equipment shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

11. 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 that 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 Architect/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 the Owner in the Contract Documents.

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

12. CLAIMS FOR EXTRA COSTS

No claims for extra work or cost shall be allowed unless the same was done in pursuance of a written order from the Architect/Engineer approved by the Owner.

13. CONTRACTORS AND SUBCONTRACTORS INSURANCE

(a) The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance reasonably required by the Owner, nor shall the Contractor allow any subcontractor to commence work on his/her subcontract until the insurance required of the subcontractor has been so obtained and approved.

(b) Types of insurance normally required are:

(1) Workers' Compensation
(2) Contractor's Public Liability and Property Damage
(3) Contractor's Vehicle Liability
(4) Subcontractors' Public Liability, Property Damage and Vehicle Liability
(5) Builder's Risk (Fire and Extended Coverage)

(c) **Scope of Insurance and Special Hazards:** The insurance obtained, which is described above, shall provide adequate protection for the Contractor and his/her subcontractors, respectively, against damage claims that may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him/her and also against any of the special hazards that may be encountered in the performance of this Contract.

(d) **Proof of Carriage of Insurance:** The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates, and dates of expiration of applicable insurance policies.

14. CONTRACT SECURITY BONDS

(a) If the amount of this Contract exceeds $150,000, the Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and also a payment bond in an amount equal to one hundred percent (100%) of the Contract price or in a penal sum not less than that prescribed by State, Territorial, or local law, as security for the payment of all persons performing labor on the Work under this Contract and furnishing materials in connection with this Contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law. Before final acceptance, each bond must be approved by EDA. If the amount of this Contract does not exceed $150,000, the Owner shall specify the amount of the payment and performance bonds.

(b) All bonds shall be in the form prescribed by the Contract Documents except as otherwise provided in applicable laws or regulations, and shall be executed by such sureties as are named in the current list of *Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies* as published in Treasury Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's

authority to act. Surety companies executing the bonds must also be authorized to transact business in the state where the Work is located.

15. **LABOR STANDARDS - DAVIS-BACON AND RELATED ACTS**
(as required by section 602 of PWEDA)

(a) **Minimum Wages**

(1) All laborers and mechanics employed or working upon the site of the Work in the construction or development of the Project will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act at 29 C.F.R. part 3, the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at the time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor, which is attached hereto and made a part hereof, regardless of any contractual relationship that may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 C.F.R. § 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 C.F.R. § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates determined under 29 C.F.R. § 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics to be employed under the Contract, but not listed in the wage determination, shall be classified in conformance with the wage determination. EDA shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

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

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

(C) The proposed wage rate, including any bona fide fringe benefits, bears a

reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and EDA or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by EDA or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and EDA or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), EDA or its designee shall refer the questions, including the views of all interested parties and the recommendation of EDA or its designee, to the Administrator for determination.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(2)(ii) or (iii) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

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

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

(b) **Withholding**

EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper employed or working on the site of the Work in the construction or development of the Project, all or part of the wages required by the Contract, EDA or its designee may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations

have ceased. EDA or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(c) **Payrolls and basic records**

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

(2) (i) For each week in which Contract work is performed, the Contractor shall submit a copy of all payrolls to the Owner for transmission to EDA or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 C.F.R. part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose. It may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402; or downloaded from the U.S. Department of Labor's website at https://www.dol.gov/whd/forms/wh347.pdf. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under 29 C.F.R. § 5.5(a)(3)(i) and that such information is correct and complete;

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

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

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 15(c)(2)(ii) of this section.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of Title 18 and section 3729 of Title 31 of the U.S. Code.

(3) The Contractor or subcontractor shall make the records required under paragraph 15(c)(1) of this section available for inspection, copying, or transcription by authorized representatives of EDA or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, EDA or its designee may, after written notice to the Contractor or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 C.F.R. § 5.12.

(d) **Apprentices and Trainees**.

(1) **Apprentices**. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training (Bureau), or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any

apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a Project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) **Trainees**. Except as provided in 29 C.F.R. § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program that has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) **Equal employment opportunity**. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity

requirements of Executive Order 11246, *Equal Employment Opportunity*, as amended, and 29 C.F.R. part 30.

(e) **Compliance with Copeland Anti-Kickback Act Requirements**. The Contractor shall comply with the Copeland Anti-Kickback Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations (29 C.F.R. part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that the Contractor and any subcontractors shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which they are otherwise entitled. The Owner shall report all suspected or reported violations to EDA.

(f) **Subcontracts**. The Contractor and any subcontractors will insert in any subcontracts the clauses contained in 29 C.F.R. §§ 5.5(a)(1) through (10) and such other clauses as EDA or its designee may require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 C.F.R. § 5.5.

(g) **Contract termination; debarment**. The breach of the contract clauses in 29 C.F.R. § 5.5 may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 C.F.R. § 5.12.

(h) **Compliance with Davis-Bacon and Related Act Requirements**. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 C.F.R. parts 1, 3, and 5 are herein incorporated by reference in this contract.

(i) **Disputes concerning labor standards**. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 C.F.R. parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and EDA or its designee, the U.S. Department of Labor, or the employees or their representatives.

(j) **Certification of Eligibility**.

(1)By entering into this Contract, the Contractor certifies that neither it nor any person or firm that has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 C.F.R. § 5.12(a)(1).

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

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

16. LABOR STANDARDS - CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(a) **Overtime requirements**. No Contractor or subcontractor contracting for any part of the Contract work, which may require or involve the employment of laborers or mechanics, shall require or permit any such laborer or mechanic in any workweek in which that person is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

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

(c) **Withholding for unpaid wages and liquidated damages**. EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or subcontractor under any such Contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) of this section.

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

17. EQUAL EMPLOYMENT OPPORTUNITY

(a) The Recipient hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 C.F.R. chapter 60, which is paid for in whole or in part with funds obtained from EDA, the following equal opportunity clause:

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

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by EDA and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of

this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally-assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the portion of the sentence immediately preceding paragraph 17(a)(1) and the provisions of paragraphs 17(a)(1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as EDA or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however, that in the event the Contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by EDA or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

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

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

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

to the Department of Justice for appropriate legal proceedings.

(b) Exemptions to Above Equal Opportunity Clause (41 C.F.R. chapter 60):

(1) Contracts and subcontracts not exceeding $10,000 (other than Government bills of lading, and other than contracts and subcontracts with depositories of Federal funds in any amount and with financial institutions which are issuing and paying agents for U.S. savings bonds and savings notes) are exempt. The amount of the Contract, rather than the amount of the federal financial assistance, shall govern in determining the applicability of this exemption.

(2) Except in the case of subcontractors for the performance of construction work at the site of construction, the clause shall not be required to be inserted in subcontracts below the second tier.

(3) Contracts and subcontracts not exceeding $10,000 for standard commercial supplies or raw materials are exempt.

18. **CONTRACTING WITH SMALL, MINORITY AND WOMEN'S BUSINESSES**

(a) If the Contractor intends to let any subcontracts for a portion of the work, the Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services.

(b) Affirmative steps shall consist of:

(1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(2) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(4) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises;

(5) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies;

(6) Requiring each party to a subcontract to take the affirmative steps of this section; and

(7) The Contractor is encouraged to procure goods and services from labor surplus area firms.

19. **HEALTH, SAFETY, AND ACCIDENT PREVENTION**

(a) In performing this contract, the Contractor shall:

(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to their health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;

(2) Protect the lives, health, and safety of other persons;

(3) Prevent damage to property, materials, supplies, and equipment; and

(4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

(1) Comply with regulations and standards issued by the Secretary of Labor at 29 C.F.R. part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 3701 – 3708); and

(2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this Contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 C.F.R. part 1904.

(d) The Owner shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the Work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as EDA, or the Secretary of Labor shall direct as a means of enforcing such provisions.

20. CONFLICT OF INTEREST AND OTHER PROHIBITED INTERESTS

(a) No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part hereof.

(b) No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

(c) The Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the Contract Documents has a corporate or financial affiliation with the supplier or manufacturer.

(d) The Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, may be involved. Such a conflict may arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in the Contractor. The Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors, or anything of monetary value from the Contractor or subcontractors.

(e) If the Owner finds after a notice and hearing that the Contractor, or any of the Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of the Owner or EDA in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, the Owner may, by written notice to the Contractor, terminate this Contract. The Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which the Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

(f) In the event this Contract is terminated as provided in paragraph (e) of this section, the Owner may pursue the same remedies against the Contractor as it could pursue in the event of a breach of this Contract by the Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, the Owner may pursue exemplary damages in an amount (as determined by the Owner) which shall not be less than three nor more than ten times the costs the Contractor incurs in providing any such gratuities to any such officer or employee.

21. RESTRICTIONS ON LOBBYING

(a) This Contract, or subcontract is subject to 31 U.S.C. § 1352, regarding lobbying restrictions. The section is explained in the common rule, 15 C.F.R. part 28 (55 FR 6736-6748, February 26, 1990). Each bidder under this Contract or subcontract is generally prohibited from using federal funds for lobbying the Executive or Legislative Branches of the Federal Government in connection with this EDA Award.

(b) **Contract Clause Threshold**: This Contract Clause regarding lobbying must be included in each bid for a contract or subcontract exceeding $100,000 of federal funds at any tier under the EDA Award.

(c) **Certification and Disclosure**: Each bidder of a contract or subcontract exceeding $100,000 of federal funds at any tier under the federal Award must file Form CD-512, *Certification Regarding Lobbying – Lower Tier Covered Transactions*, and, if applicable, Standard Form-LLL, *Disclosure of Lobbying Activities*, regarding the use of any nonfederal funds for lobbying. Certifications shall be retained by the Contractor or subcontractor at the next higher tier. All disclosure forms, however, shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(d) **Continuing Disclosure Requirement**: Each Contractor or subcontractor that is subject to the Certification and Disclosure provision of this Contract Clause is required to file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by such person. Disclosure forms shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(e) **Indian Tribes, Tribal Organizations, or Other Indian Organizations**: Indian tribes, tribal organizations, or any other Indian organizations, including Alaskan Native organizations, are excluded from the above lobbying restrictions and reporting requirements, but only with respect to expenditures that are by such tribes or organizations for lobbying activities permitted by other federal law. An Indian tribe or organization that is seeking an exclusion from Certification and Disclosure requirements must provide EDA with the citation of the provision or provisions of federal law upon which it relies to conduct lobbying activities that would otherwise be subject to the prohibitions in and to the Certification and Disclosure requirements of 31 U.S.C. § 1352, preferably through an attorney's opinion. Note, also, that a non-Indian subrecipient, contractor, or subcontractor under an award to an Indian tribe, for example, is subject to the restrictions and reporting requirements.

22. HISTORICAL AND ARCHAEOLOGICAL DATA PRESERVATION

The Contractor agrees to facilitate the preservation and enhancement of structures and objects of historical, architectural or archaeological significance and when such items are found and/or unearthed during the course of project construction. Any excavation by the Contractor that uncovers an historical or archaeological artifact shall be immediately reported to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the State Historic

Preservation Officer (SHPO) for recovery of the items. *See* the National Historic Preservation Act of 1966 (54 U.S.C. § 300101 *et seq.*, formerly at 16 U.S.C. § 470 *et seq.*) and Executive Order No. 11593 of May 31, 1971.

23. **CLEAN AIR AND WATER**

Applicable to Contracts in Excess of $150,000

(a) **Definition**. "Facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by the Contractor or any subcontractor, used in the performance of the Contract or any subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the United States Environmental Protection Agency (EPA) determines that independent facilities are collocated in one geographical area.

(b) In compliance with regulations issued by the EPA, 2 C.F.R. part 1532, pursuant to the Clean Air Act, as amended (42 U.S.C. § 7401 *et seq.*); the Federal Water Pollution Control Act, as amended (33 U.S.C. § 1251 *et seq.*); and Executive Order 11738, the Contractor agrees to:

(1) Not utilize any facility in the performance of this contract or any subcontract which is listed on the Excluded Parties List System, part of the System for Award Management (SAM), pursuant to 2 C.F.R. part 1532 for the duration of time that the facility remains on the list;

(2) Promptly notify the Owner if a facility the Contractor intends to use in the performance of this contract is on the Excluded Parties List System or the Contractor knows that it has been recommended to be placed on the List;

(3) Comply with all requirements of the Clean Air Act and the Federal Water Pollution Control Act, including the requirements of section 114 of the Clean Air Act and section 308 of the Federal Water Pollution Control Act, and all applicable clean air and clean water standards; and

(4) Include or cause to be included the provisions of this clause in every subcontract and take such action as EDA may direct as a means of enforcing such provisions.

24. **USE OF LEAD-BASED PAINTS ON RESIDENTIAL STRUCTURES**

(a) If the work under this Contract involves construction or rehabilitation of residential structures over $5,000, the Contractor shall comply with the Lead-based Paint Poisoning Prevention Act (42 U.S.C. § 4831). The Contractor shall assure that paint or other surface coatings used in a residential property does not contain lead equal to or in excess of 1.0 milligram per square centimeter or 0.5 percent by weight or 5,000 parts per million (ppm) by weight. For purposes of this section, "residential property" means a dwelling unit, common areas, building exterior surfaces, and any surrounding land, including outbuildings, fences and play equipment affixed to the land, belonging to an owner and available for use by residents, but not

including land used for agricultural, commercial, industrial or other non-residential purposes, and not including paint on the pavement of parking lots, garages, or roadways.

(b) As a condition to receiving assistance under PWEDA, recipients shall assure that the restriction against the use of lead-based paint is included in all contracts and subcontracts involving the use of federal funds.

25. ENERGY EFFICIENCY

The Contractor shall comply with all standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. § 6201) for the State in which the Work under the Contract is performed.

26. ENVIRONMENTAL REQUIREMENTS

When constructing a Project involving trenching and/or other related earth excavations, the Contractor shall comply with the following environmental constraints:

(1) **Wetlands**. When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert wetlands.

(2) **Floodplains**. When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency (FEMA) Floodplain Maps, or other appropriate maps, i.e., alluvial soils on Natural Resource Conservation Service (NRCS) Soil Survey Maps.

(3) **Endangered Species**. The Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of the Contractor, the Contractor will immediately report this evidence to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the U.S. Fish and Wildlife Service.

27. DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSIONS

As required by Executive Orders 12549 and 12689, *Debarment and Suspension*, 2 C.F.R. Part 180 and implemented by the Department of Commerce at 2 C.F.R. part 1326, for prospective participants in lower tier covered transactions (except subcontracts for goods or services under the $25,000 small purchase threshold unless the subrecipient will have a critical influence on or substantive control over the award), the Contractor agrees that:

(1) By entering into this Contract, the Contractor and subcontractors certify, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared

ineligible, or voluntarily excluded from participation in this Contract by any federal department or agency.

(2) Where the Contractor or subcontractors are unable to certify to any of the statements in this certification, the Contractor or subcontractors shall attach an explanation to this bid.

See also 2 C.F.R. part 180 and 2 C.F.R. § 200.342.

28. **EDA PROJECT SIGN**

The Contractor shall supply, erect, and maintain in good condition a Project sign according to the specifications provided by EDA. To the extent practical, the sign should be a free standing sign. Project signs shall not be located on public highway rights-of-way. Location and height of signs will be coordinated with the local agency responsible for highway or street safety in the Project area, if any possibility exists for obstructing vehicular traffic line of sight. Whenever the EDA site sign specifications conflict with State law or local ordinances, the EDA Regional Director will permit such conflicting specifications to be modified so as to comply with State law or local ordinance.

29. **BUY AMERICA**

To the greatest extent practicable, contractors are encouraged to purchase American-made equipment and products with funding provided under EDA financial assistance awards.

OMB Number: 0610-0096
Expiration Date: 01/31/2025

EDA PROJECT SIGN

The Contractor shall supply, erect, and maintain in good condition a project sign according to the specifications set forth below:

EDA SITE SIGN SPECIFICATIONS

Size: 4' x 8' x ¾"

Materials: Exterior grade/MDO plywood (APA rating A-B)

Supports: 4" x 4" x 12' posts with 2" x 4" cross branching

Erection: Posts shall be set a minimum of three feet deep in concrete footings that are at least 12" in diameter.

Paint: Outdoor enamel

Colors: Jet Black, Blue (PMS300), and Gold (PMS7406). Specifically, on white background the following will be placed:

The U. S. Department of Commerce seal in blue, black, and gold;

"EDA" in blue;

"U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT

ADMINISTRATION" in black;

"In partnership with" in blue;

(Actual name of the) "EDA Grant Recipient" in black;

Lettering: Specific fonts are named below; positioning will be as shown on the attached illustration.

"U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT ADMINISTRATION" use Bank Gothic Medium - BANK GOTHIC MED

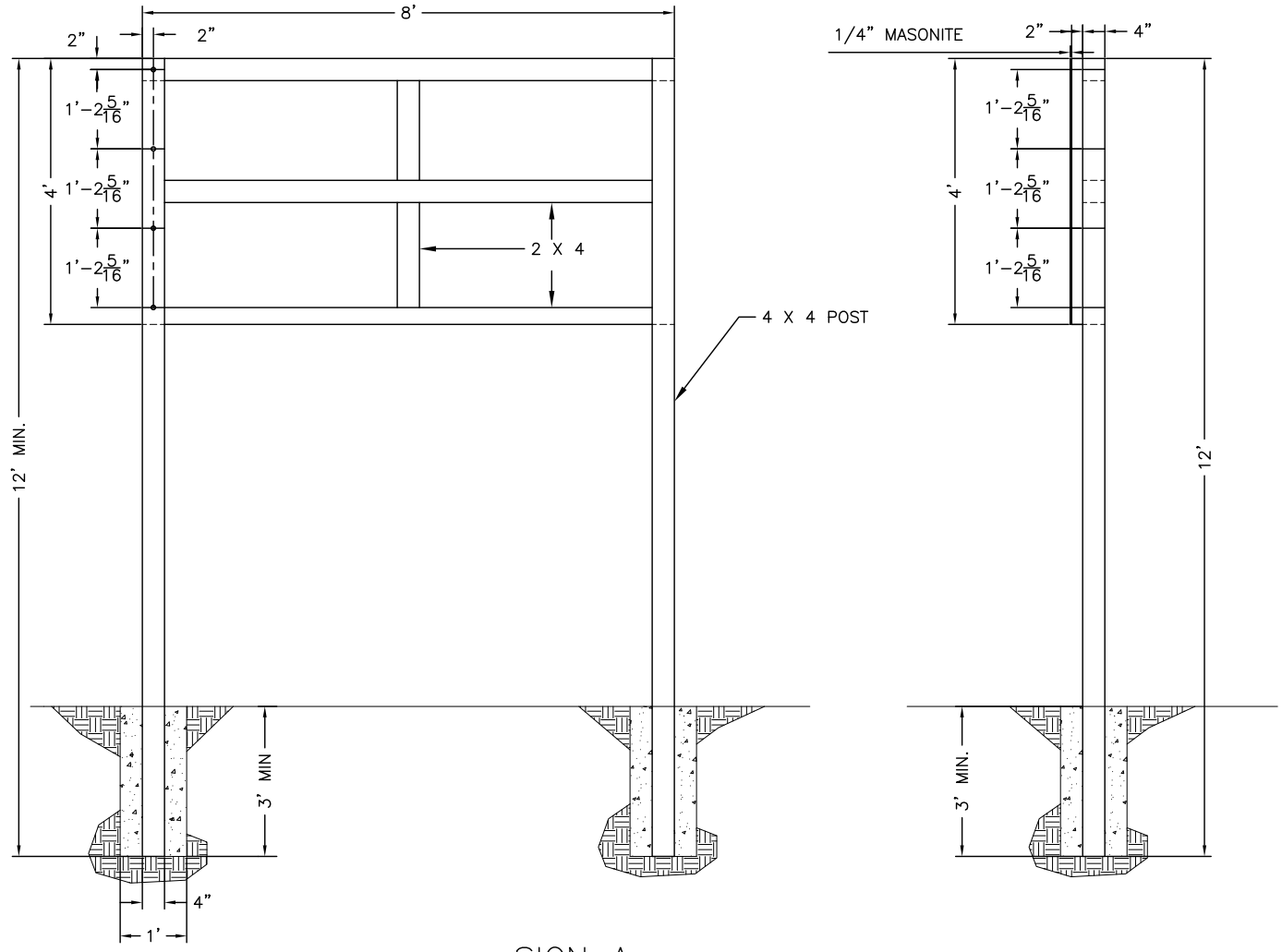
"In partnership with" use Univers™ 55 Oblique - *Univers 55*

(Name of) "EDA Grant Recipient" use Univers™ Extra Black 85 **Univers 85**

Project signs will not be erected on public highway rights-of-way. If any possibility exists for obstruction to traffic line of sight, the location and height of the sign will be coordinated with the agency responsible for highway or street safety in the area.

The EDA Regional Director may permit modifications to these specifications if they conflict with state law or local ordinances.

OMB Number: 0610-0096
Expiration Date: 01/31/2025

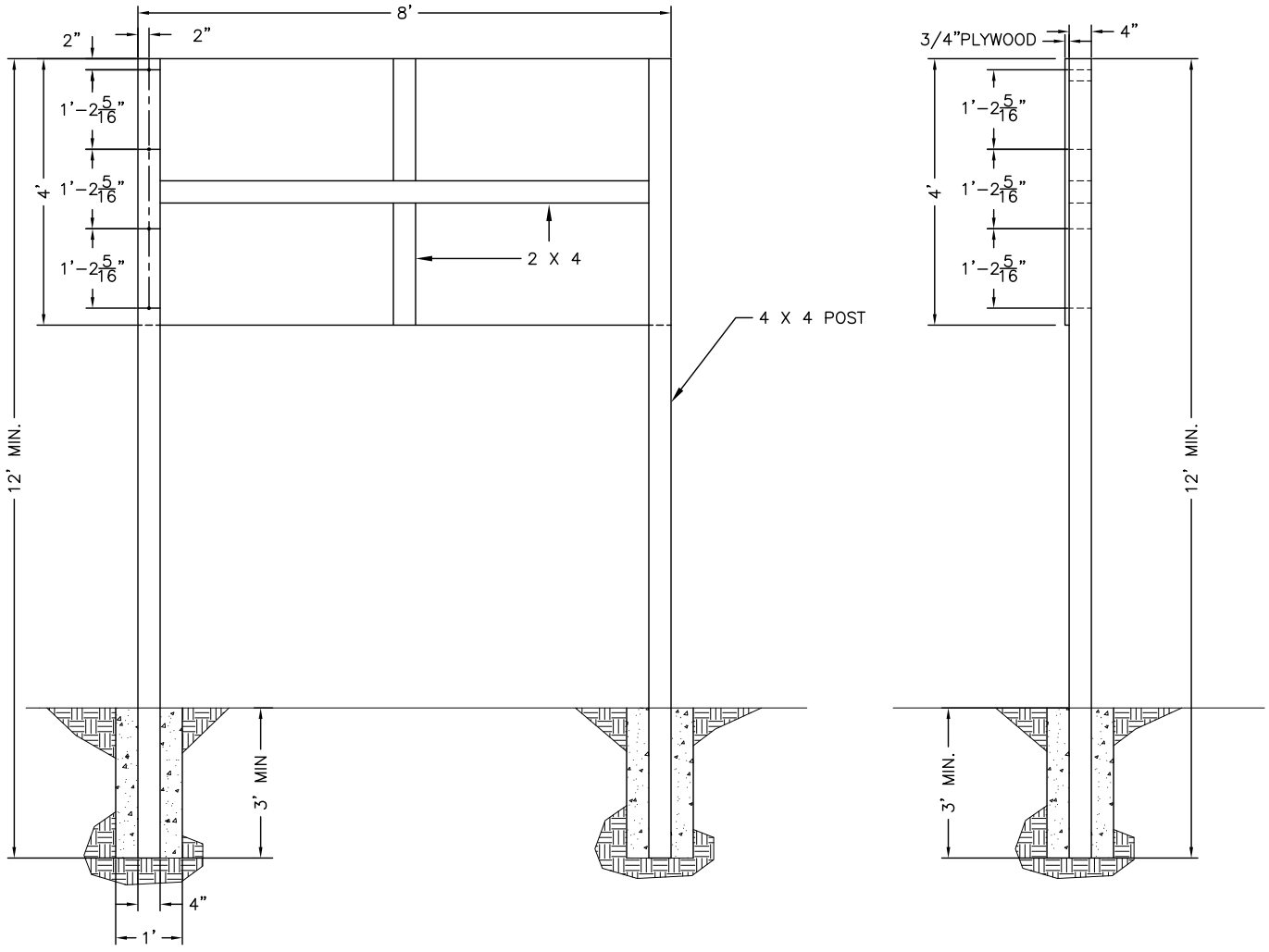


SIGN A
MASONITE SIGN

SCALE: 3/8" = 1'

PROJECT - SIGN A
ECONOMIC DEVELOPMENT ADMINISTRATION

OMB Number: 0610-0096
Expiration Date: 01/31/2025



SIGN B
PLYWOOD SIGN
SCALE: 3/8" = 1'

PROJECT - SIGN B
ECONOMIC DEVELOPMENT ADMINISTRATION

EDA

U.S. Department of Commerce Economic Development Administration

In partnership with

<EDA Grant Recipient Name>

2.25”

13.5”

1.75”

1.75”

EDA

10”

Black
Blue= PMS300
Gold= PMS7406

2.0”

1.5”

U.S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT ADMINISTRATION

4.0”

48”

3.0”

In partnership with

3.0”

<EDA Grant Recipient Name>

3.75”

15.0”

96"

FORM **CD-512**
(REV 12-04)

U.S. DEPARTMENT OF COMMERCE

CERTIFICATION REGARDING LOBBYING
LOWER TIER COVERED TRANSACTIONS

Applicants should review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying."

LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

In any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure Form to Report Lobbying,'' in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

NAME OF APPLICANT	AWARD NUMBER AND/OR PROJECT NAME
	01-01-15370 NRRWA WTP Expansion
PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE	
SIGNATURE	DATE

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246 AND 41 CFR PART 60-4)

The following Notice shall be included in, and shall be a part of all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000.

The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation for each trade
	12.0 %	6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non federally involved construction.
The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is:

State of Virginia

County of Wythe

City of N/A

"General Decision Number: VA20240009 02/02/2024
Superseded General Decision Number: VA20230009
State: Virginia
Construction Type: Building
Counties: Bland, Buchanan, Carroll, Dickenson, Grayson, Henry, Lee, Patrick, Russell, Tazewell and Wythe Counties in Virginia.
Includes the independent cities of Galax* and Martinsville*
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).
Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.
Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.
Modification Number Publication Date

```
          0              01/05/2024
          1              02/02/2024
 ASBE0024-006 10/01/2023
                                  Rates          Fringes
ASBESTOS WORKER/HEAT & FROST
INSULATOR - MECHANICAL (Duct,
Pipe & Mechanical System
Insulation).....................$ 40.02          19.67+a
  a. PAID HOLIDAYS: New Year's Day, Martin Luther King Day,
  Memorial Day, Independence Day, Labor Day, Veterans' Day,
  Thanksgiving Day,the day after Thanksgiving and Christmas
  Day provided the employee works the regular work day before
  and after the paid holiday.
------------------------------------------------------------------
* ELEC0666-001 03/01/2023
                                  Rates          Fringes
ELECTRICIAN.....................$ 34.77            50.45%
------------------------------------------------------------------
 ENGI0147-015 05/01/2022
                                  Rates          Fringes
POWER EQUIPMENT OPERATOR
     Bulldozer..................$ 28.60             13.05
------------------------------------------------------------------
*  SUVA2013-018 01/11/2016
                                  Rates          Fringes
CARPENTER.......................$ 15.84 **           1.42

GLAZIER.........................$ 16.95 **           2.48

LABORER:  Common or General.....$ 10.89 **           0.00

OPERATOR:
Backhoe/Excavator/Trackhoe.....$ 11.00 **           0.50

PIPEFITTER......................$ 20.89             6.63

PLUMBER.........................$ 18.45             3.05

ROOFER..........................$ 15.56 **           3.06

SHEET METAL WORKER (HVAC Duct
Installation Only)..............$ 17.73             6.44

TRUCK DRIVER:  Dump Truck.......$ 11.25 **           0.57
------------------------------------------------------------------
WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.
==================================================================
** Workers in this classification may be entitled to a higher
minimum wage under Executive Order 14026 ($17.20) or 13658
($12.90).  Please see the Note at the top of the wage
determination for more information. Please also note that the
minimum wage requirements of Executive Order 14026 are not
currently being enforced as to any contract or subcontract to
```

which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.
Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.
Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).
Union Rate Identifiers
A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.
Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.
Survey Rate Identifiers
Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average

rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier. Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

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

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

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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Contractor:		Contractor's Project No.:	
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			
Date Issued:		Effective Date of Work Change Directive:	

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Notes to User—Check one or both of the following

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: $ _____ **[increase] [decrease] [not yet estimated]**.

Contract Time: _____ days **[increase] [decrease] [not yet estimated]**.

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

	Recommended by Engineer	Authorized by Owner
By:	_____	_____
Title:	_____	_____
Date:	_____	_____

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Contractor:		Contractor's Project No.:	
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			
Date Issued:		Effective Date of Change Order:	

The Contract is modified as follows upon execution of this Change Order:

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	**Change in Contract Times [State Contract Times as either a specific date or a number of days]**
Original Contract Price: $ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. **[Number of previous Change Order]**: $ _____	**[Increase] [Decrease]** from previously approved Change Orders No.1 to No. **[Number of previous Change Order]**: Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: $ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: $ _____	**[Increase] [Decrease]** this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: $ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

	Recommended by Engineer (if required)	Accepted by Contractor
By:		
Title:		
Date:		
	Authorized by Owner	**Approved by Funding Agency (if applicable)**
By:		
Title:		
Date:		

FIELD ORDER NO.: [Number of Field Order]

Owner:	New River Regional Water Authority	Owner's Project No.:	
Engineer:	Peed & Bortz, LLC	Engineer's Project No.:	22-18
Contractor:		Contractor's Project No.:	
Project:	NRRWA Water Treatment Plant Expansion		
Contract Name:			
Date Issued:	Effective Date of Field Order:		

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

SECTION 01100 – SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: New River Regional Water Authority Water Treatment Plant Expansion

1. Owner: New River Regional Water Authority;
289 Kohler Ave.
Austinville, VA 24312

B. Engineer Identification: The Contract Documents were prepared for this Project by Peed & Bortz, LLC, Civil and Environmental Engineers, 20 Midway Plaza Drive Ste. 100, Christiansburg, VA 24073.

C. Base Bid and Deductive Alternates:

1. Base Bid: The Base Bid includes all work identified in the plans, specifications, or other contract documents including, but not limited to, improvements to the raw water intake, chemical feed and mixing systems, sedimentation and sludge collection systems, gravity filters, finished water pumping system, solids handling basins, and electrical and control systems; and construction of new sludge pump station, thickener tanks, Sludge Dewatering Building, Dry Solids Shelter, and dewatering centrifuge and conveyor system.

2. Deductive Alternate #1 – Centrifuge and Conveyor System: This deductive alternate is the amount subtracted from the Base Bid amount to delete the centrifuge and conveyor system from the project scope. The deductive alternate is limited to deleting the materials and associated installation of work specified in Section 11390 – Sludge Dewatering Equipment including the centrifuge, polymer feed system, sludge feed pump flow meter, auger and belt conveyor system to the dry solids shelter, and centrifuge/conveyor control panel. All other piping, switchgear, SCADA controls, and other items shall remain in project scope to allow the centrifuge and conveyor systems to be installed in the future. A 4" bland flange shall be installed on the 4" base elbow at the northern corner of the Dewatering Building for future extension to the sludge feed pump. The Dewatering Building wall opening for the conveyor shall be constructed and filled with a 6" wide wood stud framed panel with painted plywood on interior and exterior sides. The Dry Solids Shelter shall be designed for future conveyor loads and mounting. Fabric wall opening for future conveyor penetration may either be installed with a removable fabric panel or left solid for the opening to be installed in the future.

3. Deductive Alternate #2 – Dry Solids Shelter: This deductive alternate is the additional amount subtracted from the Base Bid and Deductive Alternate #1 net amounts to delete the Dy Solids Shelter from the project scope. This deductive alternate is limited to deleting the materials and labor associated with the tensioned fabric structure, concrete foundation and knee walls, and concrete pavement and approximately 2,400 square feet of gravel access road to the north east of the dry solids shelter.

D. Substantial Completion Milestones:

1. Partial Substantial Completion – Water Treatment Plant Capacity Expansion: A partial substantial completion will be issued when the work to expand the treatment plant capacity to 6.33 MGD is complete and the treatment plant is capable of normal operation at the expanded rate. This partial substantial completion applies to all work other than the solids handling and sludge dewatering facilities downstream of the sedimentation basins.

2. Full Project Substantial Completion: Full project substantial completion applies to all project work including the capacity expansion and solids handling and sludge dewatering elements of the project.

1.2 CONTRACT

A. Project will be constructed under one contract.

1.3 WORK SEQUENCE

A. General: The Work will be constructed in accordance with sequences indicated on the plans.

1.4 USE OF PREMISES

A. All work shall be performed at the existing Water Treatment Plant and Raw Water Intake Sites.

B. Contractor shall coordinate access and storage requirements with Owner.

1.5 FUTURE WORK

A. Future Contract: No future contractors are anticipated at this time.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "Master Format" numbering system.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred, as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.7 RECORD DRAWINGS

A. General: The Contractor will submit to the Engineer at the Final Completion inspection, record drawings of the project. Engineer will provide Contractor with one set of reproducible plan sheets upon request.

The record drawings provided to the Engineer will be in a legible, reproducible format and show all revisions/changes to the plans made during construction, including horizontal and vertical location changes..

1.8 SCHEDULE OF VALUES

A. Schedule of Values: The Contractor will provide a suitable schedule of values for the work. The schedule of values will be presented to the Engineer at the pre-construction conference for the Engineer's approval.

1.9 OSHA REQUIREMENTS

A. General: The Contractor will be responsible for performing all work in accordance with OSHA requirements The Contractor's responsibility also extends to providing a "Competent Person" as defined by the OSHA regulation referenced above on the job site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The Contractor shall provide submittals for the Engineer's approval to show compliance with the specifications. Unacceptable submittals shall be revised and resubmitted as necessary until compliance with the specifications is achieved.

1.2 QUALITY ASSURANCE

A. Coordination of Submittals: The Contractor shall be responsible for reviewing the Specifications to ensure that the items being submitted conform in all respects with the requirements. All submittals shall be provided to the Engineer at least 3 weeks prior to commencing work on the items being submitted.

B. Substitutions:

1. The Contractor is bound to the standards of quality established in the Contract Documents. Refer to Article 6 of the General Conditions regarding “Equals”.
2. The substitution of materials or equipment shall not be permitted unless the Engineer has given prior approval for the substitution in writing.
3. The Contractor shall certify that the proposed substitution has been determined to be equal or superior to the product specified. The proposed substitution shall be in complete compliance with the provisions in the Contract Documents.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. General: The Contractor shall comply with Article 6 of the General Conditions regarding “Submittals”.

B. Submissions: Submittals will be stamped by the Engineer in one of the following ways:

1. “Approved” – No exceptions are taken, subject to compliance with the Contract Documents.
2. “Approved as Corrected” – Minor corrections are noted and a resubmittal is not required, subject to compliance with the corrections and the Contract Documents.
3. “Not Approved” – The submittal material, method or system is totally rejected and does not meet the intent of the Specifications.
4. “Revise and Resubmit” – Revise prior to resubmittal is required.

C. Submission Procedure: The Contractor shall provide a digital copy of each submittal to the Engineer for review. Submittals for any products with color options shall include printed color cards or samples. Submittals, reviews, and approvals shall be transmitted electronically (excluding color samples).

2.2 SHOP DRAWINGS

A. Scale and Measurements: Shop drawings shall be to a scale sufficiently large to show all pertinent aspects of the item.

2.3 MANUFACTURER'S LITERATURE

A. General: The Contractor shall provide all manufacturers' data pertinent to the submittal, clearly showing which portions of the contents are being provided for review.

2.4 OPERATION AND MAINTENANCE MANUALS

A. General: The Contractor shall provide the Engineer, 1 digital and 2 printed copies of complete operation and maintenance manuals and other written recommendations for operation, as provided by manufacturers.

2.5 RECORD DRAWINGS

A. The Contractor will submit to the Engineer at the Final Completion inspection, record drawings of the project. Engineer will provide Contractor with one set of reproducible plan sheets upon request. The record drawings provided to the Engineer will be in a legible, reproducible format and show all revisions/ changes to the plans made during construction, including horizontal and vertical location changes.

PART 3 - EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

A. Numbering: All submittals shall be consecutively numbered. Resubmittals shall cite the original submittal number for reference.

B. Transmittal: Each submittal shall be accompanied by a transmittal letter showing all the information required for identification and checking, including the appropriate Specification sections.

C. Submittal Log: The Contractor shall maintain a submittal log for the duration of the Work that indicates current status of all submittals. The submittal log shall be available to the Engineer at all times for the Engineer's review.

3.2 ENGINEER'S REVIEW

A. General: Review by the Engineer does not relieve the Contractor from responsibility for errors that may result from the submitted data.

B. Revisions: All revisions requested by the Engineer will be required. If the Contractor is considering any required revision to be changed, he shall notify the Engineer as provided in the General Conditions.

END OF SECTION

SECTION 01450 – TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The Contractor shall be responsible for providing an independent testing laboratory for analysis of field samples for all soil, compaction, and concrete testing. The testing laboratory shall be approved by the Engineer. This service shall be provided at no cost to the Owner. Should any test results be unacceptable, the Contractor will at no cost provide the additional testing necessary. The Owner will be responsible for cost only when additional samples are tested at their request.

1.2 QUALITY ASSURANCE

A. General: The independent testing laboratory must be qualified and regularly engaged in this type of work, and approved by the Engineer.

B. Testing: All testing shall be performed in accordance with all pertinent codes, regulations and standards.

C. Personnel: Individuals taking and performing the field tests shall have the proper training and qualifications.

PART 2 - PRODUCTS

2.1 PAYMENT FOR TESTING

A. Initial Services: The CONTRACTOR shall be responsible for paying for the initial testing services.

B. Retesting: When initial tests indicate noncompliance with the Contract Documents, subsequent retesting will be necessary and shall be performed by the same testing laboratory. The additional costs incurred from these tests will be the responsibility of the Contractor. Refer to Section 13 of the General Conditions.

C. Additional Testing: Should additional tests be requested by the Owner, the cost of such testing shall be borne by the Owner.

2.2 CODE COMPLIANCE TESTING

A. General: Inspections and testing required by codes or ordinances, a planning authority, or which are made by a legally constituted authority shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided for in the Contract Documents.

2.3 CONTRACTOR'S CONVENIENCE TESTING

A. General: Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

PART 3 - EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY

A. General: Representatives of the testing laboratory shall have access to the work site at all times and at all locations where work is in progress.

3.2 TAKING SAMPLES

A. General: All specimens and samples shall be taken by the Contractor, unless otherwise provided for in the Contract Documents. All sampling equipment shall be provided by the testing laboratory. All specimens and samples shall be delivered to the testing laboratory by the Contractor.

3.3 SCHEDULE FOR TESTING

A. Schedule: The Contractor shall schedule and allow adequate time for the necessary testing to be performed and results received from the testing laboratory. When field sampling or testing is required to be witnessed by the Engineer or Inspector, the Contractor shall schedule such work with the Engineer or Inspector at least 48 hours in advance.

B. Revising Schedule: When changes in the construction schedule are necessary, these changes must be coordinated with the testing laboratory.

C. Adherence to Schedule: When the testing laboratory is ready to test according to the established schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra charges for testing attributed to the delay shall be borne by the Contractor.

END OF SECTION

SECTION 01453 - CODE REQUIRED SPECIAL INSPECTIONS

Structural Statement of Special Inspections

Project:	Austinville NRWAA Water Treatment Plant Expansion
Location:	Austinville, Virginia
Owner:	New River Regional Water Authority

This *Statement of Special Inspections* encompass the following discipline: **Structural**

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 Structural Special Inspection Coordinator (SSIC) and the identity of other approved agencies to be retained for conducting these inspections and tests.

The Structural Special Inspection Coordinator shall keep records of all Structural inspections and shall furnish inspection reports to the Building Code Official (BCO) and the Structural Registered Design Professional in Responsible Charge (SRDP). Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Structural Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Structural Registered Design Professional in Responsible Charge at an interval determined by the SSIC and the BCO.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted to the BCO prior to issuance of a Certificate of Use and Occupancy.

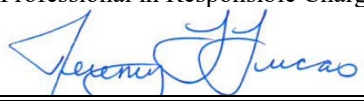
Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: ☒Upon request of Building Official _____ or ☐ per attached schedule.

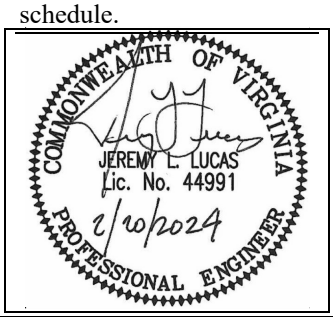
Prepared by:

Jeremy L. Lucas, P.E.

(Type or print name of the Structural Registered Design Professional in Responsible Charge)



Signature Date



Owner's Authorization: Building Code Official's Acceptance:

Signature Date Signature Date

List of Agents

Project:	Austinville Water Treatment Plant
Location:	Austinville, Virginia
Owner:	New River Regional Water Authority

This *Statement of Special Inspections* encompasses the following discipline: **Structural**

(Note: *Statement of Special Inspections* for other disciplines may be included under a separate cover)

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete System
- ☒ Masonry Systems
- ☐ Structural Steel
- ☐ Cold Formed Steel Construction

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. STRUCTURAL Special Inspection Coordinator (SSIC)		
2. Special Inspector (SI 1)		
3. Special Inspector (SI 2)		
4. Testing Agency (TA 1)		
5. Testing Agency (TA 2)		
6. Other (O1)		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Final Report of Special Inspections (SSIC/SI 1)
[To be completed by the Structural Special Inspection Coordinator (SSIC/SI 1). Note that all Agent's Final Reports must be received prior to issuance.]

Project:	Austinville Water Treatment Plant
Location:	Austinville, Virginia
Owner:	New River Regional Water Authority
Owner's Address:	289 Kohler Ave. Austinville, VA 24312

Architect of Record:	(name)	(firm)
Structural Registered Design Professional in Responsible Charge:	Jeremy L. Lucas	Master Engineers and Designers, Inc
	(name)	(firm)

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved.

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Structural Special Inspection Coordinator

(Type or print name)

(Firm Name)

Signature Date

Licensed Professional Seal

Special Inspector's/Agent's Final Report

Project:

Special Inspector or Agent:

(name) (firm)

Designation:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Inspector/Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved.

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,

Special Inspector or Agent:

(Type or print name)

Signature Date

Licensed Professional Seal or Certification Number

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided to the Special Inspector for their records. *NOTE VERIFICATION THAT QUALIFIED INDIVIDUALS ARE AVAILABLE TO PERFORM STIPULATED TESTING AND/OR INSPECTION SHOULD BE PROVIDED PRIOR TO SUBMITTING STATEMENT. AGENT QUALIFICATIONS IN SCHEDULE ARE SUGGESTIONS ONLY; FINAL UALIFICATIONS ARE SUBJECT TO THE DISCRETION OF THE REGISTERED DESIGN PROFESSIONAL PREPARING THE SCHEDULE.*

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge or Special Inspector of Record deems it appropriate that the individual performing a stipulated test or inspection have a specific certification, license or experience as indicated below, such requirement shall be listed below and shall be clearly identified within the schedule under the Agent Qualification Designation.

PE/SE Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

Experienced Testing Technician

ETTExperienced Testing Technician – An Experienced Testing Technician with a minimum 5 years experience with the stipulated test or inspection

American Concrete Institute (ACI) Certification

ACI-CFTT Concrete Field Testing Technician – Grade 1
ACI-CCI Concrete Construction Inspector
ACI-LTT Laboratory Testing Technician – Grade 1&2
ACI-ST Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI Certified Welding Inspector
AWS/AISC-SSI Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI Structural Masonry Special Inspector
ICC-SWSI Structural Steel and Welding Special Inspector
ICC-SFSI Spray-Applied Fireproofing Special Inspector
ICC-PCSI Prestressed Concrete Special Inspector
ICC-RCSI Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Other _____

_____

Structural Schedule of Special Inspections
SOILS & FOUNDATION CONSTRUCTION

VERIFICATION AND INSPECTION IBC Section 1705	Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	REFERENCE	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. Verify existing soil conditions, fill placement and load bearing requirements	Y					
a. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Y	P	IBC 1705.6		PE/GE, EIT or ETT	
b. Verify excavations are extended to proper depth and have reached proper material.	Y	C	IBC 1705.6		PE/GE, EIT or ETT	
c. Perform classification testing of compacted fill materials.	Y	P	IBC 1705.6		PE/GE, EIT or ETT	
d. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill	Y	P	IBC 1705.6		PE/GE, EIT or ETT	
e. Prior to placement of compacted fill inspect subgrade and verify that site has been prepared properly	Y	P	IBC 1705.6		PE/GE, EIT or ETT	

Structural Schedule of Special Inspections
CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION IBC Section 1705	Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	REFERENCE	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. Inspection of reinforcing steel, including prestressing tendons, and placement	Y	P	IBC 1705.3, IBC 1908.4 and ACI 318: Ch 20, 25.2, 25.3 and 26.6.1-26.6.3		PE/SE, EIT or ETT	
2. Inspection of reinforcing steel welding”	N		AWS D1.4 ACI 318: 26.6.4			
a. Verify weldability of reinforcing bars other than A706.	N	P			AWS-CWI	
b. Inspect single-pass fillet welds, maximum 5/16”	N	P			AWS-CWI	
c. Inspect all other welds	N	C			AWS-CWI	
3. Inspect anchors cast in concrete.	Y	P	ACI 318: 17.8.2		PE/SE, EIT or ETT	
4. Inspect anchors post-installed in hardened concrete members.	Y					
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	N	C	ACI 318: 17.8.2.4		PE/SE, EIT or ETT	
b. Mechanical anchors and adhesive anchors not defined in part a above.	Y	P	ACI 318: 17.8.2		PE/SE, EIT or ETT	
5. Verifying use of required design mix	Y	P	IBC 1705.3 ACI 318: Ch 19, 26.4.3, 26.4.4 IBC 1904.1, 1904.2. 1908.2 and 1908.3		PE/SE, EIT or ETT	
6. Prior to concrete placement, fabricate specimens for strength test, perform slump and air content test and temperature	Y	C	IBC 1705.3, IBC 1908.10 ASTM C172 ASTM C31 ACI 318: 26.5, 26.12		ACI-CFTT or ACI-STT	
7. Inspection of concrete and shotcrete placement for proper application techniques	Y	C	IBC 1705.3, 1908.6. 1908.7, 1908.8 ACI 318: 26.5		PE/SE, EIT or ETT	

8. Inspection for maintenance of specified curing temperature and techniques	Y	P	IBC 1705.3 IBC 1908.9 ACI 318: 26.5.3-26.5.5		PE/SE, EIT or ETT	
9. Inspect formwork for shape, location and dimensions of the concrete member being formed, shoring and reshoring.	Y	P	VCC 1705.3 ACI 318: 26.11.1.2 (b)		PE/SE, EIT or ETT	

Structural Schedule of Special Inspections
MASONRY CONSTRUCTION – LEVEL 3 (ESSENTIAL FACILITY)

VERIFICATION AND INSPECTION IBC Section 1705	Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	REFERENCE	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. As masonry construction begins, the following shall be verified to ensure compliance:						
a. Proportions of site-prepared mortar.	Y	P	TMS 602: 2.1, 2.6A, 2.6 C		PE/SE, EIT, ICC-SMSI or ETT	
b. Grade and size of prestressing tendons and anchorages.	N	P	TMS 602: 2.4B, 2.4H		PE/SE, EIT, ICC-SMSI or ETT	
c. Grade, type and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorage.	Y	P	TMS 602: 3.4. 3.6A		PE/SE, EIT, ICC-SMSI or ETT	
d. Prestressing technique.	N	P	TMS 602: 3.6B		PE/SE, EIT, ICC-SMSI or ETT	
e. Properties of thin-bed mortar for AAC masonry.	N	C	TMS 602: 2.1 C.1		PE/SE, EIT, ICC-SMSI or ETT	
f. Sample panel construction.	N	C	TMS 602: 1.6D		PE/SE, EIT, ICC-SMSI or ETT	
g. Verify f'm and other materials are in compliance with submittals	Y	P	TMS 602: 1.4B		PE/SE, EIT, ICC-SMSI or ETT	
2. Prior to grouting, verify that the following are in compliance:	Y					
a. Grout space.	Y	C	TMS 602: 3.2D, 3.2F		PE/SE, EIT, ICC-SMSI or ETT	
b. Placement of prestressing tendons and anchorages.	N	P	TMS 402: 10.8, 10.9 TMS 602: 2.4, 3.6		PE/SE, EIT, ICC-SMSI or ETT	
c. Placement of reinforcement, connectors, and anchor bolts.	Y	C	TMS 402:6.1, 6.3.1, 6.3.6, 6.3.7 TMS 602: 3.2E, 3.4		PE/SE, EIT, ICC-SMSI or ETT	
d. Proportions of site-prepared grout and prestressing grout for bonded tendons.	Y	P	TMS 602: 2.6B, 2.4G.1.b		PE/SE, EIT, ICC-SMSI or ETT	
3. Verify compliance of the following during construction:	Y					
a. Materials and procedures with approved submittals.	Y	P	TMS 602: 1.5		PE/SE, EIT, ICC-SMSI or ETT	
b. Placement of masonry units and mortar joint construction.	Y	P	TMS 602: 3.3B		PE/SE, EIT, ICC-SMSI or ETT	
c. Size and location of structural members	Y	P	TMS 602: 3.3F		PE/SE, EIT, ICC-SMSI or ETT	
d. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, and other construction.	Y	C	TMS 402: 1.2.1(e), 6.2.1, 6.3.1		PE/SE, EIT, ICC-SMSI or ETT	
e. Welding of reinforcement	N	C	TMS 402: 6.1.6.1.2		AWS-CWI	

f. Preparation, construction, and protection of masonry during cold weather (temperatures below 40°F) or hot weather (temperatures above 90°F)	Y	P	TMS 602: 1.8C, 1.8D		PE/SE, EIT, ICC-SMSI or ETT	
g. Application and measurement of prestressing force	N	C	TMS 602: 3.6 B		PE/SE, EIT, ICC-SMSI or ETT	
h. Placement of grout and prestressing grout for bonded tendons is in compliance	N	C	TMS 602: 3.3.B.9. 3.3.F.1.b		PE/SE, EIT, ICC-SMSI or ETT	
4. Observe preparation of grout specimens, mortar specimens, and/or prisms.	Y	C	TMS 602: 1.4B.2.b.3, 1.4B.2.c.3, 1.4B.3 and 1.4B.4		PE/SE, EIT, ICC-SMSI or ETT	

Structural Schedule of Special Inspection Services
FABRICATION AND IMPLEMENTATION PROCEDURES – COLD-FORMED STEEL TRUSSES

VERIFICATION AND INSPECTION IBC Section 1705	Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	REFERENCE	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. Trusses w/ clear span 60 feet or greater – verify temporary installation restraint/bracing and permanent individual truss member restraint/ bracing are installed in accordance with approved truss submittal.	N	P	IBC 1705.2.4		PE/SE, EIT or ETT	

Structural Schedule of Special Inspection Services
FABRICATION AND IMPLEMENTATION PROCEDURES – COLD-FORMED STEEL LIGHT FRAMED CONSTRUCTION

VERIFICATION AND INSPECTION IBC Section 1705	Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	REFERENCE	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. Welding operations of elements of the main wind-force resisting system.	N	P	IBC 1705.11.2		PE/SE, EIT or ETT	
2. Screw attachment, bolting, anchoring, and other fastening elements of the main windforce resisting system, including shear walls, braces, diaphragms, collectors (drag struts), and hold-downs.	N	P	IBC 1705.11.2		PE/SE. EIT or ETT	

Structural Schedule of Special Inspections
LATERAL RESISTANCE - STRUCTURAL

VERIFICATION AND INSPECTION IBC Section 1705	Y/N	EXTENT: CONTINUOUS, PERIODIC, SUBMITTAL, OR NONE	REFERENCE	AGENT	AGENT QUALIFICATION	TASK COMPLETED
1. Special inspections for seismic resistance. Special inspection as specified in this section is required for the following:	N					
a. The seismic-force-resisting systems in structures assigned to Seismic Design Category B, C, D, E or F	N	P	IBC 1705.12		PE/SE or EIT	
2. Structural steel: Special inspection for structural steel in accordance with AISC 341.	N	P	IBC 1705.12.1.2		AWS-CWI	
3. Structural wood:	N					
a. Continuous special inspection during field gluing operations of elements of the wind/seismic-force-resisting system.	N	C	IBC 1705.11.1 and 1705.12.2		PE/SE or EIT	
b. Periodic special inspections for nailing, bolting, anchoring and other fastening of components of the wind/seismic-force-resisting system, including drag struts, braces and hold-downs	N	P	IBC 1705.11.1 and 1705.12.2		PE/SE or EIT	
4. Cold-formed steel framing: Periodic special inspections during welding operations of elements of the seismic-force-resisting system. Periodic special inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system, including struts, braces, and hold-downs	N	N	IBC 1705.11.2 and 1705.12.3		PE/SE or EIT	
5. Seismic isolation system. Provide periodic special inspection during the fabrication and installation of isolator units and energy dissipation devices if used as part of the seismic isolation system	N	N	IBC 1705.12.8 and 1705.13.4		PE/SE or EIT	
6. Wind resisting components. Provide periodic special inspections for fastening of the following systems and components: a. Roof covering, roof deck, and roof framing connections. b. Exterior wall coverings and wall connections to roof and floor diaphragms and framing.	Y	P	IBC 1705.11.3		PE/SE or EIT	

Quality Assurance Plan – Seismic and Wind

QUALITY ASSURANCE FOR SEISMIC RESISTANCE CHECK LIST [IBC 1705]

Seismic Design Category	B

☐ FOR SEISMIC DESIGN CATEGORY C OR HIGHER:

Structural:

☐ The seismic-force-resisting systems

- ☐ Steel Braced Frames and associated connections/anchorage
- ☐ Steel Moment Frames and associated connections
- ☐ Shear walls: ☐ CMU ☐ Wood ☐ Concrete ☐ Diaphragms: ☐ Floor ☐ Roof
- ☐ Other:

QUALITY ASSURANCE FOR WIND RESISTANCE CHECK LIST [IBC 1705]

Wind Exposure Category	C

REQUIRED	NOT REQUIRED	NOT APPLICABLE	QUALITY ASSURANCE PLAN REQUIREMENTS (A Quality Assurance Plan is required where indicated below)
☐	☐	☒	In wind exposure Categories A and B, where the 3-second-gust ASD wind speed is 120 miles per hour (mph) (52.8 *m/sec)* or greater.
☒	☐	☐	In wind exposure Categories C and D, where the 3-second-gust ASD wind speed is 110 mph (49 *m/sec)* or greater.

Jeremy Lucas, PE

Prepared by: Building Code Official's Acceptance:

Signature Date Signature Date

Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan must submit a Statement of Responsibility. The Statement of Responsibility is required for Seismic Design Category C or higher. Make additional copies of this form as required.

Project:

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Statement of Responsibility:

Contractor's Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Quality Assurance Plan and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Building Official.

_____ _____

Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

SECTION 01610 - DELIVERY, STORAGE, AND HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Products to be used in the work shall be properly stored and handled as described in this section. This section is not intended as a substitution for good judgment by the CONTRACTOR, nor is it intended to limit protective measures to be taken by the CONTRACTOR during construction.

B. QUALITY ASSURANCE

1. General: The CONTRACTOR shall protect the materials and work as required.

C. MANUFACTURER'S RECOMMENDATIONS

1. General: Unless otherwise approved by the ENGINEER or specified herein, the CONTRACTOR shall comply with the manufacturer's recommendations on product handling, storage and protection.

D. PACKAGING

1. General: Products shall be delivered to the job site in their manufacturer's original container with labels intact and legible. Damaged materials shall be immediately replaced at no additional cost to the OWNER. The ENGINEER may reject, as non-complying, any materials that do not bear the proper identification such as manufacturer, grade, quality and other pertinent information.

E. PROTECTION OF SURFACES

1. General: The CONTRACTOR shall protect and maintain all finished surfaces from damage during storage and construction. Finished surfaces shall remain clean, unmarred and suitably protected until the work is accepted by the OWNER.

F. REPAIRS AND REPLACEMENTS

1. General: In the event of damage, the CONTRACTOR shall make the necessary replacements as approved by the ENGINEER at no additional cost to the OWNER. No extension of contract time will be given for work associated with replacement and repair of damaged materials.

G. DELIVERY AND STORAGE

1. General: The CONTRACTOR shall be responsible for making all the arrangements for the delivery, unloading, receiving and storage of materials.

2. Storage: The CONTRACTOR shall store all products and materials in a protected location to prevent any damage or deterioration due to moisture, freezing temperatures or other detrimental conditions.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION

SECTION 02080 – UTILITY PIPE AND MATERIALS

PART 1 – GENERAL

1.1 REFERENCES

1. Work Included: The work in this section shall include the furnishing, installation, and testing of all pipe, fittings and structures, and furnishing the equipment, labor, and appurtenances for the installation of piped utilities. All work shall be completed as shown on the plans and as specified in related sections and hereunder.

2. Related Sections: Additional Sections of the Documents which are referenced in this Section Include:

    1) Section 01450 – Testing & Inspection Requirements

    2) Section 02317- Earthwork

    4) Section 02510 - Water Distribution

1.2 QUALITY ASSURANCE

1. Quality Assurance: All pipe and fittings shall be new, free from defects or contamination and shall, whenever possible, be the standard product of a single manufacturer.

2. Manufacturer's Limitations: Products used in the work of this section shall be manufactured in the U.S. where possible by manufacturer's regularly engaged in production of similar items.

PART 2 – PRODUCTS

2.1 PIPE

1. Polyvinyl Chloride (PVC) Pipe: Polyvinyl chloride pipe shall be made from clean, virgin, PVC compound conforming to ASTM D 1784, and meet the following requirements. Precautions shall be taken to prevent the storage of PVC pipe under direct sunlight for extended periods. PVC pipe that has not been installed more than 18 months from the manufacture date shall not be used. The cost to replace expired pipe shall be borne by the Contractor.

    1) SDR 35 Pipe: SDR 35 shall be used for gravity sewer where indicated on plans and shall be bell and spigot conforming to ASTM D 3034 with a rubber sealing ring locked in place to allow expansion and contraction but prevent displacement during assembly. Pipe stiffness at 5 percent deflection shall exceed 46 psi when tested in accordance with ASTM D 2412. Joints shall be designed to pass when tested in accordance with ASTM D 3212. The maximum allowable joint length shall be 13 feet nominal.

    2) Schedule 40 PVC: Schedule 40 PVC pipe for dewatering building drain, waste (non-process), and vent line shall be Type 1, Grade 1, plain end conforming to ASTM D 1784 and ASTM D 1785 with solvent weld joints and fittings.

    3) Schedule 80: Pipe for chemical feed, miscellaneous applications, and where specified on the plans shall be Schedule 80 conforming to ASTM D 1785 with solvent weld joints.

2. Ductile Iron Pipe: Ductile iron pipe (DIP) and fittings shall be used for all pressure and process piping 3” and larger and shall meet or exceed the following requirements:

1) Pipe and fittings shall be the diameter shown on the plans.

2) Pipe and joints shall be manufactured in accordance with ANSI/AWWA C 151/A21.51.

3) All pipe shall be cement-mortar lined in accordance with ANSI/AWWA C 104/A21.4.

4) All lines below grade shall be constructed with push-on joints with O-ring gasket in accordance with ANSI/AWWA C111, and mechanical joints at fittings unless otherwise specified. Pipe lines inside of buildings or vaults and exterior non-buried lines shall be with flanged joints.

5) Ball and socket ductile iron pipe shall have push on joints with an allowable deflection of up to 15 degrees and be equal to Griffin SNAPLOCK River Crossing Pipe or approved equal.

3. Copper Tubing: All copper tubing for water service piping shall meet the requirements of ASTM B 88 for Type "L" copper, hard drawn for above ground and Type "K" hard drawn for services.

4. Polyethylene (PE) Pressure Tubing: PE tubing shall be pressure class 200, copper tube size, meeting the requirements of AWWA C 901.

5. HDPE Gravity Pipe (Storm): HDPE pipe shall be AASHTO M 294M, Type S, with smooth waterway for coupling joints. Silttight Couplings shall be PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

6. PVC Tubing: PVC tubing for chemical feed shall be clear nylon reinforced with smooth interior rated for minimum 150 psi working pressure.

2.2 FITTINGS

1. Polyvinyl Chloride (PVC) Fittings: Polyvinyl chloride fittings shall be made from clean, virgin, PVC compound conforming to ASTM D 1784 and shall conform to the following requirements:

1) Drain, Waste, and Vent: Fittings shall be Schedule 40 socket type conforming to ASTM D 2467.

2) Solvent Cement: Solvent cement for use on PVC pipe and fittings shall conform to ASTM F 493 ASTM D 2564, or ASTM D 2846 as appropriate for pipe used.

3) Gravity Sewer: Fittings shall be gasketed bell type conforming to ASTM D 3034 for SDR 35.

2. Ductile Iron Fittings: Ductile iron fittings shall be lined and seal coated in accordance with ANSI/AWWA C 104/A21.04, and shall be manufactured in accordance with ANSI/AWWA C 110/A21.10 for standard body and ANSI/AWWA C 153/A21.53 for compact body fittings, and meet the following requirements:

1) Buried fittings shall be mechanical joint and supplied with the proper adapter and/or transition gasket for use with PVC pipe. Buried fittings shall be rated for a working pressure of 350 psi.

2) Flanged fittings shall be 125 pound fittings meeting ANSI/ASME B 16.42, or meeting ANSI/ASME B 16.1 for fittings not available in ductile iron.

3. Copper Pipe Fittings: Fittings shall meet requirements of ANSI/ASME B 16.22 for wrought copper, sweat joint.

4. Restrained Flange Adapters: Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10. Restraint for the flange adapter shall consist of individual actuated gripping wedges with torque limiting actuating screws to insure

proper initial set. The flange adapter shall be rated for a working pressure of 350 psi. Flange adapters shall be EBAA Series 2100 MegaFlange, or approved equal.

5. Restrained Joint Fittings: Restrained joint fittings shall be utilized on all pressure pipe fittings beneath slab and on all buried pressure water pipe joints. Restrained joints shall use mechanical joint pipe with a mechanical retainer gland. Dimensions of the glands shall be such that they can be used with the standardized mechanical joint bell and tee head bolts conforming to the requirements of AWWA C 111 and AWWA C 153. Restraining glands shall be as listed in the ACSA Approved Products list or approved equal.

   1) Mechanical to Push-On Joint Connection: An appropriate adapter shall be used to convert from mechanical joint pipe to push-on joint pipe. Adapters shall be by Griffin or approved equal.

   2) Push On Joint Pipe: If push-on joint pipe is used, restraining mechanisms shall be a contoured wedge-action retainer gland installed on the spigot (plain) end of the pipe, connected to a standard mechanical joint gland seated behind the pipe bell.

6. Pressure Tubing Fittings: Couplings and fittings for copper, polyethylene, or PVC pressure tubing shall be compression type.

2.3 SERVICE METERS AND EQUIPMENT

1. Service Meters: Service meters shall be supplied by the Owner.

2.3 MISCELLANEOUS DEVICES

1. Mag Meter: Magnetic flow meters shall be provided as shown on the plans. Meters shall be Toshiba "Mount Anywhere" or Cadillac CMAG series, suitable for installation with less than 2 pipe diameters upstream straight pipe length and immediate downstream bend or tee connection. The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC pulsed signal directly proportional and linear to the liquid flow rate. The meter shall be design for operation on 120 vac +/- 10 percent, 60 Hz +/- 5 percent with a power consumption of less than 15 watts for sizes through 12 inch. The meter shall measure both forward and reverse flow. Complete zero stability shall be an inherent characteristic of the meter system to eliminate the need to adjust the system with a full pipe at zero flow.

   The metering tubes shall be constructed of stainless steel. All magnetic flow meters shall be designed to mount directly in the pipe between ANSI Class 150 flanges. Meter shall have PE liner and be supplied with tungsten carbide electrodes in a zirconium holder. The meter housing shall be splash-proof and weather resistant design. The exterior of the meter shall be protected by an epoxy paint.

   The electronics portion of the magnetic flow meter shall include both a magnet driver to power the magnet coils and a signal converter. The signal converter shall be integrally mounted and shall be housed in a die cast aluminum case. The interconnecting cable shall be supplied with the meter. The converter shall include a separate customer connection section to isolate the electronics compartment and protect the electronics from the environment. A separate terminal strip for power connection shall be supplied. The electronics shall be of the solid state, feedback type and utilize integrated circuitry. The input span of the signal converter shall be continuously adjustable between 0-1 and 0-31 fps for both analog and frequency outputs and range adjustment shall be direct reading. The converter shall not be affected by quadrature noise nor shall it require zero adjustment or special tools for startup. Input and output signals shall be fully isolated. The converter shall include 4 to 20 mA DC flow rate output as well as totalized flow pulse relay output and additional relay contact programmable for activation above when flow rate is measured above a setpoint.

PART 3 – EXECUTION

3.1 EXCAVATION, BACKFILLING AND COMPACTION

1. General: Trench excavation shall be in accordance with Section 02300 – Earthwork.

3.2 SEPARATION OF WATER AND SEWER LINES

1. Parallel Installation:

   1) Normal conditions – Water mains shall be separated at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge-to-edge.

   2) Unusual conditions – When local conditions prevent a horizontal separation of 10 feet, the CONTRACTOR shall notify the ENGINEER. The ENGINEER, after consultation with the Virginia Department of Health, shall provide special instructions for construction within the area of conflict. In some cases, if authorized by the ENGINEER, the 10 foot separation requirement may be waived provided that:

      a) The bottom (invert) of the water main shall be at least 18 inches above the top (crown) of the sewer.

      b) Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure tested in place to 30 psi without leakage prior to backfilling.

      c) The sewer manhole shall be of watertight construction and tested in place.

2. Crossings:

   1) Normal conditions – Water lines crossing over sewers shall have a separation of at least 18 inches between the bottom of the water line and the top of the sewer.

   2) Unusual conditions – When local conditions prevent a vertical separation described above, the CONTRACTOR shall notify the ENGINEER. The ENGINEER, after consultation with the Virginia Department of Health, shall provide special instructions for construction within the area of conflict. In some cases, if authorized by the ENGINEER, the following construction shall be used:

      a) Sewers passing over or under water mains shall be constructed of AWWA approved water pipe, pressure tested in place to 30 psi without leakage prior to backfilling.

      b) Water lines passing under sewers shall, in addition, be protected by providing:

         - A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line.

         - Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the waterline.

         - That the length of the water line be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer.

         - That the sewer joints are placed equidistant and as far as possible from the water line joints.

3. Intersections: No water pipe shall pass through or come in contact with any part of the sewer or sewer manhole.

4. Special Cases: In the event that existing utilities or field conditions make it impossible or impractical to meet the separation requirements, the CONTRACTOR shall notify the ENGINEER. The ENGINEER, after consultation with the Virginia Department of Health, shall provide special instructions for construction within the area of conflict.

3.3 INSTALLATION OF PIPE AND FITTINGS

1. General: No valve, hydrant, or other appurtenance on existing water lines shall be opened or closed for any purpose by the CONTRACTOR. Any opening or closing of valves, hydrants, whatsoever shall be by the OWNER of the utilities only.

2. Handling: Pipe shall be placed in the trench in such a manner as to prevent damage to pipe and protective coatings and linings. Under no circumstances shall pipe be dropped or dumped into the trench. As the temperature approaches or drops below freezing, extra care shall be used in handling pipe.

3. Cleaning: Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. Spigot and bell ends of pipe and gaskets shall be cleaned and lubricated according to manufacturer's instructions. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug.

4. Cutting: Pipe shall be cut in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized by the ENGINEER, cutting shall be done by means of approved type of mechanical cutters. Wheel cutters shall be used when practicable.

5. Direction of Laying: All pipe shall be laid with bell ends facing in the direction of laying unless otherwise directed by the ENGINEER. Where pipe is laid on a grade of 10 percent or greater, or for gravity pipe systems, the laying shall start at bottom and shall proceed upward with the bell ends of pipe upgrade. Each piece of pipe shall be laid true to line and grade. The bottom of the trench shall be smoothly graded and bell holes provided so that the trench bottom provides uniform support to the barrel of the pipe when in final position. Adjustments to line or grade shall be made by removing or adding granular material under the barrel. In no case shall wedges or blocks be used under the body of the pipe. The pipe shall be pushed fully "home" by hand, with a bar and block of wood to cushion the bell, or other methods for large diameter pipe.

6. Bedding: Bedding of pipe shall be placed to the depth shown on the plans or standard details and shall be compacted to specified density. Bedding of ductile iron and PVC pressure pipe will not be required except when used as gravity sewer, in rock excavation, or as shown on the plans.

7. Deflection at Joints: Maximum deflection for force main and pressure pipe joints will be as follows:

Pipe Size	Allowable Deflection (in inches)								
	Ductile Iron (Push on) Lengths				Ductile Iron (Mechanical) Lengths				PVC-AWWA (Push-on)
	12'	16'	18'	20'	12'	16'	18'	20'	
4"	12	17	19	21	21	28	31	34	12
6"	12	17	19	21	18	24	27	30	4
8"	12	17	19	21	13	18	20	22	3
10"	12	17	19	21	13	18	20	22	2.5
12"	12	17	19	21	13	18	20	22	2
16"	7.5	10	11	12	9	12	13.5	15	-

Flexible pipe may be curved in the trench to the limits specified in "Allowable Deflection (in inches table above)". Do not deflect PVC pipes in joints. Joints must be secured laterally in ditch and deflection effected in the barrel of the pipe unless specific allowance by manufacturer is provided in the joint.

8. Installation of Fittings: Fittings shall be installed with the same care that mainline pipe is installed. Caps or plugs shall be braced to prevent blow off during testing.

    1) Ductile iron fittings used on Force main and Other Pressure Pipe shall be supported in accordance with PART 2 PRODUCTS of this Section.

9. Jointing:

    1) Mechanical Joints: When installing mechanical joint (MJ) ductile iron pipe, the socket, spigot end and rubber gasket shall be thoroughly washed with soapy water to remove any grease or grit that might damage the gasket. In making up the joint, the gland for MJ pipe followed by the gasket, shall be placed over the plain end of the pipe and inserted into the socket. The gasket shall be pushed into position without excessive force and evenly seated in the socket of the pipe bell, and the gland for MJ pipe, then moved into position against the face of the rubber gasket.

    2) Flanged Joints: Where flanged joints are used, they shall be installed by skilled workmen in accordance with the best standard practice. Bolts shall be tightened so as to evenly distribute the joint stress and insure proper pipe alignment.

10. Setting of Valves: Valves shall be installed in accordance with manufacturer's instructions and shall be in accordance with Section 02085 - Valves and Cocks and as shown on the details.

11. Anchorage: Pressure pipe lines shall be protected against joint pulling or thrust damage by suitable concrete anchors, braces, tie rods or mechanical joint restraining devices installed at direction changes as a result of fittings and all other critical points.

    Rods and clamps shall be galvanized or otherwise rust proof treated.

12. Installation of Pipe Supports: Exposed piping inside of building and vaults shall be supported both horizontally and vertically such that forces are transmitted to the supports and sagging is eliminated.

3.4 PIPELINE TESTING

1. General: Testing of pipe lines and structures shall be at the CONTRACTOR's expense. Any defects or leaks shall be repaired or replaced at the CONTRACTOR's expense. Water for the first test shall be provided by the OWNER. Subsequent water for tests shall be at the CONTRACTOR's expense.

2. Pressure Testing:

    1) Test Section: Pressure and leakage testing shall be conducted on each valved section (between adjacent valves) of pressure pipeline. Force mains and other pressure pipe without valves shall be tested in sections not to exceed 5,000 feet.

    2) Procedures: Pressurization, air removal, and allowances shall be in accordance with AWWA C600, Section 5 or AWWA C605, Section 7 as appropriate for pipe used. Testing shall begin on the first valved section of line within ten days after its completion. The pressure and leakage tests shall be conducted concurrently for a duration of two hours. Water main testing through fire hydrants shall not be permitted. The valved section of the pipe under consideration shall be slowly filled with water and brought to the specified pressure by means of a pump. Before supplying the specified test

pressure, all air shall be expelled from the pipe. Testing shall not begin until at least seven days after the last concrete anchor has been poured on the section of line being tested (if high early concrete is used, two days). The ENGINEER or Resident Project Representative shall observe all leakage tests. If the pipe fails to meet test requirements, all leaks shall be repaired and defective pipe replaced at the CONTRACTOR's expense. The test shall be repeated until satisfactory results are obtained. The CONTRACTOR shall be charged for all retests at the normal rates for inspection services.

3) Test Pressures: Test pressure shall be 300 psi as measured at the lowest point in that test section, unless otherwise noted. For test pressures less than 200 psi, CONTRACTOR shall demonstrate that there is no significant pressure (other than static) in the adjacent sections of pipeline to the one being tested.

3.5 EXPOSED PIPING IDENTIFICATION

1. General: To identify exposed piping, the different lines shall have contrasting colors. Pipes shall be color coded in a manner that will permit ready identification of pipes at any location. Labeling of the identification of the pipe with or without an accompanying color code shall be considered as an acceptable substitute for the color scheme contained herein. Where color bands are utilized, the bands are to be one-inch wide and placed on 18 inch centers.

   Potable Water Line – Dark Blue
   Raw Water Line – Green
   Drain Line – Light Grey
   Chlorine Line - Yellow

END OF SECTION

SECTION 02085 - VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide complete, in place, and free from leakage, all valves as shown on the plans and in accordance with this Specification. Valves shall be furnished complete with valve operators and accessories necessary for a complete assembly adequate for the specified or indicated purpose. Valve assemblies shall be installed, painted, tested and adjusted.

1.2 SBMITTALS

A. General: Comply with the pertinent provisions of Section 01330 – Submittal Procedures. Each submittal shall be identified with precise, use, line and location.

B. Shop Drawings: As a minimum, shop plans shall include manufacturers names, class of materials, catalog, and engineering data showing compliance with the specified requirements.

C. Maintenance Instructions: Submit corrective and preventive maintenance instructions, including recommended spare parts.

1.3 DELIVERY, STORAGE AND HANDLING

A. General: Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling.

B. Delivery: Deliver valves to the job site packaged, tagged, and marked.

C. Storage: Store valves at the job site in a manner to prevent damage and accumulation of dirt and rust.

PART 2 - PRODUCTS

2.1 GATE VALVES

A. Gate Valves: Valves shall be cast or ductile iron, resilient wedge, non-rising stem conforming to ANSI/AWWA C509. Wedge disc shall have two seating surfaces and provide smooth unobstructed waterway with 100 percent smooth passage. Working pressure shall be at least 250 psi for valves 12 inches in diameter and smaller and 200 psi for valves 14”-16”. Valves shall have O-ring seals and open left (counterclockwise) with a 2 inch square wrench nut. Handwheel operators shall be provided for all interior or non-buried installations. Valve ends shall be of mechanical joint type for buried installations and flanged ends for all other installations, unless otherwise shown on the plans. Valves shall be equal to gate valves manufactured by Mueller, Kennedy, Darling, or Clow. Valves 3 inches and smaller shall have screw ends and may be ANSI/AWWA C500 double disc gate valves if resilient seat units are not available.

2.2 CHECK VALVES

A. Swing Check Valves: Check valves on all iron and steel piping shall be of the swing check type, bronze mounted with cast iron body conforming to ANSI/AWWA C508. Valve shall be operated by an external lever and adjustable weight. Disc shall provide a positive seal in the closed position and pivot to provide an unobstructed flow-way in the open position. Valve shall be similar to Kennedy Figure 106 LW, Mueller A 2600-01, or GA Figure 250D.

B. Flexible Check Valves: Flexible check valves shall be all rubber flow operated check type with a slip-on screw clamp connection or insert style with expansion ring and shall be designed to open with 1”-2” of head pressure. The port area for slip on valves shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow, and shall include a sloped outlet to prevent standing water upstream. The unit shall be one piece rubber construction with nylon reinforcement. Valves shall be as manufactured by Proco, Tideflex, or approved equal.

C. PVC Ball Check Valves (Chemical Feed): Valves shall be manufactured of PVC Type 1 Grade 1 with true union connections and threaded end connectors.

D. Reduced Pressure Zone Backflow Preventer (RPZ): RPZ shall consist of two independent check valves, relief port, four test ports, and an in-line strainer. The body of the unit shall be bronze construction and shall be supplied with ball type shutoff valves and an air gap discharge funnel. Units shall conform with ASSE 1013.

2.3 BUTTERFLY VALVES

A. Butterfly Valves (Water): Butterfly valves shall be rubber seated, short body in accordance with AWWA C 504, Class 250 ductile iron bodies conforming to AWWA A 536 (unless otherwise specifically approved), bronze discs, 416 stainless steel stems, #12 Buna-N or Ethylene-Propylene seat and steam O-rings, and with hand-wheel actuator with position indicator.

2.4 PLUG VALVES

A. Plug Valves: Valves shall be cast iron provided with standard mechanical joint or flange ends as shown on the plans and shall be ANSI rated at 150 psi. Valve shall be capable of bubble tight closure but adjustable to stop positions partially closed for throttling. Buried valves shall be fitted with a standard 2 inch operating nut. Exposed valves, including valves within vaults, shall be provided with a handwheel for operation. All valves shall have gear boxes providing multi-turn open and close operation. Valve liners and seats shall be of a material suitable for use with an abrasive sanitary sludge.

2.5 WASTE VALVE

A. The filter angle waste valves shall be furnished and installed with electric actuators for open and close operation. Overall system responsibility for the proper operation of the Angle Waste Valve shall be provided by a firm with not less than five (5) years experience providing new or refurbished angle waste valves and previous electric activation experience. The valve supplier shall have not less than 30 successful installations/rebuilds of angle waste valves of similar or larger size valves in the last in the last five (5) years. Valves shall operate freely without binding and shall stop and hold in any position.

2.6 BALL VALVES

A. Brass Ball Valves: Ball valves shall be two piece regular port valve with lever handle. Valves shall be of lead free brass and bronze material rated for minimum 250 psi working pressure.

B. PVC Ball Valves: Valves shall be manufactured of PVC Type 1 Grade 1 with EPDM O-ring seals, true union connections, and threaded end connectors.

2.7 SLIDE GATES

A. Wall mounted slide gates shall be provided at the existing Solids Holding Basin inlet pipes to provide water tight isolation of the basin inlet pipes. Gates shall conform to AWWA C501, be water-tight up to minimum 15 feet of head, and have floor stand operators mounted above the top of the basin walls. Frame and gate shall be aluminum, stainless steel, or cast iron. Gate stem shall be stainless steel.

2.8 MISCELLANEOUS VALVES

A. Corporation Stop: Shall be 3/4 inch unless otherwise indicated with inlet threads conforming to ANSI/AWWA C800, commonly known as the “Mueller” thread, and an outlet compatible with the service pipe and shall be Mueller #H-15000 for copper outlet or approved equal.

B. Hose Bibb: Assembly shall be anti-contamination wall faucet. Valve shall be furnished with approved vacuum breaker which complies with ANSI/ASSE 1011 and has 3/4 inch male hose threads. Valve shall be of brass construction with adjustable packing nut and deep stem guard, Teflon impregnated packing and standard "O" size washer and wheel handle. Inlet shall be 1/2 inch copper tube.

C. Sampling Taps: The sampling tap shall be plain end spigot facet, renewable seats, tee handles, and be polished chrome plated.

D. Air Release, Air Vacuum, and Combination Valves for Wastewater: Air release valves shall be combination air/vacuum type, cast iron meeting requirement of ASTM A126 Class B, stainless steel (ASTM A744 CF8M) or reinforced nylon body.

E. Pressure Reducing: Pressure reducing valves will be diaphragm type with adjustable outlet pressure as indicated on the plans. Provision shall be made to permit the bypass flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply. Pressure reducing valves shall be lead free and manufactured by Watts, or approved equal.

F. Pressure Gauges: Pressure gages shall have 4” dial, full accuracy, liquid filled with stainless steel case. Gauges shall have ¼” NPT brass bottom connection and stainless steel movements. The gauge graduations shall vary de-pending on the application operating range. The gauges shall have snubbers either integral with the gauge or mounted on the gauge piping.

G. Solenoid Valves: Contractor shall furnish and install solenoid valves of the size and at the locations shown on the plans. The valves shall be 2 way type with Nema 4 rating. Operation shall be the normally closed type unless otherwise shown.

2.9 RELATED ITEMS

A. Valve Boxes: Boxes shall be furnished and installed for all valves buried in the earth. The valve boxes shall be a 3-piece screw type in accordance with Standard Detail, with 5-¼ inch shaft similar to buffalo

type by Bingham and Taylor. Boxes shall incorporate 160 oval bases. The word "WATER" shall be cast on the box lid in letters not less than 1 inch high.

B. Valve Operators: Shall be either handwheel or wrench for nut operated valves as indicated on the plans. Minimum two wrenches shall be provided by the manufacturer of nut operated valves.

2.10 VALVE ACTUATORS

A. Electric Valve Actuators:

1. Valve actuators for raw water intake screen pipes and sludge collector discharge valves shall be as manufactured by Auma, Emerson EIM, or Rotork and shall be of type and adequate torque capacity for the valve to be operated.
2. Each valve actuator shall be capable of fully opening and closing the valve on which it is installed under the maximum load. The actuator shall be self-locking under normal operating conditions in order to hold the valve in an intermediate position. The actuator shall be designed for indoor and outdoor service and capable of mounting in any position. The actuators shall include, in one integral unit, the motor, power gearing, travel limit switches, torque limit switches, manual handwheel, terminals for motor power and controls, local open and close controls, Hand-Off-Auto selector switch, and separable worm gear operator.
3. Actuator shall open or close the valve in sixty (60) seconds or less.
4. The entire actuator enclosure shall be watertight according to NEMA 4 Standard. All covers and entries shall be sealed by means of O-rings. All conduit entries shall be properly sealed to maintain the watertight housing. Terminal compartment and limit switch compartment covers shall be fastened to the gear housing by stainless steel bolts which are "captured" to prevent loss when covers are removed.
5. The gear housing and all load bearing enclosure shall be cast iron. The non-load bearing enclosure and covers may be aluminum, cast iron or steel. All housings are to be adequately designed, manufactured and inspected to assure against the ingress of moisture.
6. Gearing
   a. All power gearing shall be made of hardened steel or bronze and operate in a lubricant. Gearing shall be designed to withstand the stall torque of the motor without failure. The final drive shall be of the self-locking worm and steel type to prevent creeping of the valve disc in an intermediate position. Gearing shall be non-segmented.
   b. The drive nut shall be separable from the gear assembly to facilitate rapid mounting of the operator on the valve. The drive nut shall be splined to allow mounting on the valve at 90 degree intervals in order that the valve/operator combination can be mounted to minimize interference with adjacent facilities and equipment.
   c. Stops shall be furnished to mechanically restrict the movement of the valve disc from passing through the seat. The stops shall be adjustable from eighty (80) to one hundred twenty (120) degrees in order that accurate seating can be achieved.
7. Motor
   a. The drive motor shall be specifically designed for actuator service and shall be characterized by high starting torque, low stall torque and low inertia.
   b. The motor shall be capable of starting against the rated load in either the open or close direction when voltage to the motor terminals is plus or minus ten (10) percent of nameplate.
   c. The motor shall be induction type with Class F – tropicalized insulation. Three terminal switches are to be imbedded in the windings – one hundred twenty (120) degrees apart to insure safe motor shut-down during periods of high current draw resulting in a high temperature condition.

d. The motor shall be capable of operation in any position. It shall be properly sealed from the lubricant filled gearcase to allow the motor to be mounted in any position relative to the gearcase. Removal of the motor shall not result in loss of lubricant.
e. The motor shall have plug and socket electrical connection to facilitate easy removal and replacement.

8. A handwheel shall be permanently attached for manual operation. A positive declutch mechanism shall engage the handwheel when required. The handwheel shall not rotate during motor operation. A fused or inoperable motor shall not prevent manual operation. Motor operation shall always take precedence over the manual operation.

9. Limit Switches:
   a. Travel limit switches shall be provided to de-energize the motor control circuit when the actuator reaches the limits of travel in the open and close directions.
   b. Limit switches and the limit switch drive shall be an integral part of the actuator.
   c. The limit switch drive shall be of the counter gear type and "in step" with the actuator output drive at all times in either the electrical or manual modes of operation.
   d. A minimum of four (4) contacts two (2) normally open and two (2) normally closed shall be supplied at each end of valve travel. The contacts shall be supplied at each end of valve travel. The contacts shall be of silver and adequately rated to carry the control current. All contracts are to be completely sealed in a NEMA 4 enclosure to prohibit electrical shock while adjusting, eliminate shoring out and ensure that contaminants do not foul the contacts.
   e. Limit switches shall be fully adjustable when power is applied to the actuator.

10. Torque Switches:
    a. Torque limit switches shall be provided to de-energize the motor control circuit when the valve encounters and obstruction during travel. Each actuator shall have an open direction torque switch and a close direction torque switch.
    b. The torque switches shall be mechanically operated and able to be set in torque units. Torque switches shall be calibrated prior to the actuator's assembly to the valve.
    c. Torque switches shall be adequately rated to carry the control current. The contacts are to be completely sealed.

11. An adequately sized space heater shall be installed in the limit switch compartment to aid in the prevention of damage resulting from condensation.

12. The dial indicator shall be furnished to continuously indicate the position of the valve or at and between the fully open and fully closed position. The indicator shall operate when the actuator is in either the electrical mode or manual mode.

13. Controls (General): All actuators shall include local open and close controls as well as a Hand-Off-Auto selector switch to enable local or remote input controls. Local operation of actuator will be by open-stop-close pushbuttons with red lamp indicating closed, green lamp indicating open, amber for fault.

PART 3 - EXECUTION

3.1 INSPECTION

A. General: Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION - ALL VALVES

A. General: Valves shall be cleaned to remove all dirt or other foreign material. Valve installation shall comply with Standard Details and the Manufacturer's recommendations.

B. Stems: Shall be oriented for accessibility as approved by the OWNER's representative. Do not install valves with stems in the downward direction.

C. Setting of Valves: A valve box shall be provided for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished grade or as directed by the ENGINEER. Valves boxes shall be installed in accordance with the Standard Detail.

D. Transmitting Forces: Valves and valve boxes shall be installed so no forces are transmitted to the valve through the piping or valve boxes.

E. Flushing: All valves and appurtenances shall be flushed clear of all foreign material after installation.

F. Installation: Valves shall be installed so no forces are transmitted to the valve through the piping supports. Valves and valve boxes shall be set plumb and centered with boxes directly over valves. Valve box installation shall conform with the Standard Detail.

G. Cleaning: All valves and appurtenances shall be flushed clear of all foreign material after installation.

H. Testing: Field-test all valves and appurtenances for proper operation, proper adjustments and settings, freedom from vibration, binding, scrapings, and other defects. Check all valve supports for strength and high quality workmanship. All defects shall be corrected to the satisfaction of the OWNER’s RPR. Hydrostatic and leakage tests shall be performed as specified.

END OF SECTION

SECTION 02200 – SITE PREPARATION

PART 1 - GENERAL

1.1 GENERAL

A. Work Included: Work shall include the furnishing of all labor, material, equipment, and appurtenances to remove all tree stumps, trees, limbs, sod, topsoil, and rubbish from construction area and dispose of said material in an approved location. Stockpile topsoil in an approved area for later use during final grading and restoration. The Contractor shall furnish all labor materials, supplies, and equipment necessary to provide erosion and sediment control during construction of the facilities.

1.2 DEFINITIONS

A. Clearing: Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

B. Grubbing: Grubbing shall consist of the removal and disposal of brush, stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

C. Usable Topsoil: Topsoil to be stockpiled for restoration shall consist of friable clay loam, free from roots, stones, and other undesirable material and shall be capable of supporting a good growth of grass.

D. Large Trees: Trees, limbs, and other timber having a diameter of 3 inches and greater shall be disposed of as saw logs, firewood, and other usable material.

E. Brush: Brush and tree tops may be chipped, stockpiled, and used for mulch on the project.

1.3 PROJECT CONDITIONS

A. Coordination: Coordinate clearing operations with Engineer to limit clearing of work areas.

B. Site Protection: Contractor shall provide protection as necessary to prevent damage to existing site improvements or vegetation to remain in place as indicated on the plans. Contractor shall restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Clearing: All trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated on the plans to be left standing. Trees designated to be left standing within the more cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter or as directed by the Owner. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

B. Grubbing: Material to be grubbed, together with logs and other organic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated as construction areas under this Contract, such as areas buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

C. Staking: Areas to be cleared shall be staked on the ground by the Contractor and approved by the Owner before clearing operations are begun. Contractor shall obtain services of a licensed Engineer or Land Surveyor for purposes of facilities layout. Locations to be field staked by the Contractor and approved by Owner’s representative or Engineer prior to any construction.

D. Protection of Trees: Owner shall mark any trees within the limits of clearing which are desired to be saved for landscaping purposes. Contractor shall take whatever measures deemed necessary to protect marked trees throughout the duration of construction.

3.2 DISPOSAL OF MATERIAL

A. Disposal: Carry out disposal of debris and unsuitable or surplus material in accordance with the VDOT 106. In all cases, the Contractor will be responsible for obtaining a suitable disposal site.

B. Burning or Removing from Site: Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, will not be burned, but disposed of off site by the Contractor. Permission to dispose of such products on private property shall be in writing, and a copy of this permit shall be filed with the Owner. The Contractor shall be responsible for compliance with all local ordinances, securing permits, and conforming to all Federal and State laws and regulations and with reasonable relative to disposal.

3.3 DRAINAGE

A. General: The Contractor shall be responsible for proper drainage of the site during construction of the project. Water shall not be allowed to accumulate in any of the excavated areas. Storm or ground water collecting on the site during construction shall be removed by pumping, ditching or other suitable means.

3.4 STOCKPILING

A. Topsoil: Topsoil shall be stripped from all excavation and fill areas and stockpiled in an approved area until needed for finish grading. Stockpiles shall be seeded within 10 days of construction. Silt fence shall also be maintained around the stockpiles until mature vegetation is established on the stockpile.

B. Mulch: Chipped brush to be used in the project as landscaping mulch shall be stockpiled in an approved area until needed. Stockpile shall be maintained to prevent contamination of the material.

END OF SECTION

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.1 REFERENCES

A. Virginia Department of Transportation (VDOT) publications:

1. Road and Bridge Specifications: latest edition.
2. Road and Bridge Standards: latest edition.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for facilities.
2. Finish grading of facility sites.
3. Base course for plant pavement.
4. Excavation and backfilling for sanitary sewer and utility installation.

B. Related Sections include the following:

1. Section "Unit Prices" for a schedule of unit prices.
2. Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
3. Section "Lawns and Grasses" for finish grading, including placing and preparing topsoil for lawns and plantings.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Trench Backfill: Backfill placed above bedding beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Trench Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil excavated from the Industrial Park site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for trenches that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. No additional compensation will be paid for rock excavation.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials. Subgrade elevations are generally characterized as the following:

1. 6 inches below finished grade in grassed areas.
2. 12 inches beneath pipe in trenches, and the greater of 24 inches wider than the pipe or minimum 42 inches wide.
3. Subbase material elevation under gravel drives and concrete slabs.

I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Bedding Material
2. Plastic Warning Tape

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
3. Field quality control testing for earthwork compaction.

1.5 QUALITY ASSURANCE

A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code."

B. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials testing, as documented according to ASTM D 3740 and ASTM E 548. The testing agency shall be approved by the Engineer prior to providing services.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not damage existing utilities in the work areas.

1. Contact “Miss Utility” prior to commencing excavation.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: All borrow material for this project shall be obtained from the site.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, SM, CH, CL, MH, and ML or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: VDOT Standard 21-B aggregate. Refer to Virginia Department of Transportation: Road and Bridge Specifications, latest edition; for aggregate mix specifications.

F. Trench Bedding: VDOT #57 aggregate. VDOT #10 aggregate for gravity sewer.

G. Initial Trench Backfill: Satisfactory soil materials free of rocks or gravel larger than 1-inch

H. Final Trench Backfill: Satisfactory soil materials

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities/casings, minimum 2 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Orange: Telephone and other communications.
3. Green: Sewer systems.
4. Blue: Water.

B. Filter Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing structures, utilities, fills, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Explosives will not be allowed, unless prior written authorization is received from the Owner and Town. In the event that explosives are allowed, Contractor shall be responsible for proper safety measures, including blasting mats. Contractor shall also be responsible for repairing any damage to site or surrounding property which may arise from blasting activities.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials and obstructions.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR GRAVEL PAVEMENT AREAS

A. Excavate surfaces under gravel pavement areas to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Unclassified Excavation: Excavation to trench subgrade regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

C. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

D. Trench Bottom in Rock: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped bedding material.
2. Excavate trenches 6 inches deeper than pipe invert elevation required to allow for bedding material.

E. Trench Bottoms in Native Soil Material: Excavate trenches 4 inches deeper than bottom of pipe invert elevation to allow for initial backfill material. Hand excavate for bell of pipe.

F. Trench Protection: Furnish and install such sheathing, bracing, shoring and furnish necessary signs, barricades and temporary lighting as may be pertinent for the protection of the work, employees, the public, livestock, and to guard against contingencies which might give rise to delays in the work. Sheathing left in place shall be at the Contractor's expense. Where trench wall sloping is necessary for safety or other reasons, the Engineer shall be notified to determine if additional strength pipe will be required. Responsibility for preservation of trench banks and other excavated spaces and the prevention of injury to any persons or property shall rest entirely with the Contractor. Trench construction and safety shall be governed by the Virginia Occupational Safety and Health Standards for the Construction Industry, 29 CFR 1926-Subpart P.

G. Open Trenches: No trench shall remain open overnight.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavations under pavement, structures, or utility pipe as directed by Engineer. Lean concrete fill may be used when approved by the Engineer.

3.9 APPROVAL OF SUBGRADE

A. The Contractor will, in the presence of the Geotechnical Engineer, proof roll the subgrade with heavy equipment to identify soft pockets and areas of excess yielding. The Contractor will excavate the

unsatisfactory soil and replace with satisfactory soil. Excavation and backfill of Unsuitable Material will be considered incidental to the contract and no additional payment will be made by the Owner.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Provide silt fence around the perimeter and temporary seeding for all stockpile material left undisturbed for more than 30 days.

3.11 UTILITY TRENCH BACKFILL

A. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Place and compact bedding course on all trench bottoms. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Bedding depths are shown on the drawings.

C. Hand place and compact initial backfill of subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Fill voids with approved initial backfill materials while shoring and bracing, and as sheeting is removed.

E. Place and compact final backfill of satisfactory soil material to final grade. Place backfill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment.

F. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under gravel pavement and concrete pads, scarify and compact each layer of backfill at 95 percent.
2. Under lawn and pasture areas, compact each layer of backfill at 85 percent.

G. Coordinate backfilling with utilities testing.

H. Install detectable warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under pavements, use satisfactory soil material or engineered fill.
3. Under buildings and structures, use satisfactory soil material or engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

B. All moisture control (aeration or watering) of material excavated for use as fill or backfill will be performed by the Contractor at no additional cost to the Owner.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under buildings and structures, compact backfill and fill material at 95 percent of the maximum dry density. In addition, the uppermost 6 inches of the subgrade shall be compacted to 100 percent of the maximum dry density.

2. Under pavement and structures, compact backfill and fill material at 95 percent of the maximum dry density. In addition, the uppermost 6 inches of the road subgrade shall be compacted to 100 percent of the maximum dry density.

3. Under piping, compact backfill and fill material at 95 percent of the maximum dry density at a minimum 12” on each side of the pipe diameter on a 1:1 loading plane down to undisturbed earth.

4. Compact backfill and fill material in pasture and lawn areas at 85 percent of the maximum dry density.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from structures as shown on the drawings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn, Pasture, or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Structures: Plus or minus 1/2 inch (25 mm).
3. Pavements and Graveled Drives: Plus or minus 1/2 inch (13 mm).

C. Topsoil: The Contractor will spread a minimum of 4" of topsoil over all disturbed areas not to receive asphalt, concrete or gravel as a top-course. All excess stripped topsoil will be stockpiled and seeded in a location determined by the Owner.

3.16 SUBBASE COURSE

A. Under gravel pavement, place subbase course on prepared subgrade according to VDOT Specifications Section 315.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified licensed independent geotechnical engineering testing agency to perform field quality control testing. The Engineer will approve or disapprove of the selected agency. If the agency is disapproved, the Contractor must select another agency until approved by the Engineer. Testing costs shall be considered incidental to the work and shall be performed at no additional cost to the Owner.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Gravel Pavement Areas: At subgrade and at each compacted fill and backfill layer, at least two tests for every 5,000 sq. ft. or less of paved area, with a minimum of two tests per lift.
2. Graded Structural Pad Areas: At subgrade and at each compacted fill and backfill layer, one test for every 200 sq. ft. or less of graded pad area. The Owner may require, at his discretion, less frequent testing.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 500 feet or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Contractor is responsible for disposal of surplus satisfactory soil, unsatisfactory soil, and all construction related debris. In this regard, Contractor shall comply with all E&SC and Virginia DEQ regulations.

B. No materials will be disposed in easement areas without written permission from the property owner.

END OF SECTION

SECTION 02510 - WATER DISTRIBUTION

PART 1 – GENERAL

1.1 REFERENCES

1. General: The work shall comply with the most recent standards or tentative standards as published at the date of the contract and as listed in this specification.

2. Related Sections: Additional Sections of the Documents which are referenced in this Section include:

   1) Section 02080 - Utility Pipe and Materials

   2) Section 02085 - Valves and Cocks

3. American National Standards Institute (ANSI)/American Water Works Association (AWWA):

   1) C 651 Standard for Disinfecting Water Mains

4. American National Standards Institute / National Sanitation Foundation (ANSI/NSF):

   1) Std. 61 Drinking Water System Components-Health Effects

PART 2 – PRODUCTS

2.1 MATERIALS

1. General: All materials for use with potable water shall be in accordance with applicable ANSI/AWWA standards and approved for use with potable water in accordance with ANSI/NSF 61.

2. Waterlines: Water mains and distribution lines shall be ductile iron pipe in accordance with Section 02080 – Utility Pipe and Materials.

3. Service Laterals: Service laterals shall be type “K” copper and shall be 1” minimum in diameter when serving 2 or more connections or under roadways. Laterals serving only one connection may be ¾” in diameter. Laterals shall be in accordance with the Section 02080 - Utility Pipe and Materials.

4. Pipe Fittings: All fittings 4 inch and larger shall be ductile iron and shall be in accordance with the Section 02080 - Utility Pipe and Materials.

5. Valves: All valves shall be in accordance with Section 02085 - Valves and Cocks.

6. Concrete: Miscellaneous concrete shall be VDOT Type A-3 specifications.

7. Restrained Joints: Joint restraint shall be performed by mechanical joint pipe and retainer glands in accordance with Section 02080 – Utility Pipe and Materials. Tie rods may be used with hydrant installations in accordance with Section 02080 – Utility Pipe and Materials.

8. Stone: Stone for repair of gravel road shoulder shall be VDOT #25 or #26.

9. Drain, Waste, and Vent: Shall be Schedule 40 PVC in accordance with Section 02080 – Utility Pipe and Materials.

10. Water Plumbing Pipe: Interior potable water plumbing shall be copper pipe in accordance with Section 02080 – Utility Pipe and Materials.

11. Interior Piping: Pipe lines inside of buildings or vaults shall be flanged ductile iron pipe for 4 inches and larger pipe. Pipe which is less than 4 inches in diameter shall be copper or Schedule 80 PVC pipe. Pipe shall be in accordance with Section 02080 – Utility Pipe and Materials.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPE, FITTINGS, AND ACCESSORIES

1. Pipe and Fitting Installation: All work shall be in accordance with Section 02080 - Utility Pipe and Materials.

2. Valve Installation: All work shall be in accordance with Section 02085 - Valves and Cocks.

3.2 DISINFECTION

1. Disinfecting Water Mains: Water mains and accessories shall be disinfected using the "continuous-feed" or "slug method" in accordance with ANSI/AWWA C 651. The "Tablet Method" described in ANSI/AWWA C 651 shall not be used. The Contractor shall obtain the most recent applicable AWWA standard. This standard shall be at jobsite with access granted to the Owner's Representative. Care shall be taken to minimize entrance of foreign material into pipe, fittings and valves. The main shall be flushed prior to disinfection with sufficient flow to produce a velocity of 3.0 fps. Flushing shall take place in areas with adequate drainage.

   1) Continuous Feed Method

   During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals. The quantity of granules shall be as shown in Table 1. This procedure shall provide a strong chlorine concentration in the first flow of flushing water that flows down the main. The main shall be filled prior to flushing to eliminate air pockets and to remove particulates.

   Water supplied from a temporary, backflow prevented connection to the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate into the newly installed water main. At a point not more than 10 ft downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 50 mg/L free chlorine. The chlorinated water shall remain in the pipe at least 24 hours, after which, the chlorine concentration in the water shall be at least 10 mg/l. All valves and appurtenances shall be operated while the chlorinated water remains in the pipe. Table 2 gives the amount of chlorine required for each 100 ft of pipe of various diameters.

Table 1. Application of Calcium Hypochlorite Granules in Water Main for the Continuous Feed Method

Pipe Diameter (inch)	Calcium Hypochlorite Granules (ounce)
4	1.0
6	2.0
8	4.0
12	8.0
16	16.0

Direct feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be used for the application of liquid chlorine.

Table 2. Chlorine Required to Produce 50 mg/L Concentration in 100 ft. of Pipe by Diameter.

Pipe Diameter (inch)	100% Chlorine (lb)	1% Chlorine Solution (gallon)
4	0.026	0.32
6	0.060	0.72
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88
16	0.434	5.20

2) Slug Method

Calcium hypochlorite granules shall be placed in the main during construction as in the Continuous Feed Method. Preliminary flushing and chlorinating of the main shall be the same as in the Continuous Feed Method except for free chlorine concentrations and contact time. At a point not more than 10 ft. downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. The chlorine shall be applied continuously and for a sufficient period to develop a "slug" of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of 100 mg/L for at least 3 hours.

The free chlorine residual shall be measured in the slug as it moves through the main at intervals not more than 2000 ft.

As the chlorinated water flows past fittings and valves, related valves and hydrants shall be opened so as to disinfect appurtenances and pipe branches.

After the required retention period, the main shall be flushed using potable water until the water leaving the system shows a chlorine concentration of less than 1 mg/L or no higher than that prevailing in the water used for flushing. A neutralizing chemical shall be applied to the water to be wasted to neutralize thoroughly the remaining chlorine residual.

In the event the mains are damaged and are in need of repairing, cleaning, disinfection, flushing, testing, or similar operational actions, they shall be done in accordance with the most current standard issued by AWWA (AWWA C-601).

2. Final flushing: Shall be performed with potable water and shall follow to ensure that the chlorine concentration is not higher than that generally prevailing in the system. Chlorinated water shall not be discharged to any water course or drainage way until it is diluted or reduced to a level, which will result in no damage to aquatic life.

3. Bacteriological Tests: After final flushing and before the water main is placed in service, 2 consecutive samples shall be collected at 24 hours intervals for each 1,200 feet of line. These samples shall be tested for bacteriological quality by the State Laboratory or other certified laboratory and shall show the absence of coliform organisms. Samples will be collected (through the use of sample taps supplied by the Contractor) and delivered to the Testing Laboratory by the OWNER within 48 hours of written notifications from Contractor. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. The Contractor is responsible for the cost of all tests.

END OF SECTION

SECTION 02700 – BASES, BALLASTS, PAVEMENTS, AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: This Section includes specifications for the furnishing of all equipment, material, and labor in connection with concrete walks, curb and gutters, curb ramps, and paving of parking areas.

B. Related Sections: Additional Sections of the Documents which are referenced in this Section include:
1. Section 01330 – Submittal Procedures
2. Section 02200 – Site Procedures
3. Section 02300 – Earthwork
4. Section 03300 – Cast-in-Place Concrete

1.2 REFERENCES

A. General: The work shall comply with the most recent standards or tentative standards as published at the date of the contract and as listed in this specification using the abbreviation shown.

B. American National Standards Institute (ANSI)/American Concrete Institute (ACI):

1.	A117	Tolerances for Concrete Construction and Materials
2.	301	Specifications for Structural Concrete
3.	318	Building Code Requirements for Structural Concrete (ACI 318-99) and Commentary (ACI 318R-99)
4.	306R	Standard Specification for Cold Weather Concreting
5.	347R	Guide to Formwork for Concrete

C. American Society for Testing and Materials (ASTM)

1.	A185	Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
2.	A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3.	C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
4.	C94	Standard Specification for Ready-Mixed Concrete
5.	C150	Standard Specification for Portland Cement
6.	C185	Standard Test Method for Air Content of Hydraulic Cement Mortar
7.	D698	Test Method for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lb/ft^3)

8.	D1751	Standard Specification for Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
9.	D1752	Standard Specification for Performed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

3. Virginia Department of Transportation Road and Bridge Specifications (VDOT):

1.	208	Subbase and Aggregate Base Material
2.	210	Asphalt Materials
3.	211	Asphalt Concrete
4.	305	Subgrade and Shoulders
5.	308	Subbase Course
6.	309	Aggregate Base Course
7.	310	Tack Coat
8.	311	Prime Coat
9.	312	Seal Coat
10.	314	Penetration Surface Courses
11.	315	Asphalt Concrete Pavement
12.	502	Incidental Concrete Items
13.	504	Sidewalks, Steps, and Handrails
14.	515	Planing Pavement

4. Virginia Department of Transportation Road and Bridge Standards (VDOT):

1.	CG-2	Standard 6” Curb
2.	CG-3	Standard 4” Curb
3.	CG-6	Combination 6” Curb and Gutter
4.	CG-7	Combination 4” Curg and Gutter
5.	CG-12A	Perpendicular Curb Ramp (Access for Mobility Impairments)
6.	CG-12B	Parallell Curb Ramp Access for (Mobility Impairments)
7.	CG-12C	Combined (Parallel & Perpendicular) Curb Ramp (Access for Mobility Impairments)

5. American Association of State Highway and Transportation Officials (AASHTO):

1.	T99	The moisture-density relations of soils using a 5.5 pound rammer and a 12 inch drop
2.	T119	Slump of Portland Cement Concrete
3.	T152	Air Content of Freshly Mixed Concrete by the Pressure Method
4.	T196	Air Content of Freshly Mixed Concrete by the Volumetric Method
5.	T199	Air Content of Freshly Mixed Concrete by the Chance Indicator

1.3 QUALITY ASSURANCE

A. Restrictions: The VDOT Standards and Specifications shall define temperature restrictions, application procedures, mix components, and material references. All materials and application procedures shall be in accordance with VDOT Standards and Specifications.

B. Cast-in Place Concrete: Unless shown otherwise, cast-in-place concrete shall comply with the Building Code Requirements for Structural Concrete (ANSI/ACI 318) and all applicable requirements of the Specifications for Structural Concrete (ANSI/ACI 301).

C. Mix Designs: Do not commence placement of pavement until mix designs have been reviewed and approved by the ENGINEER and all governmental agencies having jurisdiction, and until copies of the approved mix designs are at the job site and the batch plant.

D. Testing: The Geotechnical Engineer shall observe the following to determine if the work has been performed in accordance with these specifications:

1. Subgrade prior to placing base stone.
2. Base stone prior to laying asphalt.
3. Surface course application.

It is the CONTRACTOR's responsibility to coordinate inspections with the Geotechnical Engineer.

1.4 SUBMITTALS

A. General: Submittals shall be made in accordance with Section 01330 – Submittal Procedures at least two weeks prior to construction. Provide submittals for the following:

1. Concrete Mix Design
2. Steel Reinforcement
3. Welded Wire Reinforcement

B. Concrete Mix Designs:

1. Within 30 calendar days after award of the Contract, and prior to proceeding with any concrete work, secure concrete mix designs from the concrete supplier, and submit to the ENGINEER for review and approval.

2. Distribute approved mix designs to testing laboratory, batch plant, job site, and governmental agencies having jurisdiction.

1.5 SITE CONDITIONS

A. Asphalt Paving Limitations:

1. Aggregate base course may be placed when air temperature is above 30 degrees F.
2. Apply prime and tack coats when ambient temperature is above 50 degrees F. (10 degrees C) and when temperature has not been below 35 degrees F. (1 degree C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
3. Construct asphalt concrete base and surface course only when atmospheric temperature is above 40 degrees F. (4 degrees C) and when base is dry.

B. Portland Cement Concrete Limitations: Placement of concrete shall be restricted to conditions defined in Section 03300 – Cast-in-Place Concrete.

1.6 MAINTENANCE

A. Streets: The CONTRACTOR shall maintain and repair existing streets as necessary during the construction period and provide for additional applications of compacted stone after completion of trenching and prior to paving, as required.

B. Roadway and Parking Areas: The CONTRACTOR shall maintain and repair the road and parking areas as necessary during the construction period.

PART 2 - PRODUCTS

2.1 PAVEMENT REPAIR

A. General: Pavement if disturbed, shall have the edges clean cut, then repaired with a bituminous concrete, VDOT Type SM-9.5 at least 1 1/2 times the thickness of the original surface material but in no case less than 2 inches. Pavement seal or overlay, where required, for perpendicular pavement cuts or crossings shall have a minimum width equal to the width of the road. In cases of pavement cuts parallel to the road centerline, the entire width of the pavement shall have a pavement seal or overlay applied after initial patching, extending over the entire length of the patching plus 5 feet at each end as measured along the road centerline.

B. Pavement Seal for Surface Treated Pavement: Where required, pavement seal shall be performed in accordance with VDOT Sections 312 and 314 and shall consist of:

CRS-2	Liquid Asphalt	0.30 Gal/S.Y.
VDOT #8	Cover Stone	25 lbs/S.Y.

C. Pavement Overlay for Asphalt Concrete Pavement: Where required, pavement overlay shall be performed in accordance with VDOT Section 315 and shall consist of:

SM-9.5	Asphalt Concrete	1 inch

2.2 GRAVEL ROADS AND SURFACING

A. General: Gravel roads, access drives, parking areas, or other gravel surfaces shall consist of a minimum of 6 inches of compacted VDOT #21A aggregate unless shown otherwise on the plans.

B. Subgrade: Subgrade shall conform to VDOT Section 305.

2.3 PENETRATION SURFACE COURSES

A. General: Asphalt surface treatment, where required, shall comply with VDOT Specification 314.

B. Subgrade: Subgrade shall conform to VDOT Section 305.

C. Base: Base shall consist of a minimum of 6 inches of compacted VDOT #21-A aggregate unless shown otherwise on the plans. Joints in existing pavement shall be overlapped and sealed.

D. Prime and Surface: Pavement shall consist of a prime coat and two surface coats as follows:
Prime Coat

CRS-2 Liquid Asphalt	0.30 Gal/S.Y.	
VDOT #8	Cover Stone	25 lbs./S.Y.
Seal Coats (each)		
CRS-2	Liquid Asphalt	0.30 Gal/S.Y.
VDOT #8	Cover Stone	25 lbs./S.Y.

2.4 ASPHALT CONCRETE PAVING AND SURFACING

A. General: All materials and methods for the construction of the travelway and parking paving shall be in accordance with applicable provisions of the VDOT specifications referred to hereinafter by section.

B. Subgrade: Subgrade shall conform to VDOT Section 305.

C. Base Courses:

1. Aggregate base course shall consist of VDOT #21A aggregate base material and shall conform to VDOT Section 208.
2. Prime coat shall consist of liquid asphalt material meeting the requirements of VDOT Section 311.
3. Bituminous concrete base course shall consist of bituminous concrete base material VDOT Type BM-25.0 and conform to VDOT Section 315.

D. Intermediate Course:

1. Tack coat shall consist of liquid asphalt material meeting the requirement of VDOT Section 310.
2. Bituminous concrete intermediate course shall consist of bituminous concrete intermediate material VDOT Type IM-19.0 and conform to VDOT Section 315.

E. Surface Course and Pavement Overlay:

1. Tack coat shall consist of liquid asphalt material meeting the requirements of VDOT Section 310.

2. Bituminous concrete surface course or overlay shall consist of bituminous concrete surface material VDOT Type SM-9.5 and shall conform to VDOT Section 211.

2.5 ASPHALT WALKWAYS

A. General: All materials and methods for the work shall be in accordance with applicable provisions of the VDOT specifications referred to hereinafter by section.

B. Subgrade: Subgrade shall conform to VDOT Section 305.

C. Base Courses: Aggregate base course shall consist of VDOT 21-A aggregate base material and installation shall conform to VDOT Section 208.

D. Surface Course

1. Tack coat shall consist of liquid asphalt material meeting the requirements of VDOT Section 310.
2. Bituminous concrete surface course or overlay shall consist of bituminous concrete surface material VDOT Type SM-9.5 and shall conform to VDOT Sections 210 and 211.

2.6 CONCRETE PAVEMENT AND WALKS

A. General: All concrete shall be air entrained and comply with Section 03300 – Cast-in-Place Concrete.

B. Formwork:

1. General: Metal forms are preferred over wooden forms for the sidewalk installation. Form work shall be designed and constructed to insure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inch nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with ¾ inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms and radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms. Pointed tips designed for use with steel forms.
2. Sidewalk Form: Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.
3. Curb and Gutter Forms: Curb and gutter outside forms shall have a height equal to the full depth of the curb and gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that bender or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1 ½ inch benders, for the full height of the curb, cleated together.

C. Reinforcement:

1. General: Reinforcement steel shall be the size shown on the plans with all bars being billet steel, grade 40 or 60 (ASTM A615).
2. Welded Wire: Shall be placed in sidewalk areas and shall conform to ASTM A185. Size shall be as indicated on the plans.

D. Expansion Joints:

1. General: Expansion joints are to be provided at locations shown on the plans or at other locations during construction as approved by the OWNER. (Joints shall be filled with a premolded expansion joint filler complying with ASTM D1751.
2. Characteristics: The expansion joint shall have the following properties:
   a. Density of 25 pounds per cubic foot.
   b. Asphalt content of 40 percent by volume.
   c. Water absorption of 9.4 percent by volume.
   d. Compressive strength of 475 psi at 50 percent deflection.
   e. Joint fillers shall be non-extruding, ½ inch thickness complying with ASTM D1751 specifications.
3. Surface Sealant: Sealant for the expansion joint shall be an epoxidized polyurethane material or equal designed for dynamically moving joints to withstand extension up to 40 percent and compression up to 25 percent. Color shall match concrete surface. Material shall be Tremco "Dymeric" or equal by GE, Pecora, or Dow Corning. Sealant shall not extend above the surface elevation of walks.

PART 3 - EXECUTION

3.1 GENERAL

A. Grading: Uniformly smooth grade excavated areas, filled sections and adjacent transition areas. Subgrade shall be rolled and compacted prior to stone application. Earthwork shall be in accordance with Section 02300 of these specifications.

B. Subbase and Base Courses: Aggregate base courses shall be placed in accordance with VDOT Sections 308 and 309. Coordinate with work of Section 02300 – Earthwork, in the compaction of base course.

C. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

D. Barricades: Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

E. Surface Drainage: The surface of all paving work shall slope and drain surface water toward catch basins or swales. If water stands, paving shall be corrected to prevent standing water, subject to the ENGINEER's approval.

F. Connections to Existing: Where new work connects to or adjoins existing sidewalk, curb and gutter, or pavement, existing surface shall be saw cut in a straight line at point of connection. Expansion joint material shall be installed, when applicable. Finished surfaces shall be continuous providing a smooth transition between existing and new work.

3.2 ASPHALT PAVING AND SURFACING

A. General. Asphalt concrete pavement construction shall be in accordance with the details on the plans and construction shall be in accordance with VDOT Section 315.

3.3 ASPHALT WALKWAY

A. Base Courses: Aggregate base course shall be mixed and placed to a depth of 4 inches in accordance with VDOT Section 309 and shall be in accordance with Section 02200 – Site Preparation.

B. Surface Course:

1. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
2. Barricades: Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.
3. Surface Drainage: The surface of all paving work shall slope and drain surface water toward catch basins or swales. If water stands, paving shall be corrected to prevent standing water, subject to the ENGINEER's approval.

3.4 CONCRETE PAVING AND WALKS

A. General: Construction shall be in accordance with Section 03300 – Cast-in-Place Concrete, except as noted otherwise.

B. Subgrade: The subgrade shall be maintained in a smooth compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected so as to produce a subgrade free from frost when the concrete is deposited.

C. Bedding: Concrete shall be placed on a minimum of 2 inches of VDOT #21A stone or other stone approved by OWNER's representative unless shown otherwise on the plans. Bedding shall be placed on firm, undisturbed subgrade.

D. Thickness: Concrete thickness shall match that of the existing concrete unless otherwise noted on the plans. Concrete shall, under no circumstances be less than 6 inches thick.

E. Width: Pavement and sidewalk width shall match that of the existing unless otherwise noted on the plans. The width of the sidewalk shall be measured from the back of the curb.

F. Slopes: Sidewalks, unless otherwise noted on the plans, shall slope toward drainageways at a minimum of ¼ inch to 1 foot.

G. Form Setting: Forms shall be carefully set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of three stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired at no cost to the OWNER. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

1. Sidewalks: Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope (as

indicated of a minimum ¼ inch per foot) with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

2. Curbs and Gutters: The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

H. Expansion Joints: The CONTRACTOR shall install expansion joints at the locations shown on the plans. The distance between expansion joints shall not exceed 50 feet. Installation of the expansion joints shall be in accordance with the manufacturer's recommendations.

I. Control Joints: The CONTRACTOR shall divide concrete sidewalk into sections, the length of which match the existing sidewalk, by transverse control joints formed by a trowel or jointing tool. These control joints shall be at least 1/4 of the slab depth and 1/8-inch wide and match in appearance the joints in the existing sidewalk.

J. Handicapped Access Ramps: The minimum width of handicapped access ramps shall be 36 inches excluding the flared sides. The maximum slope of ramp runs shall be 1:12. All handicapped access ramp construction shall conform to ANSI A117.1 using dimensions shown on VDOT Standards CG-12A, CG-12B, and CG-12C. Detectable warning in walking surface consisting of exposed aggregate or groves in conformance with ANSI A117.1-4.27 is required.

K. Finish Surface: The finished surface including control joints and edging of the new concrete shall match that of the existing concrete. The finished surface shall exhibit a uniform texture free from irregularities. No water shall pond on the finished surface. Areas which exhibit excessive cracking, discoloration, form marks or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced at no additional cost to the OWNER.

L. Protection: CONTRACTOR shall protect uncured concrete from vandalism. Any damage to concrete work prior to acceptance by OWNER shall be repaired by the CONTRACTOR at no expense to the OWNER.

M. Weather: Concrete shall be protected from low temperatures. See Section 3.1.1

N. Concrete Curb: Concrete curb shall be in accordance with VDOT Standards CG-2 or CG-3 as shown on the plans. Combination curb and gutter shall be in accordance with VDOT Standards CG-6 or CG-7 as shown on the plans. All concrete curbing shall be in accordance with VDOT Section 502.

O. Curb Ramps, Concrete Steps, and Sidewalk Transitions: Shall be in accordance with VDOT Section 504.

P. Construction Joints: Transverse joints for crack control shall be in accordance with VDOT Section 502.

Q. Concrete Finishing: Except as may be shown otherwise on Drawings, provide the following finishes at the indicated locations. Finishes for concrete other than listed here shall be in accordance with Section 03300 – Cast-in-Place Concrete.

1. Trowel Finish: apply to curbs and gutters and other surfaces that are to be exposed to view, unless otherwise shown.
2. Exposed Aggregate Finish: apply to all handicap ramps exceeding +/- 5 percent slope.
3. Nonslip Broom Finish: apply to all concrete walks, steps and ramps except as noted above.

3.5 FIELD QUALITY CONTROL

A. Subgrade Testing: The subgrade shall be tested for grade and cross section by means of a template extending the full width of the sidwalk and/or curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

B. Thickness Deficiency: When measurements indicate that the completed concrete sections is deficient in thickness by more than 0.25 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

C. High Areas: In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed ¼ inch. All pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

D. Remedial Work: Repair or replace deficient work as directed by the ENGINEER and at no additional cost to the OWNER.

END OF SECTION

SECTION 02821 - CHAIN LINK FENCES

1.1 SUMMARY

A. Work Included: Furnish and supply all materials, equipment, and labor for chain link fences as shown on the plans and specified herein, and as needed for a complete and proper installation. Fence shall be designed to match existing site fence in material and configuration.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences.

1. Fence posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Hardware.
4. Accessories: Barbed wire.

B. Shop Drawings: Show locations of fences, posts, rails, tension wires, details of extended posts, extension arms, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Product Certificates: For each type of chain-link fence signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1. Engineering Responsibility: Preparation of data for chain-link fences, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

1.5 REFERENCES

A. ASTM 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel.

B. ASTM F 1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Like Fence Framework.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
   1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.192 inch.
      a. Mesh size: 2 inches.
      b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied after weaving.

B. Selvage: Twisted top and knuckled bottom.

2.2 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for round pipe, and the following:
   1. Group: IA, round steel pipe, Schedule 40.
   2. Fence Height:
      a. Perimeter Fence: 8’ high fabric with 3-strand barbed wire on angled support arms.
   3. Strength Requirement: Light industrial according to ASTM F 1043.
   4. Post Diameter and Thickness: According to ASTM F 1043.
      a. Gate Post: According to ASTM F 900.
   5. Coating for Steel Framing:
      a. Metallic Coating: Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating per ASTM A 653/A 653M.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:
   1. Location: Extended along top and bottom of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:

1. Metallic Coating: Type II, zinc coated (galvanized), with the following minimum coating weight:

a. Matching chain-link fabric coating weight.

2.4 FITTINGS

A. General: Comply with ASTM F 626.

B. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts, or integral with post cap; for each post, unless otherwise indicated, and as follows:

1. Line posts with arms that accommodate top rail or tension wire.
2. Corner arms at fence corner posts, unless extended posts are indicated.
3. Type I, single slanted arm for three strands of barbed wire.

2.5 BARBED WIRE

A. Zinc-Coated Steel Barbed Wire: Comply with ASTM A 121, Standard grade for the following two-strand barbed wire:

1. Standard Size and Construction: 0.099-inch- diameter line wire with 0.080-inch- diameter, 2-point round barbs spaced not more than 5 inches o.c.

2.6 GROUT AND ANCHORING CEMENT

A. Nonshrink,Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

1. Do not begin installation before final grading is completed, unless otherwise permitted by Engineer.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Staking: Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set terminal posts in concrete and in-line posts with mechanical anchors or by mechanically driving into soil at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
3. Mechanically Driven Posts: Drive into soil to depth of 36 inches. Protect post top to prevent distortion.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

E. Line Posts: Space line posts uniformly at 10 feet o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.

1. Top Tension Wire: Install tension wire through post cap loops.
2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

L. Barbed Wire: Install barbed wire uniformly spaced, angled toward security side of fence. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

END OF SECTION

SECTION 02920 – SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install lime, fertilizer, seed, mulch, and water on all disturbed areas on the site, in strict accordance with this Section and as shown on the plans. Work in this section includes permanent seeding and, when required, temporary seeding.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Product Data: CONTRACTOR shall furnish labels or other appropriate product data for landscape materials. This may include but is not limited to: labels showing lime and fertilizer analysis; labels showing seed mixture contents and analysis; and labels from geotextile fabrics and similar materials.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

B. Delivery: All seed shall be kept cool, dry and free of contaminants during transportation. Seed and soil amendments shall be delivered in original, unopened containers with appropriate labels attached.

C. Storage: Seed which is not sown within 24 hours after delivery shall be stored as follows, unless other methods of storage are requested by the CONTRACTOR and approved by the ENGINEER.

1. Seed storage location shall be cool, dry, and sheltered from wind, traffic and construction activities.
2. Fertilizers, lime, herbicides, insecticides, and other agricultural chemicals shall be stored separately from the seed.

D. Replacement: Seed which is heated, moistened, or otherwise damaged during transportation or storage shall be rejected and replaced by the CONTRACTOR at no additional cost to the OWNER. Seed in damaged or opened packaging shall be rejected and replaced by the CONTRACTOR at no additional cost to the OWNER.

1.4 QUALITY ASSURANCE

A. General: Use adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Equipment: Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.

C. Seed: Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

D. Soil Amendments: Provide fertilizers, lime and other soil amendments in containers showing analysis, contents, and volume or weight.

1.5 WARRANTY

A. General: Contractor shall perform periodic inspection of the seeded areas during the warranty period.

B. Warranty Maintenance: Contractor shall provide, during the warranty period, maintenance as necessary to establish a healthy uniform stand of turf. Contractor's maintenance shall generally include overseeding, application of amendments, and repair of erosion as necessary.

1.6 MAINTENANCE

A. General: Seeded areas shall be maintained as necessary to establish a healthy, uniform stand of turf until substantial completion. Maintenance shall consist of watering, mowing, fertilizing, weed removal, disease and insect removal, and where erosion occurs, repair.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grass seed: Seed shall comply with all applicable state and federal seed laws and contract requirements. Seed shall comply with all pertinent provisions of VDOT Section 244.

1. Grass seed shall consist of pure, live, certified grass seed mixture, of the latest crop, and containing weed seed less than 0.5 percent by weight of the total mixture.
2. Varieties of grass seed shall be selected from the current VCIA Recommendations and shall conform to the standards described therein for the Virginia Sod Certification Program.
3. Seed mixture(s) for permanent seeding shall be selected from the following table, based on the time of year during which seeding is to occur. Numbers indicate pounds of seed per acre. Bermudagrass shall be used in the Southern Piedmont and Coastal Plain, and Kentucky Bluegrass shall be used in the Northern Piedmont and Mountains. Bermudagrass and Kentucky Bluegrass shall not be included in the same mixture.

Southern Piedmont and Coastal Plain (1)	Feb. 1 – April 30	May 1 – Aug. 30	Sept. 1 – Nov. 15	Nov. 16 – Jan. 31
Northern Piedmont and Mountains (2)	Feb. 1- May 15	May 16- Aug. 15	Aug. 16 - Oct. 15	Oct. 16 – Jan. 31
Grass Type	Mixture A	Mixture B	Mixture C	Mixture D
Bermudagrass (1) *(Cynodon dactylon)* OR Kentucky Bluegrass (2) *(Poa pratense)*	175	175	175	175
Turf-Type Tall Fescue (*Festuca* hybrids)	25	25	25	25
Weeping Lovegrass *(Evagrostis curvula)*	20	-	24	-
Foxtail Millet *(Setaria italica)*	-	80	8	-
Rye *(Secale cereale)*	20	-	8	8
TOTAL WEIGHT	240	280	240	208

4. Where specified on plans, crown vetch seed shall be added to the specified seed mixture at a rate of 10 pounds per acre.
5. Seed mixture(s) for temporary seeding shall consist of two seed types selected from the appropriate mixture in the table below. Selection of the particular mixture shall be based on the time of year during which seeding is to occur. Numbers indicate pounds of seed per acre.

Southern Piedmont and Coastal Plain	Feb. 16 – April 30	May 1 – Aug. 30	Sept. 1 – Nov. 15	Nov. 16 – Jan. 31
Northern Piedmont and Mountains	March 1 – April 30	May 1 – Aug. 15	Aug. 16 – Oct. 31	Nov. 1 – Feb. 28/29
Seed Type	Mixture A	Mixture B	Mixture C	Mixture D
Oats *(Avena sativa)*	50	-	-	-
Rye *(Secale cereale)*	35	-	35	35
Foxtail Millet *(Setaria italica)*	-	30	-	-
Annual Ryegrass *(Lolium multifolium)*	35	-	35	40
Weeping Lovegrass *(Evagrostis curvula)*	-	10	-	-
Korean Lespedeza *(Lespedeza stipulacea)*	15	15	-	-

B. Fertilizer: Fertilizer shall be commercially prepared and granular. Fertilizer shall be uniform in composition, dry, and free-flowing.

1. Fertilizer must comply with pertinent provisions of VDOT Section 244. Fertilizer shall conform to all applicable state and federal regulations.
2. Fertilizer for permanent seeding shall be complete with a 10-10-10 analysis (percentages by weight of nitrogen, phosphorous and potassium, respectively) or as recommended in the soil test report and approved by the Engineer.
3. Fertilizer for temporary seeding shall be complete with a 10-20-10 analysis (percentages by weight of nitrogen, phosphorous and potassium, respectively).

C. Mulch: Oat or wheat straw shall be used. Straw shall be dry and free from weeds, weed seeds, and foreign matter detrimental to plant life. Mulch shall conform to VDOT Section 244.

D. Straw blanket: Straw blanket shall consist of a 100 percent straw blanket sewn into a lightweight photodegradable net. The straw blanket shall be designed for installation on 3:1 and steeper slopes. Weight of blanket shall be approximately 0.5 pounds per square yard. Straw blankets shall be used in areas indicated on plans.

E. Paper matting: Paper matting shall consist of a flexible knitted construction of high strength degradable yarn interwoven with strips of biodegradable paper. Weight of matting shall be approximately 0.2 pounds per square yard.

F. Water: Water shall be potable or clean water free of contaminants harmful to plant growth. Brackish water shall not be used.

G. Lime: Unless otherwise noted, lime shall be agricultural ground or pulverized limestone.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Rake the soil surface to remove all root clumps, stones, and debris 1 inch or greater in size. True up all depressions and edges. Soil in the area to be seeded shall be prepared in accordance with VDOT Sections 602 and 603.

B. Grading: Establish a smooth grade ready to receive seed. Finish grade must conform to the grades and elevations as shown on the plans.

C. Topsoil: Topsoil shall be in place for all areas to be permanently seeded.

3.2 APPLICATION

A. General: Seeding shall conform with VDOT Section 603. Initial seeding shall consist of uniformly applying seed, mulch, and water on prepared areas. Over-seeding shall consist of applying seed, mulch, and water to areas previously seeded.

B. Lime: Apply lime uniformly at the rate of 2 tons per acre or as recommended in the soil test report, using approved application method listed in VESCH 3.32. After application, the soil shall be loosened to a depth of 3 inches by disking, harrowing, or other approved method. Washed and disturbed areas shall be final dressed prior to applying fertilizer. Lime application is not required for areas to be temporarily seeded for periods less than 4 months.

C. Fertilizer: Incorporate fertilizer into top 3 inches of soil by discing or power rake.
1. For areas to be permanently seeded, apply fertilizer uniformly at the rate of 30 pounds per 1,000 square feet or as recommended in the soil test report.
2. For areas to be temporarily seeded, apply fertilizer uniformly at the rate of 15 pounds per 1,000 square feet.

D. Seeding Time: Seed shall be sown during favorable weather conditions. Seed shall not be sown when the ground is frozen or when air temperatures are below freezing. Do not sow under windy conditions.

E. Seeding: Sow seed uniformly, dividing the selected rate in half and sowing in cross directions using a mechanical spreader. Do not allow seed to drift into adjacent planting beds.

F. Rolling: After machine sowing, lightly cover seed by harrowing or raking. Compact lawn area seedbed by rolling with a 200 pound hand roller.

G. Mulching: Mulching shall comply with the pertinent provisions of VDOT Section 603.
1. Apply mulch within 48 hours of sowing seed. Apply mulch of loose straw uniformly at the rate of 2 tons per acre. Between October 16 and January 31, the application rate shall be increased to 3 tons per acre. Mulch shall be anchored to the seeded surface by discing, netting, or by other methods approved by the Engineer.
2. Areas to be temporarily seeded need be mulched only during the fall or during the summer when weather conditions are excessively hot or dry.
3. On slopes steeper than 2:1, paper matting shall be installed after fertilizing and seeding to serve as both mulch and mulch anchor. Application of matting shall be according to VDOT Section 606.

H. Watering: Immediately after completion of mulching, apply water thoroughly to mulch and seedbed with a fine mist spray. Water heavily once per week during dry weather until a thick cover of grass is established.

I. Hydroseeding: Hydroseeding may be used as an alternative application method upon approval of the Engineer. The use of alternative soil amendments and mulch will be considered provided the application rates comply with the rates specified in this section.

END OF SECTION

SECTION 03100 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Form liners.
3. Insulating concrete forms.
4. Shoring, bracing, and anchoring.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Forms for cylindrical columns.
4. Pan-type forms.
5. Void forms.
6. Form liners.

7. Insulating concrete forms.
8. Form ties.
9. Waterstops.
10. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.

    a. Location of construction joints is subject to approval of the Architect.

3. Indicate location of waterstops.
4. Indicate form liner layout and form line termination details.
5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.

C. Samples:

1. For waterstops.
2. For Form Liners: 12-inch by 12-inch sample, indicating texture.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC353.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:

a. Wind Loads: As indicated on Drawings.

1) Horizontal Deflection Limit: Not more than 1/240 of the wall height.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

a. Plywood, metal, or other approved panel materials.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 WATERSTOPS

A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals, with factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. J P Specialties, Inc.
   b. Sika Corporation.

2. Profile: Flat dumbbell with center bulb.
3. Dimensions: 4 inches by 3/16 inch thick; nontapered.

2.4 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

E. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:
1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
2. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
5. Space vertical joints in walls at 30’-0” maximum spacing and no closer than 2’-0” to a corner or intersection.

a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."
4. Secure waterstops in correct position at 12 inches on center.
5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.

    a. Miter corners, intersections, and directional changes in waterstops.
    b. Align center bulbs.

6. Clean waterstops immediately prior to placement of concrete.
7. Support and protect exposed waterstops during progress of the Work.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Protect exposed waterstops during progress of the Work.

3.4 INSTALLATION OF INSULATING CONCRETE FORMS

A. Comply with ACI 301 and manufacturer's instructions.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Install forms in running bond pattern.

1. Align joints.
2. Align furring strips.

D. Construct forms tight to prevent loss of concrete mortar.

E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Shore insulating concrete forms to ensure stability and to resist stressing imposed by construction loads.

3.5 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 03200 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Galvanized.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.

2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Fiber reinforcement.
5. Vapor retarders.
6. Curing materials.
7. Accessories.
8. Repair materials.
9. Concrete mixture materials.
10. Concrete mixture class types.
11. Concrete mixing.

B. Related Requirements:
1. Section 03100 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 03200 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:
1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for inspections and acceptance testing of concrete at Project site.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.

d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold- and hot-weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Concrete repair procedures.
l. Concrete protection.
m. Initial curing of standard-cured and field curing of field-cured test cylinders (ASTM C31/C31M.)
n. Protection of field cured field test cylinders.
o. Distribution of test reports.

1.4 ACTION SUBMITTALS

A. Product Data:
1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral fillers.
10. Admixtures:

a. Include limitations of use. Admixtures that do not comply with reference ASTM International requirements must be submitted with test data for approval.

11. Fiber reinforcement.
12. Vapor retarders.
13. Floor and slab treatments.
14. Liquid floor treatments.
15. Curing materials.
16. Joint fillers.
17. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Calculated equilibrium and fresh density for lightweight concrete.
7. Slump or slump flow limit.
8. Air content.
9. Nominal maximum aggregate size.
10. Intended placement method.
11. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.
2. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

B. Material Certificates: For each of the following:
1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. Material Test Reports: For the following:
1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral filler.
10. Admixtures.

D. Research Reports:
1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC's Acceptance Criteria AC380.

E. Preconstruction Test Reports: For each mix design.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.
1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer's production facilities and delivery vehicles certified in accordance with NRMCA's certification requirements or equivalent approval by a State DOT.

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.
   1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level 1. Testing agency laboratory supervisor tests to be an ACI-certified Concrete Laboratory Testing Technician, Level 2.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
   1. Include the following information in each test report:

      a. Admixture dosage rates.
      b. Slump.
      c. Air content.
      d. Seven-day compressive strength.
      e. 28-day compressive strength.
      f. Evaluation of permeability-reducing admixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 as follows:
   1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   2. When air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   3. Do not use frozen materials or materials containing ice or snow.
   4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
   1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:
   1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
   2. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:
   1. Portland Cement: ASTM C150/C150M,.
   2. Blended Hydraulic Cement: ASTM C595/C595M.
   3. Pozzolans: ASTM C618, Class C, F, or N.
   4. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
   5. Ground Glass Pozzolan: ASTM C1866/C1866M, Type GS or GE.
   6. Silica Fume: ASTM C1240.

C. Normal-Weight Aggregates:
   1. Coarse Aggregate: ASTM C33/C33M
      a. Class 4 for dry solids shelter
      b. Class 1N for all other
   2. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
   3. Fine Aggregate: ASTM C33/C33M.
   4. Recycled Aggregate: Provide documentation of characteristics of recycled aggregate and mechanical properties and durability of proposed concrete, which incorporates recycled aggregate to conform to appliable requirements for the class of concrete.
   5. Alkali-Silica Reaction: Comply with one of the following for each aggregate used:

      a. Expansion Result of Aggregate: Not more than 0.04 percent at one year when tested in accordance with ASTM C1293.
      b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567. Do not use this option with fly ash with an alkali content greater than 4.0 percent. Submit supporting data for each aggregate showing expansion in excess of 0.10 percent when tested in accordance with ASTM C1260.
      c. Alkali Content in Concrete: Not to exceed 4 lb./cu. yd. for aggregate with expansion greater than or equal to 0.04 percent and less than 0.12 percent or 3 lb./cu. yd. for aggregate with expansion greater than or equal to 0.12 percent and less than 0.24 percent. Test aggregate reactivity in accordance with ASTM C1293. Calculate alkali content of concrete in accordance with ACI 301. Do not use this option with natural pozzolan or fly ash that has a calcium oxide content greater than 18 percent or an alkali content greater than 4.0

percent; or for an aggregate with expansion at one year greater than or equal to 0.24 percent when tested in accordance with ASTM C1293.

D. Ground Calcium Carbonate or Aggregate Mineral Filler: ASTM C1797. Unless otherwise permitted, do not use mineral filler derived from carbonate sources in concrete for members assigned to Exposure Class S1, S2, or S3.

2.3 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.

C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M. Include documentation of compliance with limits for alkalis, sulfates, chlorides, or solids content of mixing water from Table 2 in ASTM C1602/C1602M.

2.4 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A. Include manufacturer's recommended thickness and adhesive or pressure-sensitive tape.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Barrier-Bac; Inteplast Group.
b. Foxfire Enterprises, Inc.
c. ISI Building Products.
d. Poly-America, L.P.
e. Raven Industries, Inc.
f. Reef Industries, Inc.
g. Stego Industries, LLC.
h. Tex-Trude.
i. W. R. Meadows, Inc.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:

a. Ambient Temperature Below 50 deg F (10 deg C): Black.
b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
c. Ambient Temperature Above 85 deg F (29 deg C): White.

D. Water: Potable water that does not cause staining of the surface.

E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating.

G. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.6 ACCESSORIES

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 REPAIR MATERIALS

A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURE MATERIALS

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:
   1. Fly Ash or Other Pozzolans: 25 percent by mass.
   2. Slag Cement: 50 percent by mass.
   3. Silica Fume: 10 percent by mass.
   4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
   5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.9 CONCRETE MIXTURE CLASS TYPES

A. Class A: Normal-weight concrete used for Sludge Dewatering Building footings.
   1. Exposure Class: ACI 318 Class F0 Class S0 Class W0 Class C0.
   2. Minimum Compressive Strength: 3000 psi at 28 days.
   3. Slump Limit: Contractor to select a target slump in accordance with ASTM C143/C143M, as permitted under ACI 301.
   4. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cementitious materials.

B. Class C: Normal-weight concrete used for interior slabs-on-ground.
   1. Exposure Class: ACI 318 Class F0 Class S0 Class W0 Class C0.
   2. Minimum Compressive Strength: 3000 psi at 28 days.
   3. Slump Limit: Contractor to select a target slump in accordance with ASTM C143/C143M, as permitted under ACI 301.
   4. Air Content:
      a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
   5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

C. Class J: Normal-weight concrete used for exterior retaining walls and slabs.
   1. Exposure Class: ACI 318 Class F3 Class S2 Class W2 Class C1.
   2. Minimum Compressive Strength: 4000 psi at 28 days.
   1. Slump Limit: Slump Limit: Contractor to select a target slump in accordance with ASTM C143/C143M, as permitted under ACI 301.
   2. Air Content:
      a. Exposure Classes F2 and F3: 5.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.
   3. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

A. Comply with ACI 117.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install reglets to receive waterproofing and through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.5 INSTALLATION OF VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.

5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides and sealing to vapor retarder.

3.6 INSTALLATION OF CAST-IN-PLACE CONCRETE

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 INSTALLATION OF JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Place joints perpendicular to main reinforcement.
      a. Continue reinforcement across construction joints unless otherwise indicated.
   3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
   7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.8 APPLICATION OF FINISHING FLOORS AND SLABS

A. Trowel Finish:
   1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
   2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
   3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
   5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
   6. Apply a trowel finish to surfaces exposed to view.
   7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

a. Slabs on Ground:

1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.

B. Trowel and Fine-Broom Finish: First apply a trowel finish to interior walking surfaces. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.9 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:
1. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
b. Remove projections larger than 1/4 inch.
c. Patch tie holes.
d. Surface Tolerance: ACI 117, Class B.
e. Locations: Apply to concrete surfaces exposed to public view,.

3.10 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
b. Cast anchor-bolt insert into bases.
c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.11 APPLICATION OF CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period as follows:

a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
b. Continuous Sprinkling: Maintain concrete surface continuously wet.
c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing after finishing concrete.
2. Interior Concrete Floors:

a. Floors To Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.

b. Floors To Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.12 INSTALLATION OF JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s).

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.13 INSTALLATION OF CONCRETE SURFACE REPAIRS

A. Defective Concrete:
   1. Repair and patch defective areas when approved by Architect.
   2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
      a. Limit cut depth to 3/4 inch.
      b. Make edges of cuts perpendicular to concrete surface.
      c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
      d. Fill and compact with patching mortar before bonding agent has dried.
      e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
      a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
      b. Compact mortar in place and match surrounding surface.
   3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:
   1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
      a. Correct low and high areas.
      b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
   3. After concrete has cured at least 14 days, correct high areas by grinding.

4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.

C. Delivery Tickets: comply with ASTM C94/C94M.

D. Inspections:
1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 150 cu. yd. or fraction thereof.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests as needed.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:

a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.

5. Concrete Density: ASTM C138/C138M:

a. One test for each composite sample when strength test specimens are cast.

b. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture. The fresh density should be consistent with that associated with the equilibrium density within a tolerance of plus or minus 4 lb/ft.^{3}.

6. Compression Test Specimens: ASTM C31/C31M:

a. Cast and standard cure two sets of two 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39/C39M.

a. Test one set of two standard cured specimens at seven days and one set of two specimens at 28 days.

b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

11. Additional Tests:

a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.15 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION

SECTION 03400 –PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Erection of all structural precast concrete units as shown on the plans.

B. Related Sections: Additional Sections of the Documents which are referenced in this Section include:
1. Section 01610 – Delivery, Storage, and Handling
2. Section 02080 – Utility Pipe and Materials
3. Section 02200 – Site Construction

1.2 SYSTEM DESCRIPTION

A. General: Precast units shall have the same internal dimensions as those shown on the plans and must have internal wall thicknesses as shown, where applicable.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.

B. Shop Drawings: Submit shop drawings showing complete information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-section; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.

C. Details: Indicate layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at opening in precast units.

D. Design: Provide complete design calculations prepared and sealed by a registered professional Engineer licensed to practice in the Commonwealth of Virginia. Shop drawings shall also be sealed by a registered professional Engineer licensed to practice in the Commonwealth of Virginia. The design must meet the requirements of the latest edition of ACI 318 or ACI 350R. Structure must be designed to resist buoyancy with a minimum 1.25 safety factor. Buoyancy resistance shall be calculated assuming groundwater to top of structure and structure empty. Where extended footer is provided, only weight of soil directly above extended footer may be considered. Soil friction to sidewall may not be included in buoyancy calculation.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabricator must have sufficient production capacity to produce required units without causing delay in work. Tankage shall be designed, fabricated, and erected by a firm having a minimum of 10 years of experience in the manufacturing of tankage of a similar arrangement, using a precast design. The manufacturer shall document the installation of a minimum of ten (10) such functioning facilities.

B. Design by Fabricator: Design precast units for all dead loads and live loads as indicated and as required for compliance with applicable Building Code requirements. Walls shall be designed for water and soil pressure using water height at the grade elevation shown on the plans. If hydrostatic uplift forces exist when the tank is empty, the Designer (Fabricator) shall provide for necessary hold-down items. The CONTRACTOR shall furnish and install hold-down items, if they are required.

C. Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged in manufacturing of similar units, unless plant fabrication or delivery to project site is impractical.

D. Inspections: The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the ENGINEER. Such inspection may be made at the place of manufacture, or at the work site after delivery, or at both. The materials shall be subject to rejection at any time on account of failure to meet any of the Specifications requirements; even though samples may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery to the job shall be marked for identification and shall be removed from the job. All materials damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, at no additional cost to the OWNER.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with pertinent provision of Section 01610 – Delivery, Storage, and Handling.

B. Delivery: Deliver precast units to project site in such quantities and at such times to assure continuity of installation. Store units at project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units only at designated points. Deliver anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Concrete and reinforcing materials shall comply with Section 02200 – Site Construction except as modified by this Section.

B. Reinforcing Materials:
   1. Reinforcing Bars: ASTM A615, Grade 60 unless otherwise indicated
   2. Welded Wire Fabric: ASTM A185
   3. Welded Deformed Steel Wire Fabric: ASTM A497
   4. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations.
      a. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

C. Concrete Materials:
   1. Portland Cement: ASTM C150, Type II
   2. Compression Strength: 5000 psi @ 28 days
   3. Slump: 4 inch maximum unless water reduction admixtures used

4. Use only one brand and type of cement throughout project, unless otherwise acceptable to the ENGINEER.
5. Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.
6. Water: Potable
7. Air-Entraining Admixture: ASTM C260
8. Water-Reducing Admixture: ASTM C494, Type A, or other type approved for fabricator's units.

D. Proportioning and Design of Mixes:
1. Prepare design mixes for each type of concrete required.
2. Design mixes may be prepared by independent testing facility or by qualified precast manufacturing plant personnel, at precast manufacturer's option.
3. Proportion mixes by either laboratory trail batch or field experience methods, using materials to be employed on the project for each type of concrete required, complying with ACI 318.
   a. Produce standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties.
   b. Compressive strength; 5000 psi minimum at 28 days. Release strength for prestressed units: 2500 psi.
   c. Cure compression test cylinders using same methods as used for precast concrete work.
4. Admixtures:
   a. Use air-entraining admixture in concrete.
   b. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to ENGINEER'S approval.
   c. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

E. Joints: The walls and bottom slab shall be poured monolithically or shall include water stops at interface of all separate pours. Top joints shall be sealed with two rings of butyl rubber rope meeting AASHTO M198, Type B.

F. Pipe Connections:
1. Provision of the indicated pipe connections in tanks shall be made by means of an approved flexible, watertight gasket or boot.

G. Grout Materials: Cement Grout: Portland cement, ASTM C150, Type I, II, or III and clean, natural sand, ASTM C404. Mix at ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

2.2 FABRICATION

A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116, and as specified for types of units required.

B. Ready-Mix Concrete: Comply with requirements of ASTM C94/C94M, and as herein specified.
1. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to batch will not be permitted, unless batch plant ticket indicates amount of water withheld.

2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
3. When the air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32° C), reduce mixing and delivery time from 1-1/2 hour to 75 minutes and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

C. Built-in Anchorages: Accurately position built-in anchorage devices and secure to form work. Locate anchorages where they do not affect position of main reinforcement or placing of concrete.

D. Forms: Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.

E. Reinforcing:
1. Clean reinforcement of loose rust and mill scale, earth and other materials which reduce or destroy bond with concrete.
2. Accurately position, support and secure reinforcement against displacement by form work, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

F. Fabrication:
1. Place concrete in a continuous operation to prevent formation of seams or planes of weakness in precast units, complying with requirements of ACI 304R. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to reinforcement and built-in items.
2. Curing by low-pressure steam, by steam vapor, by radiant heat and moisture, or other similar process may be employed to accelerate concrete hardening and to reduce curing time.

G. Identification: Provide permanent markings to identify pick-up points and orientation during erection, complying with markings indicated on final shop drawings. Imprint date of casting on each precast unit on a surface which will not show in finished structure.

H. Finishing: Provide finishes for formed surfaces of concrete as indicated for each type of unit, and as follows:
1. Standard: Normal plant run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal form joint marks, and minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or structural defects will be permitted.
2. Unformed Surfaces: Apply trowel finish to unformed surfaces unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth uniform finish. Broom finish will not be acceptable.

I. Coordination: Coordinate with other trades for installation of items to be cast-in pre-cast units.

J. Source Quality Control:
1. The OWNER may employ a separate testing laboratory to evaluate precast manufacturer's quality control and testing methods.

2. The precast manufacturer shall allow OWNER'S testing facility access to materials storage areas, concrete production equipment and concrete placement and curing facilities. Cooperate with OWNER'S testing laboratory and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
3. Dimensional Tolerances: Units having dimensions smaller or greater than required, and outside specified tolerance limits, will be subject to additional testing as herein specified.
4. Precast units having dimensions other than shown on the plans will be rejected if appearance or function of the structure is adversely affected, or if revised dimensions interfere with other construction. Repair, or remove and replace rejected units as required to meet construction conditions.
5. Strength of Units: The strength of precast concrete units will be considered potentially deficient if the manufacturing processes fail to comply with any of the requirements which may affect the strength of the precast units, including the following conditions.
    a. Failure to meet compressive strength tests requirements.
    b. Reinforcement not conforming to specified fabrication requirements.
    c. Concrete curing, and protection of precast units against extremes in temperature, not as specified.
    d. Precast units damaged during handling and erection.
6. Testing Precast Units: When there is evidence that strength of precast concrete units does not meet specification requirements, the concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C42/C42M and as follows:
    a. Take at least 3 representative cores from precast units of suspect strength, from locations directed by ENGINEER.
    b. Test cores in a saturated-surface-dry condition per ACI 318 if concrete will be wet during use of completed structure.
    c. Test cores in an air-dry condition per ACI 318 if concrete will be dry during use of completed structure.
    d. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85 percent of 28 day design compressive strength.
    e. Test results shall be made in writing on same day that tests are made, with copies to ENGINEER, CONTRACTOR, and Precast Manufacturer. Results shall include name of concrete testing service, identification letter, name and type of member or members represented by core tests, design compressive strength, compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plan of concrete as place, and moisture condition of core at time of bearing.
7. Patching: Where core test results are satisfactory and precast units are acceptable for use in work, fill core holes solid with patching mortar, and finish to match adjacent concrete surfaces.
8. Defective Work: Precast concrete units which do not conform to specified requirements, including strength, tolerances, and finishes, shall be replaced with precast concrete units that meet requirements of this section. Contractor shall also be responsible for cost of corrections to other work affected by or resulting from correction to precast concrete work.

2.3 STRUCTURES

A. Manholes: Manholes shall be of the eccentric design, except as shown on the plans.

B. Joints: Joints shall be sealed with two rings of butyl rubber rope meeting AASHTO M 198, Type B.

C. Pipe Connections:

1. Provision of the indicated pipe connections in manholes shall be made by means of an approved flexible, watertight gasket or boot.
2. Pipe connections in wetwells, through pipe sleeves, shall be in accordance with Section 02080 – Utility Pipe and Materials.

2.4 VAULT ACCESS HATCHES

A. General: Access hatches shall be the size and type indicated on the plans. Watertight hatches shall include a drain port from the frame which shall be plumbed to drain to the exterior of the tank. Door panels shall be 1/4 inch aluminum diamond plate, reinforced to withstand a live load of 300 pounds per square foot. Frame shall be constructed of 1/4 inch thick one piece extruded aluminum. A bituminous coating shall be applied to the frame exterior where it will come into contact with concrete. Doors shall open as indicated on the plans. Doors shall automatically lock in the open position and release by handles. Hold open arm shall incorporate a stainless steel spring assist. Doors shall close flush with the frame and rest on a built-in neoprene gasket. Lifting handle, hinges, and all fastening hardware shall be stainless steel. Unit shall lock with a stainless steel slam lock with removable key. Unit shall be guaranteed against defects in material and/or workmanship for a period of 10 years. Hatches shall be provided with interior hinged safety grate.

PART 3 - EXECUTION

3.1 GENERAL

A. Surface Preparation: Work surfaces such as footings and slabs on which precast units or panels are to be erected, shall be kept clean and free of dirt and debris. Soiled surfaces shall be pressure washed, and when applicable dried, prior to the application of joint sealants.

3.2 ERECTION

A. General: Precast units shall be erected in accordance with the manufacturer's detailed recommendations and these specifications. Any conflicts between the recommendations and the specifications shall be resolved to the satisfaction of the ENGINEER in advance of erection.

B. Installation: Place units on prepared stone bedding as shown on the plans. Minimum bedding when not specifically noted shall be 6 inches of compacted ASTM D 448 No 68 stone. All structures shall be installed level. Shaped bottoms shall be formed with concrete as shown on the plans and shall be smooth conforming to the dimensions shown. Joints shall be sealed with a double ring of butyl rubber rope caulk to form a watertight seal.

C. Alignment: Sections of precast units shall be erected to the correct vertical and circumferential alignment. The edges of adjoining panels shall not vary inwardly or outwardly from one another by more than 3/8 inch (9.5 mm). Tank wall penetrations and opening shall be in proper alignment and location.

3.3 INSPECTION

A. General: At the time of inspection, the materials will be carefully examined for compliance with applicable ASTM standards, these specifications, and with the approved manufacturer's drawings. All precast concrete structures shall be inspected for general appearance, dimension, 'scratch-strength', blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

B. Imperfections: Imperfections may be repaired, subject to the approval of the ENGINEER, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Epoxy mortar may be utilized for repairs subject to the approval of the ENGINEER. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at 7 days and 5,000 psi at 28 days, when tested in 3-inch by 6-inch cylinders stored in the standard manner.

3.4 TESTING

A. Tank Testing: Upon completion of construction of the tank, it shall be filled to overflowing with water. The tank shall remain filled for a period of at least 24 hours to allow for absorption. After the initial period, makeup water shall be added as required and the water level recorded and measured at the end of the 48 hour period.

B. Tank Acceptance: There shall be no flowing water allowed through the tank walls, slab, or joints. Damp spots which glisten on the surface of the tank and spots where moisture can be picked up on a dry hand will not be allowed. Maximum allowable liquid-volume loss by measurement shall not have exceeded $1/10^{th}$ of one percent of the tank capacity per 24 hours. Testing shall be witnessed by the ENGINEER. If the loss exceeds this amount, the ENGINEER shall require the tank to be repaired and retested, or replaced.

3.5 COMPLETION

A. Repair: Defective work shall be repaired or replaced at no cost to the OWNER. Materials and methods for repairs shall be proposed by the CONTRACTOR and approved by the ENGINEER.

B. Tank Backfill: When backfill is required, it shall be initiated only after the tank has been satisfactorily tested and filled.

END OF SECTION

SECTION 03420 – PRECAST POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

1. Work Included: Supply and complete installation of structural precast post-tensioned concrete structures as shown on the Drawings. The work performed under this Section includes all labor, materials, equipment, supervision, testing, and related services and appurtenances required for the manufacture, erection, and testing of the precast post-tensioned concrete structures.

2. Related Sections: Additional Sections of the Documents which are referenced in this Section include:

   1) Section 01330 – Submittal Procedures

   2) Section 01610 – Delivery, Storage, and Handling

   3) Section 02300 – Earthwork

   4) Section 03300 – Cast-in-Place Concrete

   5) Section 05213 – Pipe and Tube Railings

1.2 REFERENCES

1. Geotechnical Report: *Geotechnical Engineering Report, NRRWA Water Treatment Plant, Austinville, Virginia* by ECS Mid-Atlantic, LLC..

2. General: The work shall comply with the most recent standards or tentative standards as published at the date of the contract and as listed in this Specification using the abbreviation shown.

3. Referenced Standards:

a)	ACI 117	Standard Specifications for Tolerances for Concrete Construction and Materials
b)	ACI 301	Specifications for Structural Concrete
c)	ACI 318	Building Code Requirements for Structural Concrete
d)	ACI 350	Code Requirements for Environmental Engineering Concrete Structures
e)	ACI 350.1	Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures
f)	ACI 350.3	Seismic Design of Liquid-Containing Concrete Structures
g)	ACI 350.4R	Design Considerations for Environmental Engineering Concrete Structures
h)	ACI 350.5	Specifications for Environmental Concrete Structures
i)	ACI 423.7	Specification for Unbonded Single-Strand Tendon Materials and Commentary
j)	ASCE 7	Minimum Design Loads for Buildings and Other Structures
k)	AWS D1.4	Structural Welding Code – Reinforcing Steel
l)	PCI MNL-116	Manual for Quality Control for Plants and Production of Structural Concrete Products

m)	PCI MNL-120	PCI Design Handbook – Precast and Prestressed Concrete
n)	PCI MNL-135	Tolerance Manual for Precast and Prestressed Concrete Construction
o)	PTI TAB.1	Post-Tensioning Manual
p)	PTI M10.2	Specification for Unbonded Single Strand Tendons
q)	PTI M10.3	Field Procedures Manual for Unbonded Single Strand Tendons
r)	PTI M55.1	Specification for Grouting of Post-Tensioned Structures

1.3 SYSTEM DESCRIPTION

1. General: Precast post-tensioned concrete shall be used for the following structures. Precast units shall have the same internal dimensions as those shown on the plans.

   a) Sludge Thickener Tanks

2. Fabrication: Precast post-tensioned wall and top panels shall be produced at a fabricating plant under controlled conditions. The base slab shall be poured in place at the project site by the tank manufacturer. The complete structure, including wall panels, top panels, base slab, tensioning system, stone foundation, and all related items and appurtenances shall be designed by the tank manufacturer to be an integral system. The tank manufacturer shall take complete responsibility for the completed tank structure.

1.4 SUBMITTALS

1. General: Comply with pertinent provisions of Section 01330 - Submittal Procedures.

2. Product Data: Submit manufacturer's specifications and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.

3. Shop Drawings: Submit shop drawings showing complete information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-sections; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.

4. Details: Provide layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at opening in precast units. Include the following information:

   a) Configuration, thickness, dimensions, and details of cast-in-place concrete base slab
   b) Size, spacing, and details of all necessary slab reinforcing
   c) Plan views, elevations, sections, and details necessary to install the tank
   d) Concrete design mixes and minimum compressive strength for each mixture
   e) Locations of all post-tensioned tendons
   f) Tendon stressing sequence and force, and theoretical elongations for all post-tensioned tendons
   g) Location of all pipe penetrations and indication of penetration styles
   h) Indication of all openings/penetrations required by other trades
   i) Location of each precast concrete member, indicated by the same identification mark placed on the unit
   j) Relationship of structural precast concrete members to adjacent materials
   k) Locations and details of joint treatment

l) Shim sizes and grout requirements

m) Bearing pad sizes and materials

5. Quality Assurance References: Provide list of 10 completed projects of comparable scope, size, and complexity that have been in service for at least 10 years. Provide suitable references including contact information (telephone and email).

6. Design: Provide complete design calculations prepared and sealed by a registered professional engineer licensed to practice in the Commonwealth of Virginia. Shop drawings shall also be sealed by a registered professional engineer licensed to practice in the Commonwealth of Virginia. The design must meet the requirements of the latest edition of ACI 350. Engineer/Owner review does not relieve the Manufacturer of its design responsibility.

7. Material Certificates: Provide material certificates signed by the manufacturers certifying that each of the following items complies with the requirements:

a) Cementitious materials

b) Aggregates

c) Reinforcing materials and post-tensioning strands

d) Admixtures

e) Bearing pads

8. Informational Submittals: Provide handling procedures, erection sequences, and temporary bracing as required for special conditions. Provide field quality-control test reports.

1.5 QUALITY ASSURANCE

1. Fabricator Qualifications: Fabricator (tank manufacturer) must have sufficient production capacity to produce required units without causing delay in work. Tankage shall be designed, fabricated, and erected by a firm having a minimum of 15 years of experience in the manufacturing of tankage of a similar rectangular arrangement, using a precast post-tensioned design. The manufacturer shall document the installation of a minimum of ten (10) such functioning ACI 350 facilities in service for at least ten (10) years.

2. Design by Fabricator: Provide complete engineering design of the tank system by a registered professional engineer experienced in design of the manufacturer-specific rectangular precast post-tensioned tanks and licensed to practice in the Commonwealth of Virginia. Design precast units for all dead loads and live loads as indicated and as required for compliance with applicable Building Code requirements. Walls shall be designed for water and soil pressure using water height as indicated herein. If hydrostatic uplift forces exist when the tank is empty, the Manufacturer (Fabricator) shall design, provide for, and furnish necessary hold-down items, including rock anchors.

3. Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged in manufacturing of similar units. If units are not produced at precast concrete fabricating plant, maintain procedures and conditions for quality control which are equivalent to plant production.

4. Post-Tensioning Qualifications:

   a) Fabricating plant shall be certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."

   b) Post-tensioning installer shall be a qualified installer whose full-time project superintendent has successfully completed PTI's Level 1 Unbonded PT - Field Installation course. Superintendent must receive training from post-tensioning supplier in the operation of stressing equipment to be used on the Project.

   c) Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 2 Unbonded PT - Inspector course.

5. Quality Control Standard: For manufacturing procedures and testing requirements and quality control recommendations for types of members required, comply with PCI MNL-116.

   a) Comply with dimensional tolerances of PCI MNL-135.

1.6 DELIVERY, STORAGE, AND HANDLING

1. General: Comply with pertinent provision of Section 01610 – Delivery, Storage, and Handling. Deliver, store, and handle post-tensioning materials according to PTI M10.3.

2. Delivery: Deliver precast units to project site in such quantities and at such times to assure project schedule compliance, proper setting sequence, and continuity of installation. Handle and transport precast concrete members in a manner to avoid excessive stresses that could cause cracking or other damage. Store units at project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units at designated points. Deliver anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.

1.7 PERFORMANCE REQUIREMENTS

1. General: The tank shall be constructed to the nominal dimensions as indicated on the Contract Drawings and shall meet the design requirements and recommendations of ACI 350 and PCI MNL 120.

   a) Tank Dimensions: See Drawings

   b) Tank Fluid Levels: Variable – See Drawings

   c) Flood Elevation: 100 Year Flood Elevation is below proposed grade.

   d) Wall Thicknesses: As required by ACI 350

   e) Backfill Conditions: As shown on Drawings. Backfill shall not be used to offset fluid loads.

   f) Tank Wall Post-Tensioning: In accordance with ACI 350. Tank walls shall have horizontal post-tensioned tendons to provide residual compression stress. Minimum residual compression shall be 125 psi after allowance for all prestress losses.

   g) Comply with ACI 350 requirements for load factors, limits on stresses at transfer of prestress and under service load, minimum bonded reinforcement, and concrete cover over reinforcement.

   h) The tank structure shall be designed to resist low to medium strength residential wastewater.

   i) Design rectangular precast, post-tensioned, concrete tanks to allow for fabrication and construction tolerances, and to accommodate deflection, shrinkage and creep of primary tank structure. Maintain structural precast concrete deflections within limits of ACI 350.

2. Design Loads: Loadings, including post-tensioning and or pre-stressing forces shall follow governing codes and as specified herein.

3. Base Slab: Design and construction of the cast-in-place base slab shall be performed by the tank manufacturer as part of a complete tank system. Refer to the Geotechnical Report for foundation recommendations.

    a) Minimum reinforcement in each orthogonal direction shall be in accordance with ACI 350.

    b) Cast-in-Place concrete shall comply with the requirements of Section 03300.

    c) Minimum Compressive Strength (28 days): 5,000psi minimum

    d) Tank manufacturer shall be responsible for base slab design and installation necessary to resist floatation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. General: The precast concrete specified and shown on accompanying plans is based upon the use of the products and techniques of Dutchland, Inc., Gap, PA 17527, or pre-approved equal.

2. Alternate Manufacturer: Submissions for consideration as "equal" manufacturer shall be made no less than ten (10) days before the date of bid opening. In order to be considered "equal", all materials, systems, and services provided must comply with these Specifications without exception and a certification provided by the manufacturer that the proposed system is functionally and operationally equivalent to the proposed structural system.

3. Manufacturer's Certification: The Manufacturer, whether named above or approved as "equal", shall be responsible for reviewing and ensuring that their screening system complies and conforms to the Drawings and Contract Documents. The Manufacturer shall notify the Engineer of any discrepancies, exceptions, or necessary modifications no less than ten (10) days before the date of bid opening. Such discrepancies, exceptions, or necessary modifications may be cause for rejection or adjustment to the bid price at the Engineer's or Owner's discretion.

4. Obtain post-tensioning materials and equipment from a single source.

2.2 DESIGN

1. General: The tank shall be constructed to the nominal dimensions as indicated on the Contract Drawings and shall be designed to meet the performance requirements indicated in Section 1.7 above.

2. Prohibited Tank Designs: Tank designs that rely on bolted or welded connections, or ship-lap joints, for primary, fluid-retaining walls shall not be allowed.

3. Design Method: Tank design shall be based on elastic analysis methods and shall take into account effects of all loads and prestressing forces during and after tensioning, and conditions of edge restraint at wall junctions with base slabs and top of slab if present. Consideration shall also be given to the effects of all loads and load combinations including stresses induced by temperature, moisture gradients, and seismic effects. Reinforced concrete shall meet the requirements set forth in Section 03300 – Cast-in-Place Concrete and ACI 350. The design must also meet the strength requirements of ACI 350. All applicable sections of the latest edition of ACI 318, including supplements and the precast and prestressed concrete chapters, shall be followed except when supplemented or modified by provisions of this specification and ACI 350.

2.3 MATERIALS

1. Form Materials: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required surface finishes.

    a) Form Releasing Agent: Commercially produced form-release agent that will not bond with, stain or affect hardening of precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2. Reinforcing Materials:

    a) Reinforcing Bars: ASTM A 615, Grade 60, deformed

    b) Low-Alloy Steel Reinforcing Bars: ASTM A 706, deformed

    c) Welded Wire Fabric: ASTM A 1064, plain or deformed, flat sheet

    d) Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL-116.

3. Pre-Stressing Tendons:

    a) ACI Publications: Comply with ACI 423.7.

    b) Prestressing Strand: ASTM A 416, Grade 270, 7-wire, low-relaxation, 0.6-inch-diameter strand with corrosion inhibitor conforming to ACI 423.7, with polypropylene tendon sheathing.

    c) Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.

    d) Tendon Sheathing:

        1) Virgin high-density polyethylene or polypropylene with a minimum thickness of 50 mils.

        2) Continuous over the length of tendon to provide watertight encapsulation of strand.

    e) Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.

        1) Anchorage devices and coupler assemblies shall be fully-encapsulated with either plastic or epoxy coating.

    f) Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:

        1) Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.

        2) Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of 4 inches with sheathing and completely filled with post-tensioning coating.

        3) The encapsulation system shall meet the hydrostatic pressure testing requirements of ACI 423.7, except with a hydrostatic pressure of 10 psi, instead of the specified 1.25 psi.

4. Accessories:

   a) Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of 2 inches (50 mm), in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.

   b) Erection Accessories: Provide steel plates and brackets, clips, hangers, high density plastic shims, and other accessories required to install precast concrete members.

5. Concrete Materials:

   a) Portland Cement: ASTM C 150, Type II or Type I/II

      1) For surfaces exposed to view in finished structure, use same type, brand, and mill source throughout the precast concrete production.

   b) Supplementary Cementitious Materials:

      1) Fly Ash: ASTM C 618, Class F with maximum loss on ignition of 6%.

      2) Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

   c) Normalweight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse, non-reactive aggregates. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

   d) Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

   e) Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

   f) Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride or more than 0.15 percent chloride ions or other salts by weight of admixture.

      1) Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

      2) Retarding Admixture: ASTM C 494/C 494M, Type B.

      3) Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

      4) Water-Reducing and Accelerating Admixture ASTM C494/C 494M, Type E.

      5) High Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type A and F.

      6) High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

      7) Plasticizing Admixture for Flowable Concrete: ASTM C 1017/C 1017M.

6. Steel Embedded Materials:

   a) Carbon Steel Shapes and Plates: ASTM A 36/A 36M

   b) Carbon-Steel Headed Studs: ASTM A 108, Grades 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with the minimum mechanical properties of PCI MNL 116, Table 3.2.3.

   c) Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M

   d) Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123, after fabrication.

      1) Galvanizing Repair Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

7. Stainless Steel Embedded Materials:

   a) Stainless Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201, of grade suitable for application.

   b) Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.

   c) Stainless-Steel Headed Studs: ASTM A 276, with minimum mechanical properties for studs as indicated under MNL 116, Table 3.2.3.

8. Bearing Pads: Provide one of the following bearing pads for structural precast concrete members as recommended by tank supplier for application:

   a) Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D 2240, minimum tensile strength 2250 psi per ASTM D 412.

   b) Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 3000 psi with no cracking, splitting or delaminating in the internal portions of the pad.

   c) High-Density Plastic: Multimonomer, nonleaching, plastic strip capable of supporting loads with no visible overall expansion.

9. Grouting and Patching Materials:

   a) Nonshrink Grout: Premixed, prepackaged, non-metallic, shrink-resistant grout complying with ASTM C 1107, Grade C. Grout shall not contain chlorides. SikaGrout 212, SikaGrout 328, or approved equal.

   b) Patching Materials: One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. ProSpec BlendCrete, or approved equal. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

10. Concrete Mixtures: Prepare design mixes for each type of concrete required. Limit use of fly ash to 25 percent replacement of portland cement by weight. Limit use of ground granulated blast-furnace slag to 40 percent of portland cement by weight.

    a) Design mixes may be prepared by a qualified independent testing agency or by qualified precast manufacturing plant personnel, at precast manufacturer's option.

    b) Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 350 or PCI MNL 116 when tested in accordance with ASTM C 1218/C 1218M.

    c) Normalweight Concrete Mixtures: Proportion mixes by either laboratory trail batch or field test data methods according to ACI 211.1, with materials to be used on the project, to provide normalweight concrete.

    d) Precast Concrete:

       1) Compressive strength; 5000 psi minimum at 28 days.

       2) Maximum Water-Cementitious Materials Ratio: 0.38

    e) Admixtures: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

1) When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

f) Concrete Mixture Adjustments: Concrete mixture design adjustments may be made if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

11. Form Fabrication: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placement and vibration operations and temperature changes, and for prestressing and detensioning operations. Coat contact surfaces of forms with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

a) Maintain forms to provide completed structural precast concrete members of shapes, lines, and dimensions within fabrication tolerances specified.

b) Edge and Corner Treatment: Uniformly chamfered or as built-in on standard forms.

12. Fabrication:

a) Cast-in Plates, Inserts, Angles, and Other Hardware: Fabricate hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate hardware where it does not affect position of main reinforcement or concrete placement.

1) Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4.

b) Reinforcement: Comply with recommendations in PCI MNL-116 for fabricating, placing, and supporting reinforcement.

1) Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy coated reinforcing exceeds limits specified in ASTM A 775, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

2) Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Locate and support reinforcement by plastic tipped or corrosion resistant metal or plastic chairs, runners, bolsters, spacers, hangers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL-116.

3) Provide cover requirements in accordance with ACI 350. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.

4) Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces in accordance with ACI 350 and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

c) Reinforce structural precast concrete members to resist handling, transportation, and erection stresses, and specified in-place loads, whichever governs.

d) Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

e) Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete members.

f) Place self-consolidating concrete with minimal vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

g) Comply with PCI MNL 116 procedures for hot and cold-weather concrete placement.

h) Identify pickup points of precast concrete members and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete member on a surface that will not show in finished structure.

i) Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure members until compressive strength is high enough to ensure that stripping does not have an effect on the performance of final product.

13. Waterstops:

a) Flexible PVC Waterstops: Corp of Engineers CRD-C 572 for embedding in concrete construction joints to prevent the passage of fluids through joints. Factory-fabricate corners, intersections and directional changes.

1) Profile: ribbed without center bulb

2) Dimensions: 9 inches by 3/8-inch thick, non-tapered

3) Acceptable Products: Greenstreak PVC Waterstop #646 or equal.

b) Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free, hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete. Greenstreak Hydrotite CJ-1030-4M or equal.

c) Self-Expanding Extrudable Waterstops: Extrudable, swelling, bentonite-free, one-part polyurethane. SikaSwell S-2 or equal.

14. Related Materials:

a) Joint/Crack Filler: ASTM C 920, Type S, Grade NS, Class 35 one-part polyurethane, elastomeric sealant, for sealing precast panel joints and minor cracks. Sikaflex 1a+ or equal.

b) High-Performance Joint Filler: ASTM C 920, Type S, Grade NS, Class 100/20 low-modulus, high-performance, one-part polyurethane-based, elastomeric sealant, for sealing precast panel joints subject to movement. Sikaflex 15 LM or equal.

c) Sealant/Adhesive Primer: Specially formulated primer to promote adhesion of sealants and adhesives to concrete. Sikaflex 429/202 or equal.

d) Joint Sealant, Epoxy: High-build, two-part, protective, solvent-free epoxy. Sikagard 62 or equal.

e) Joint Sealant, Urethane: Liquid-applied, elastomeric, urethane. CIM 1000 or equal.

f) Epoxy Injection Adhesive: Two-part, moisture-tolerant, epoxy injection adhesive. Sikadur 52 or equal.

g) Chemical Grout: Expanding, polyurethane, chemical grout. SikaFix HH+, HH Hydrophilic, or equal.

2.4 FABRICATION TOLERANCES

1. General: Fabricate structural precast concrete members of shapes, lines and dimensions indicated, so each finished member complies with PCI MNL 135 product tolerances as well as position tolerances for cast-in items.

2.5 FINISHES

1. Form Finish: Standard Grade. Normal plant-run finish produced in forms that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are acceptable. Fill air holes greater than 1/4 inch in width that occur in

high concentration (more than one per 2 square inches). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Allowable joint offset limited to 1/8 inch.

2. Smooth steel-trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float and trowel to a smooth, uniform finish.

2.6 SOURCE QUALITY CONTROL

1. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements. If using self-consolidating concrete also test and inspect according to ASTM C 1611, ASTM C 1712, ASTM 1610, and ASTM C 1621.

2. Strength: Strength of precast concrete members will be considered deficient if units fail to comply with ACI 350 concrete strength requirements.

3. Testing: If there is evidence that strength of precast concrete members may be deficient or may not comply with ACI 350 requirements, fabricator shall employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42 and ACI 350.

   a) Test results shall be reported in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports shall include the following:

      1) Project identification name and number.

      2) Date when tests were performed.

      3) Name of Tank Supplier.

      4) Name of concrete testing agency.

      5) Identification letter, name, and type of precast concrete member(s) represented by core tests; design compressive strength; type of failure; actual compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

4. Patching: If core test results are satisfactory and precast concrete members comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture or repair material, and finish to match adjacent precast concrete surfaces.

5. Acceptability: Structural precast concrete members that do not comply with acceptability requirements in PCI MNL 116, including concrete strength, and manufacturing tolerances, are unacceptable. Chipped, spalled or cracked members may be repaired. Replace unacceptable units with precast concrete members that comply with requirements.

2.7 ACCESSORIES

1. General: The following accessories shall be provided by the tank Manufacturer as indicated on the Drawings as part of a complete concrete basin.

   a) Aluminum Handrail: In accordance with Section 05213 – Pipe and Tube Railings.

   b) Access Stairs: Steel with aluminum treads.

   c) Grating: Aluminum grating.

PART 3 - EXECUTION

3.1 GENERAL

1. Site Verification of Conditions: Verify lines, levels and centers before proceeding with the work. Ensure dimension agree with drawings.

2. Preparation: Contractor shall prepare subgrade in accordance with Section 02300 – Earthwork.

3. Access Roads: Contractor shall maintain suitable access roads for the crane, concrete trucks, and precast panel delivery trucks in accordance with the following:

   a) Access roads shall be provided and maintained by the Contractor throughout the installation of the base slab and precast tank structure.

   b) Roads shall be cleared, leveled, stoned, and free of mud to provide 14-feet of vertical clearance and 14-feet of horizontal clearance.

   c) Roads shall be capable of handling 80,000 pounds GVWR.

   d) Roads shall support live loaded trucks operating under their own power.

   e) Roads shall allow drop-deck, spread axle combinations with 53-ft trailers. This includes a 60-foot-long sweep radius for corners and egress/regress to roadways.

4. Crane and Concrete Pump Pads: Contractor shall provide and maintain crane and concrete pump pads that are cleared, level, and free of mud. Locations for such pads shall be coordinated between the Contractor and tank supplier.

3.2 INSTALLATION

1. General: Install all tank and related components in accordance with manufacturer's recommended installation methods. Tank supplier shall inspect the site to confirm subgrade conditions prior to installation of the base slab. Contractor shall excavate to a minimum of four feet in plan beyond the perimeter of the exterior wall line.

2. Sub-base: Once Contractor has completed subgrade, it shall be inspected by the Geotechnical Agency. Unsatisfactory conditions shall be corrected to the satisfaction of the Geotechnical Engineer. Contractor shall prepare, level, and grade the subbase to within +/- one inch of stone grade as indicated on the tank supplier's approved shop drawings. Contractor shall notify Tank Supplier in writing that supporting subgrade has been approved by the Geotechnical Agency per the Contract Documents and Tank Manufacturer's Shop Drawings.

3. Concrete Placement: Place concrete in accordance with manufacturer's specifications and in accordance with Section 03300 – Cast-in-Place Concrete.

   a) Weather Limitations: Place in accordance with Section 03300.

   b) Field Quality Control: Place no concrete for the base slab until the subgrade has been inspected and approved by the Tank Manufacturer.

4. Erection: Erect structural precast concrete level, plumb and square within the specified allowable erection tolerances. Provide temporary bracing as required to maintain position, stability, and alignment of members until permanent connections are completed.

   a) Install temporary plastic spacing shims as necessary as precast concrete members are being erected.

b) Use patching material to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.

c) Install post-tensioning tendons as soon as practical.

d) Indicate joints to be grouted and any critical grouting sequences on shop drawings. Grout open spaces at keyways, connections and joints where required or indicated with non-shrink, non-metallic grout. Retain flowable grout in place until it gains sufficient strength to support itself. Fill joints completely without seepage to other surfaces. Alternatively, pack spaces with stiff dry pack grout material, tamping until voids are completely filled. Promptly remove grout material from exposed surfaces before it hardens.

e) Field cutting of precast concrete members is not permitted without approval of the precast tank Engineer.

5. Erection Tolerances: Erect structural precast concrete members level, plumb, square and in alignment without exceeding the noncumulative erection tolerances of PCI MNL-135.

3.3 POST-TENSIONING TENDONS

1. Sheathing: Inspect sheathing for damage before installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.

a) Ensure that sheathing is watertight and there are no air voids.

b) Follow tape repair procedures in PTI M10.3.

2. Damage: Immediately remove and replace tendons that have damaged strand.

3. Tendon Stressing:

a) Stressing jacks and gauges shall be individually identified and calibrated to known standards at intervals not exceeding six months. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.

b) Stress tendons only under supervision of a qualified post-tensioning superintendent.

c) Tendon stressing shall not begin until grout strength in the joints has attained at least 2,500 psi compressive strength.

d) Tendon stressing shall be performed in the sequence indicated on the shop drawings.

e) Mark and measure elongations according to PTI M10.3. Measure elongations to closest 1/8-inch.

f) Tendon elongations shall be recorded and compared to the theoretical elongations indicated on the Shop (Erection) Drawings. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and theoretical and measured elongations agree.

g) In the event that measured elongations exceed the tolerances indicated on the shop drawings, the precast tank Engineer shall be notified for resolution.

4. Tendon Finishing:

a) Strand tails may be cut once prestressing has been deemed acceptable.

b) Do not cut strand tails or cover anchorages of tendons where elongations exceed tolerances until all discrepancies have been resolved to the satisfaction of the precast tank Engineer.

c) Cut strand tails as soon as possible after approval of elongations.

d) The tendon tails shall be cut using hydraulic shears.

e) The strand length protruding beyond the wedges after cutting of the tendon tail shall be between 0.5-inch and 0.75-inch.

f) Wedge-cavity caps shall be installed within one working day after cutting tendon tails.

g) Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

h) If stressing pockets are not able to be filled within ten days after tendon tail cutting, then temporary protection shall be provided.

5. Protection:

a) Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.

b) Prevent water from entering tendons during installation and stressing.

c) Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.4 REPAIRS

1. General: Repairs will be permitted provided structural adequacy, serviceability and durability of members are not impaired.

2. Galvanized Coatings: Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

3. Base Slab Cracks: Repair base slab shrinkage cracks as required for watertightness. Rout a ¼-inch vee-notch along the crack and fill the crack with epoxy injection adhesive.

4. Surface Patching: Surface chips or spalls shall be cleaned and then patched with patching material.

5. Ports: Misaligned grout ports or connection ports in walkways may be repaired by either enlarging the existing port, or drilling a new one, as required. Coordinate with the precast tank Engineer to avoid internal reinforcing and hardware.

6. Damage that occurs during the shipping, installation or construction process shall be brought to the attention of the precast tank Engineer for resolution.

7. Additional repairs, if necessary, shall be performed as directed by the precast tank Engineer.

8. Remove and replace damaged structural precast concrete members when repairs do not comply with specified requirements.

3.5 CLEANING

1. General: Clean forms as installation proceeds, to remove foreign matter within forms. Clean formed cavities of debris prior to placing concrete. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms. Use compressed air or other means to remove foreign matter.

2. Grout: Clean grout and any other deleterious material from concrete surfaces and adjacent materials immediately.

3. Exposed Surfaces: Clean exposed surfaces of precast concrete members after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

   a) Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect adjacent work from staining or damage due to cleaning operations.

   b) Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

3.6 WATERTIGHTNESS TESTING

1. General: All concrete tanks designed to hold water, sewage or some other liquid shall be tested for water tightness. Each cell of multi-cell tanks shall be considered a single containment structure and shall be tested individually, unless otherwise specified. Testing shall be performed using the hydrostatic tightness test, consisting of two parts:

   a) Part 1 shall be a qualitative criterion.

   b) Part 2 shall be a quantitative criterion expressed as a maximum allowable volume loss of 0.05 percent per 24-hour period.

2. Backfill: No backfill may be placed against the walls or on the wall footings of the containment structures to be tested, unless otherwise specified.

3. Filling: The initial filling of a new containment structure shall not exceed four feet per hour. Filling shall be continued until the water surface is at the design maximum liquid level, or either one inch below any fixed overflow level in covered containment structures or four inches in open containment structures, whichever is lower. Water used may be potable, non-potable as produced by the existing treatment facility (coordinate with the Owner), or other pre-approved water source.

4. Part 1 – Qualitative Criteria: If any water is observed on the containment structure exterior wall surfaces where moisture can be picked up on a dry hand, the containment structure shall be considered to have failed Part 1 of the hydrostatic test.

   a) Wet areas on top of the wall footing shall not be cause to fail Part 1 unless the water can be observed to be flowing.

   b) Although Part 2 of the test may begin prior to completion of repairs for Part 1, all defects causing the failure of Part 1 shall be repaired before acceptance of the containment structure.

   c) The standard repair procedure for areas failing Part 1 is to inject chemical grout into the affected area. Consult with the precast tank Engineer before commencing any such repairs.

5. Part 2 – Quantitative Criteria:

   a) Part 2 of the hydrostatic tightness test shall not be scheduled for a period when the forecast is for a difference of more than 35°F between the ambient temperature readings at the times of the initial and final level measurements of the water surface. The test shall also not be scheduled when the weather forecast indicates the water surface could freeze before the test is completed.

   b) The vertical distance to the water surface shall be measured to within 1/16 inch from a fixed point on the containment structure above the water surface. The initial measurement shall not be taken until at least 24 hours after the tank is completely filled. Measurements shall be recorded at 24-hour intervals.

   c) The test period shall be the theoretical time required to lower the water surface 3/8 inch, assuming a loss of water at the maximum allowable rate. However, the test period shall not be longer than five days.

d) In uncovered containment structures, evaporation and precipitation shall be measured.

e) At the end of the test period, the water surface shall be recorded to within 1/16 inch at the location of the original measurements. The water temperature and precipitation measurements shall be recorded.

f) The change in water volume in the containment structure shall be calculated and corrected, if necessary, for evaporation, precipitation, and temperature. If the loss exceeds the required criterion, the containment shall be considered to have failed Part 2 of the test.

6. Retesting: Containment structures shall be retested until they meet the required Part 1 and Part 2 criteria. Repairs shall be made before each retest.

a) A restart of the test shall be required when test measurements become unreliable due to unusual precipitation or other external factors.

b) It shall be permitted to immediately retest a containment structure failing Part 2 of the hydrostatic test when Part 1 is passed. If the containment structure fails the second test or if not immediately retested after the first test failure, the interior of the containment structure shall be observed for probable problem areas by the Tank Supplier. The containment structure shall only be retested after the probable problem areas are repaired.

3.7 BACKFILL

1. General: After successful testing, backfill shall be placed, as required, and compacted with static compaction equipment around the tank in uniform layers in such a manner as to not cause damage to the tank. Backfill shall be placed and compacted in accordance with Section 02300 – Earthwork and the recommendations of the Geotechnical Engineer.

2. Care: The Contractor shall take extreme care to avoid heavy equipment such as vibratory rollers operating within 10 feet of the tank structure to prevent damage to the tank while backfilling.

3. Written Plan: The Contractor shall submit to the Engineer and tank supplier for record a written procedure outlining the construction plan and material to be used for backfilling of the tank. Engineer and tank supplier shall be notified in writing at least two (2) weeks prior to the start of backfilling. The following should be included in the written procedure at a minimum:

a) Type of material used as fill.

b) Type of equipment used to backfill.

c) Proximity of the equipment to the tank walls and slabs during operation.

d) Sequence of backfill.

e) Anticipated loads applied to the tank during the operations.

f) Planned compaction density.

4. Unsuitable Material: At no time shall saturated soils, rocky soils, debris, or other questionable materials be used for backfill. Frozen material shall not be placed in the backfill, nor shall backfill be placed upon frozen material. Previously frozen material shall be removed or shall be otherwise treated as required before new backfill is placed.

5. The excavation shall be kept free of water by the Contractor at all times.

3.8 WARRANTY

1. General: The manufacturer shall warrant the tank to be of quality construction, free from structural defect and defects in material and workmanship. The equipment shall be warranted for a period of 2 years. Structures or components failing to perform as specified, or as represented by the Manufacturer, or found to be defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of materials or labor to the Owner. The warranty shall become effective upon the successful testing of the structure.

END OF SECTION

SECTION 04100 – CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all equipment, material and labor to provide concrete unit masonry where shown on the plans and as specified in this Section.

1.2 SUBMITTALS

A. General: Comply with the pertinent provisions of Section 01330 – Submittal Procedures.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Samples of materials showing color and texture.

D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. For masonry units include material test reports substantiating compliance with requirements.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

A. General: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this Section.

B. Masonry Standards Joint Committee; American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), The Masonry Society (TMS).

1. Masonry Standards Joint Committee Code, Specifications, and Commentaries.
   a. ACI 530-02 / ASCE 5-02 / TMS 402-02
   b. ACI 530.1-02 / ASCE 6-02 / TMS 602-02

C. Virginia Building Code: Latest edition.

D. Variation from Plumb: For vertical walls and arises, do not exceed 1/4" in 10' or 3/8" in a story height. For external corners, expansion joints and other conspicuous lines, do not vary more than 1/4" in 10'.

E. Variation from Level: For lines of exposed lintels, sills, parapets and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 3/4" in 40' or more.

F. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed 1/4" in any bay or 20' maximum, nor 3/4" in 40' or more.

G. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed -1/4" nor +1/2".

1.4 DELIVERY, STORAGE AND HANDLING

A. General: Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMUS)

A. Type: Concrete masonry units shall be colored split face type, as indicated on the plans. Color shall be selected by Owner. Where block is to be fully buried, CMU may be uncolored standard face block with approval of Engineer.

B. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" height (15-5/8" x 7-5/8" actual), unless otherwise indicated. Width of units will be as indicated on drawings.

C. CMUs shall comply with ASTM C90. Provide standard weight hollow load-bearing units unless otherwise indicated.

D. Aggregate weight shall conform to ASTM C 331 providing a dry net unit weight of not more than 105 lbs. per cubic foot unless otherwise indicated.

E. Curing:

1. Cure units by autoclave treatment at a minimum temperature of 350°F (l76°C), and a minimum pressure of 125 psi. Limit moisture absorption to twenty-five percent (25%) of saturation during delivery and until time of installation.
2. Cure units in a moisture controlled atmosphere or in an autoclave at normal pressure and temperature to comply with ASTM C 90, Type 1. Limit moisture absorption during delivery and until time of installation to the maximum percentage specified for Type 1 units for the average annual relative humidity as reported by the U. S. Weather Bureau Station nearest the project site.

F. Special Shapes: As required by building configuration.

2.2 MORTAR

A. ASTM C 270, Type S. One part portland cement to one half part hydrated lime and four parts sand aggregate by volume. Mortar shall be colored, with color selected by Owner.

B. Portland Cement: ASTM C 150 and C91, Type III

C. Hydrated Lime: ASTM C207

D. Sand aggregate: ASTM C144

2.3 REINFORCEMENT

A. Reinforcing Bars: Deformed Steel, ASTM A 615, Grade 60

B. Continuous Wire Reinforcing: Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner and tee units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross-rods, and a unit width of 1-1/2" to 2" less than thickness of wall or partition.

1. Provide units fabricated as follows:
   a. Truss Type: Fabricated with single pair of 3/16” continuous diagonal cross-rods spaced not more than 8" o.c.
   b. For exterior and interior, hot-dip galvanize after fabrication with 1.5 oz. zinc coating, ASTM A 153, Class B2.
   c. Individual Wire Ties for Masonry: Fabricate from 3/16" cold-drawn steel wire, ASTM A 82, unless otherwise indicated, of the length required for proper embedment. Maximum spacing shall be 16" o.c. vertical and 24" o.c. horizontally.
   d. For exterior walls, fabricate from steel wire with 1.5 oz. hot-dip zinc coating ASTM A 153, Class B2, or fabricate from steel wire with not less than 7-mil. copper coating, ASTM B 227, Grade 30 HS.

2.4 LINTELS

A. General: Unless otherwise noted, provide either concrete or masonry lintels complying with the requirements below.

B. Concrete Lintels: Precast units matching concrete masonry units and with reinforcing bars indicated or required to support loads indicated.

C. Masonry Lintels: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.5 ANCHORS AND TIES

A. Provide straps, bars, bolts and rods fabricated from not less than 16 gage sheet metal or 3/8" diameter rod stock, unless otherwise indicated.

B. For devices which extend into exterior wythe, fabricate from steel with hot-dip galvanized coating, ASTM A 153, Class B1, B2, or B3.

2.6 ACCESSORIES

A. Flashing:

1. Provide concealed flashings, shown to be built into masonry.
2. Provide concealed flashings as follows: Virgin polyvinyl chloride with plasticizer and other modifiers, formed into uniform flexible sheet not less than 20 mils. thick and black in color, unless otherwise indicated.

B. Bond Breaker Strips: 15 pound asphalt roofing felt complying with ASTM D 226, or 15 pound coal-tar roofing felt complying with ASTM D 227.

C. Pre-molded Control Joint Strips: Solid rubber strips with a Shore A durometer hardness of 60 to 80, designed to fit standard sash block and maintain lateral stability in masonry wall, size and configuration as required at vertical control joints.

D. Plastic Weepholes: Unless otherwise indicated, proved 1/4" round X 4" long medium density polyethylene plastic tubes to form weepholes. Provide at 48" o.c. maximum horizontal spacing at bottom of wall or flashing, as required.

2.7 INSULATION

A. All CMU walls shall be insulated using the following:
   1. Core Fill Insulation: Core Fill-500 by Tailored Chemical Products, Inc., Thermco Foam Insulation by Thermal Corporation of America or Tripolymer Foam Insulation by C.P. Chemical Co., Inc., or equal.
   2. Core fill insulation to be free of formaldehyde.

2.8 SEALING

A. General: Exterior concrete surfaces shall be sealed with a clear penetrating water repelling sealer. Prior to coating building, sealer shall be tested a buried section or mockup wall section to verify that coating is adequate and does not damage the colored block.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Masonry units shall not be placed when air temperatures are below 40 degrees F. Masonry construction shall be protected from direct exposure to wind and sun when erected in ambient air temperature of 99 degrees F in the shade and with relative humidity less than 50 percent.

B. Cut masonry units with motor-driven saw designed to cut masonry with clean sharp, un-chipped edges. Butt units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

C. Wet clay brick having ASTM C67 absorption rates greater than 0.025 oz. per square inch per minute. Do not wet concrete masonry units.

D. Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry which is specified to be wetted, comply with the BIA recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

E. Do not lower the freezing point of mortar by use of admixtures or antifreeze agents. Do not use calcium chloride in mortar or grout.

F. Pattern Bond: Lay exposed masonry in running bond pattern. Bond and interlock each course of each wythe at corners, unless otherwise shown.

G. Avoid the use of less-than-half size units at corners, jambs, and wherever possible at other locations.

H. Lay-up walls plumb and true and with course level, accurately spaced and coordinated with other work.

I. Stopping and Resuming Work: Rack back one-half (1/2) masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

J. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

K. Intersecting Load-Bearing Walls: If carried up separately, block vertical joint with 8" maximum offsets and provide rigid steel anchors spaced not more than 4'-0" o.c. vertically, or omit blocking and provide rigid steel anchors at not more than 2'-0" o.c. vertically. Form anchors of galvanized steel not less than 1-1/2" X 1/4" X 2'-0" long with ends turned up not less than 2" or with cross-pins. If used with hollow masonry units, embed ends in mortar filled cores.

3.2 MORTAR BEDDING AND JOINTING

A. Batch Control: Measure and batch materials either by volume or weight, such that the required proportions for mortar can be accurately controlled and maintained. Measurement of sand exclusively by shovel will not be permitted.

B. Mix mortars with the minimum amount of water consistent with workability to provide minimum tensile bond strength within the capacity of the mortar.

C. Mix mortar ingredients for a minimum of five (5) minutes in a mechanical batch mixer. Use water clean and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than one and a half (1-1/2) hours has elapsed since initial mixing.

D. Lay solid masonry units (where applicable) with completely filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

E. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

F. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8" joints for concrete masonry. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials. Tool exposed joints. Rake out mortar in preparation for application of caulking or silents where required.

G. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units that have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

H. Collar Joints: Fill joints between wythes solidly with mortar by parging either the back of the facing, or the face of the backing, and shove units solidly into parging.

3.3 HORIZONTAL JOINT REINFORCING

A. Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls and 1/2" at other locations. Lay reinforcement a minimum of 6" at ends of units. Do not bridge control and expansion joints with reinforcing, unless otherwise indicated. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions. Space continuous horizontal reinforcing as follows:

1. For single-wythe walls, space reinforcing at 8" o.c. vertically, unless otherwise indicated.

2. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcing placed in two (2) horizontal joints approximately 8" apart, both immediately above the lintel and below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of the openings, bridging control joints where provided.

B. Anchoring Masonry Work:

1. Provide anchoring devices of the type shown and specified. If not shown or specified, provide standard type for facing and back-up involved.
2. Anchorage of masonry to structural members where masonry abuts or faces such members shall comply with the following:
   a. Provide an open space not less than 1" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.
   b. Anchor masonry to structural members with metal ties embedded in masonry joints and attached to structure. Provide anchors with flexible tie section, unless otherwise indicated.
   c. Space anchors as shown, but not more than 24" o.c. vertically and 36" o.c. horizontally (where applicable).

C. Control and Expansion Joints: Provide vertical expansion, control and isolation joints in masonry where shown. Build-in related masonry accessories as the masonry work progresses.

D. Build-in joint fillers where shown.

3.4 FLASHING OF MASONRY WORK

A. Provide concealed flexible flashing in masonry work at, or above, all shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through wall flashing on bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar.

B. Extend flexible flashings the full lengths of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from a line 1/2" in from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior surface of inner wythe. If inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2".

C. Provide weep holes in the head joints of the same course of masonry bedded in the flashing mortar.

D. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.

E. Install flashings in accordance with manufacturer's instructions.

F. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.5 REPAIR, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work, to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

END OF SECTION

SECTION 05213 - PIPE AND TUBE RAILINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe railings.
2. Aluminum pipe railings.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of connecting and finishing members at intersections.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

A. Handrail on top of Raw Water Intake wetwell may be steel, stainless steel, or aluminum.

B. Tubing: ASTM A 513.

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

F. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).

1. Style Designation: 3/4 number 13.

2.4 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required. Aluminum handrail shall be installed at Sedimentation Basins and Thickener Tanks and any other locations where alternate handrail types are not otherwise noted. Aluminum handrail at sedimentation basins shall be of matching dimensions and type to existing handrail.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.

1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.5 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

3. Aluminum Railings: Type 304 stainless-steel fasteners.
4. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum and stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

H. Intermediate Coats and Topcoats: Provide products that comply with Section 09910 – Exterior Painting and Section 09920 – Interior Painting.

I. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

J. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

K. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

M. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

K. Form Changes in Direction as Follows:

1. As detailed.
2. By bending or by inserting prefabricated elbow fittings.
3. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of railing members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

Q. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

R. Expanded-Metal Infill Panels: Fabricate infill panels from expanded metal made from same metal as railings in which they are installed.

1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.043 inch thick.

S. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Railings Indicated to Receive Primers: Specified in Section 09910 – Exterior Painting or 09920 – Interior Painting.
4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer unless indicated.
2. Do not apply primer to galvanized surfaces.

G. Shop-Painted Finish: Comply with Section 09910 – Exterior Painting.

1. Color: As selected by Owner from manufacturer's full range.

H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color: As selected by Owner from manufacturer's full range.

2.9 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Mill Finish: AA-M12, nonspecular as fabricated.

C. Clear Anodic Finish: AAMA 611.

D. Color Anodic Finish: AAMA 611.

1. Color: As selected by Owner from full range of industry colors and color densities.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed ¼ inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in “Fabrication” Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Anchor as indicated in plans and to meet design load requirements.

B. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. As indicated.

3.6 ADJUSTING AND CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09910 – Exterior Painting and Section 09920 – Interior Painting.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Shelf angles.
3. Metal ladders.
4. Metal floor plate.
5. Structural-steel door frames.
6. Miscellaneous steel trim.
7. Metal bollards.
8. Metal downspout boots.
9. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:
1. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.
5. Manufactured metal ladders.
6. Metal bollards.
7. Metal downspout boots.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Shelf angles.
3. Metal ladders.
4. Metal floor plate and supports.
5. Structural-steel door frames.
6. Miscellaneous steel trim including.
7. Metal bollards.
8. Loose steel lintels.
9. Vehicular barrier cable systems.

C. Delegated Design Submittals: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Research Reports: For post-installed anchors.

E. Delegated design engineer qualifications.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.

E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

F. Rolled-Stainless Steel Floor Plate: ASTM A793.

G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Galvanized Steel: ASTM A653/A653M, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.
3. Cold-Rolled Steel: ASTM A1008/A1008M, commercial steel, Type B; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening stainless steel.
2. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated. Manufacturer hardware and standard connections and connectors shall be used for slotted channel framing.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 1-inch-diameter or 1-inch-square, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Nonslip Surfaces for Steel Ladders: Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) IKG.
2) SlipNOT Metal Safety Flooring, division of Traction Technologies Holdings, LLC.

7. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize ladders, including brackets except for those noted as stainless steel.

2.8 METAL FLOOR PLATE

A. Fabricate from rolled-steel floor plate of thickness indicated below:

1. Thickness: 3/16 inch, unless otherwise indicated.

B. Provide grating sections where indicated, fabricated from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1 inch in least dimension.

C. Provide angle supports as indicated.

D. Include angle stiffeners, and fixed and removable sections as indicated.

E. Provide flush bar drop handles for lifting removable sections, one at each end of each section.

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime miscellaneous steel trim.

2.10 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Cap bollards with 1/4-inch-thick, steel plate with domed top.
2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

B. Fabricate sleeves for bollard anchorage from steel or stainless steel pipe or tubing with 1/4-inch-thick, steel or stainless steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

C. Prime steel bollards with zinc-rich primer.

2.11 PIPE AND DOWNSPOUT GUARDS

A. Fabricate guards from 3/8-inch-thick by 12-inch-wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

B. Galvanize steel guards.

2.12 METAL DOWNSPOUT BOOTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. J.R. Hoe & Sons Inc.
2. Neenah Foundry Company.

B. Source Limitations: Obtain downspout boots from single source from single manufacturer.

C. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

D. Prime cast-iron downspout boots with zinc-rich primer.

2.13 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

C. Prime plates with zinc-rich primer.

2.14 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Galvanize and prime loose steel lintels located in exterior walls.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.15 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.16 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with expansion anchors or anchor bolts.

D. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

E. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF SHELF ANGLES

A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.4 INSTALLATION OF METAL LADDERS

A. Secure ladders to adjacent construction with the clip angles attached to the stringer.

B. Install brackets as required for securing of ladders welded or bolted to structural steel or built into masonry or concrete.

3.5 INSTALLATION OF METAL FLOOR PLATE

A. Install metal floor plates flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.6 INSTALLATION OF STRUCTURAL-STEEL DOOR FRAMES

A. Fasten structural steel door frames to the floor slab by means of angle clips and expansion bolts. Anchor door jambs to adjacent construction in accordance with shop drawing details.

3.7 INSTALLATION OF MISCELLANEOUS STEEL TRIM

A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.8 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.9 INSTALLATION OF PIPE AND DOWNSPOUT GUARDS

A. Provide pipe guards at exposed vertical pipes in at locations indicated on Drawings where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 26 inches above driving surface.

3.10 INSTALLATION OF METAL DOWNSPOUT BOOTS

A. Anchor metal downspout boots to concrete or masonry construction to comply with manufacturer's written instructions.

B. Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

3.11 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.12 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 06110 – WOOD FRAMING AND CONSTRUCTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide wood, wood trusses, fasteners, and other items needed as specified herein or as shown on the plans, and as needed for a complete and proper installation.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Submit:
1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Shop Plans showing species, sizes, and stress grades of lumber proposed to be used; pitch, span, camber configuration, and spacing of trusses; or rafters connector type, thickness, size, location, and design value; bearing details and location of any required lateral bracing.
4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer’s recommendations.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with Truss Plate Institute “Commentary and Recommendations for Handling and Erecting Wood Trusses” and “Quality Control Manual”.

PART 2 - PRODUCTS

2.1 WOOD

A. General: All structural lumber shall be Southern Pine construction grade, kiln dried to a maximum moisture content of 15 percent.

B. Framing Lumber: Framing lumber shall be treated with osmosalts such as OSMOSE K-33 or similar treatment and dried after treatment to a maximum moisture content 15 percent.

C. Fascia Board: Shall be Southern Yellow Pine, construction grade or better, 1 inch by 6 inches.

D. Plywood:

1. Roof sheathing shall be 5/8 inch exterior sheathing grade.
2. Ceiling and exterior wall sheathing shall be 1/2 inch exterior grade A-C or A-D.

E. Trim: Trim shall be Grade B or better yellow pine, fir, or redwood or #2 or better Wolmanized selected yellow pine.

F. Fasteners: Nails and anchor bolts used in connection with osmosalt treated lumber shall be galvanized coated.

G. Plates: Shall be Southern Yellow Pine, No. 2 Grade, Dimensions as shown on the plans.

2.2 WOOD TRUSSES

A. General: The wood truss profile, the required truss spacing, and the dimensions are shown on the plans. The truss design and spacing shall comply with all requirements as shown. Trusses may be fabricated with two inch nominal members and installed in connected pairs or triple units, as required.

B. Fabrication: Shall comply with the following as a minimum:

1. Prefabricate in strict accordance with the Shop Plans and other data approved by the Engineer.
2. Provide truss connector plates manufactured by a single firm, which is a member of the Truss Plate Institute, and which complies with procedures in "Quality Control Manual" of Truss Plate Institute.
3. Fabricator shall utilize a quality control program which is comparable to the program specified in "Quality Control Manual" of Truss Plate Institute.

2.3 ROUGH HARDWARE

A. Steel Items: Shall be galvanized complying with ASTM A 36.

B. Machine Bolts: Shall comply with ASTM A 307, Zinc coated.

C. Anchor Bolts: Shall comply with ASTM E 754.

D. Nails: Shall be galvanized at all locations, spiral shank or ring shank complying with ASTM F 547.

2.4 OTHER MATERIALS

A. General: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 SELECTION OF LUMBER

A. General: Members shall be carefully selected so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will not interfere with making of proper connections.

3.2 TRUSS INSTALLATION

A. General: The truss installation shall comply with pertinent provisions of "Commentary and Recommendations for Handling and Erecting Wood Trusses" of the Truss Plate Institute.

3.3 JOINTING

A. General: Make joints which are true, tight and well nailed with all members assembled in accordance with the plans.

3.4 FASTENING

A. General: Install items straight, true, level, plumb, and firmly anchored in place.

B. Nailing: Nailing shall be done without splitting wood. Split members shall be removed and replaced with members complying with the specified requirements.

C. Bolting: Shall comply with the following as minimum:

1. Drill holes 1/16 inch larger in diameter than the bolts being used.
2. Drill straight and true from one side only.
3. Do not bear bolt threads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

END OF SECTION

SECTION 07100 – DAMPPROOFING AND WATERPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all materials and labor required for installation of waterproofing material for all building foundations and below grade concrete masonry units.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIAL

A. General: Waterproofing material shall be of spray-applied or brush-on type that provides protection for below grade concrete and masonry structures. Material shall sustain freeze-thaw cycles with no effect after installation. Material shall meet the requirements of ASTM D 412 with service temperature range of -40 degrees F to +160 degrees F. Waterproofing material shall be similar to "One Kote" manufactured by Karnak Chemical Corp.

2.2 OTHER MATERIALS

A. General: Provide other material, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General: Holes bigger than 1/8 inch in width on the foundation walls shall be filled with a suitable joint sealant prior to the installation of waterproofing material.

3.2 WATERPROOFING MATERIAL

A. General: Waterproofing material shall be sprayed to or brushed-on vertical surfaces at a minimum dry thickness of 60 mils at the locations as shown on the plans. Installation shall follow the manufacturer's instructions.

END OF SECTION

SECTION 07210 – BUILDING INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This section includes furnishing of all materials, equipment, and labor required for insulation of the buildings and roof insulation as shown on the plans and as specified herein.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 VAPOR RETARDER

A. General: Vapor barrier material underneath the concrete slab shall be a minimum 6 mil polyethylene.

2.2 EXTRUDED POLYSTYRENE INSULATION

A. General: Extruded polystyrene insulation boards shall be of a closed-cell structure. Material shall have 2 inch thickness complying with ASTM C 578.

2.3 MASONRY WALL INSULATION

A. All CMU walls shall be insulated using the following:
   1. Core Fill Insulation: Core Fill-500 by Tailored Chemical Products, Inc., Thermco Foam Insulation by Thermal Corporation of America or Tripolymer Foam Insulation by C.P. Chemical Co., Inc., or equal.
   2. Core fill insulation to be free of formaldehyde.

2.4 BATT INSULATION

A. General: Batt insulation shall be of glass fiber insulation for thermal and acoustical applications. Material shall provide minimum insulating "R" factor as indicated on the plans. Material shall comply with ASTM C 665 standard.

2.5 OTHER MATERIALS

A. General: Provide other material, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

B. Waterproofing Material: Comply with pertinent provisions of Section 07100 - Dampproofing and Waterproofing.

C. Roof Insulation: Felt shall be used for roof insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: All specified materials shall be installed in accordance with manufacturer’s instructions.

3.2 SURFACE PREPARATION

A. General: All loose aggregate or sharp protrusions shall be removed prior to the installation of wall insulation. Holes bigger than 1/8 inch in width on the foundation walls shall be filled prior to the installation of waterproofing material.

3.3 FOUNDATION WALLS INSULATION

A. General: Installation shall follow the manufacturer's instructions. A 2 inch extruded polystyrene board shall be installed after waterproofing as shown on the plans and as recommended by the manufacturer.

3.4 ROOF INSULATION

A. General: Materials shall be installed as recommended by the manufacturer and as shown on the plans.

3.5 WALLS AND CEILINGS

A. General: Insulation shall be installed as shown on the plans and according to manufacturer’s recommendations.

END OF SECTION

SECTION 07310 – ROOFING SHINGLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all material, labor and equipment required for installation of shingles.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. General: The Contractor shall comply with Section 01610 - Delivery, Storage, and Handling.

PART 2 - PRODUCTS

2.1 SHINGLES

A. General: Roofing where designated on the plans shall be “Architectural” style and consist of a two ply application of 15 pound asphalt felt followed by a 30 year mineral surfaced fiberglass shingle, U/L Type, Class C, self sealing. Shingle color to be selected by OWNER from samples provided by CONTRACTOR. Shingle material shall satisfy the requirements of ASTM E 108. Shingles shall be Tamko Heritage series, or approved equal.

2.2 FASTENERS

A. General: Nails shall be standard galvanized needle point roofing nails with 3/8 inch flat head.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Installation shall be done in accordance with the instructions supplied by the shingle manufacturer.

END OF SECTION

SECTION 07460 – VINYL SIDING AND SOFFIT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all material, labor and equipment required for installation of siding and soffit.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Siding and Soffit color to be selected by the Owner from manufacturer's standard palette of colors.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 SIDING AND SOFFIT

A. General: Siding and soffit panels shall be provided where designated on the plans. Panels shall be composed of PVC powder compound and manufactured in accordance with ASTM D 3679. Color shall be selected by Owner.

2.2 FASTENERS

A. General: Nailing must be 16 inches on center. Nails shall be aluminum or other rust-resistant material, and must penetrate the stud at least ¾ inches.

2.3 PROPERTIES

A. General: Vinyl siding shall comply with the following properties:

Physical Properties	Test Method	Value
Izod Impact (ft. lb./in.) at 32°F	ASTM D 3679	3.39
Tensile Strength (psi) at 73°F	ASTM D 638	6588
Modulus of Elasticity (psi) at 73°F	ASTM D 648	406,340
Coefficient of Linear Expansion (in./in./ °F)	ASTM D 696	2.59 x 10(-5)

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Installation shall be done in accordance with the instructions supplied by the siding manufacturer.

END OF SECTION

SECTION 07600 – FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all material, labor and equipment required for installation of window, door and roof flashing, soffit and roof vents, and gutters and downspouts.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Colors to be selected by the Owner from manufacturer's standard colors.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 FLASHING

A. General: Flashing shall be shop or field formed aluminum.

2.2 GUTTERS AND DOWNSPOUTS

A. General: Provide .025 inch seamless aluminum gutters and downspouts where shown on the plans. All outlets shall have aluminum wire strainers. Gutter and spouts shall be prefinished with 5 inch rectangular gutter sections and 3 inch rectangular downspouts. Color shall be selected by Owner.

B. Downspouts: Turn downspouts out at the bottom and provide flagstone or concrete splash blocks unless otherwise indicated on the plans.

2.3 VENTS

A. Soffit Vents: Soffit vents shall be of the same material as the soffit.

B. Gable Vents: Gable vents shall be of vinyl construction with screened openings as indicated on the plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Materials described in this section shall be installed as shown on the plans and as recommended by the manufacturer.

B. Soffit Vents: Shall be evenly spaced and placed in each rafter space.

C. Support: Downspouts to be secured to walls with wide bands at top and bottom. Hangers shall support downspouts at a minimum interval of 6 feet. Turn downspouts out at the bottom and provide flagstone or concrete splash blocks unless otherwise indicated on the plans.

END OF SECTION

SECTION 07900 – JOINT SEALERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Throughout the work, seal and caulk joints where shown on the plans and elsewhere as required to provide a positive barrier against passage of moisture.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

1.4 QUALITY ASSURANCE

A. General: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Products shall be those indicated by manufacturer as suitable for the specific applications indicated on the plans. Each container brought to the jobsite with a different sealant formulation shall be marked for the intended use. For each intended use, the color shall be one of the manufacturer's standard colors as selected by the Engineer.

B. Caulking Compound: Except where shown different on the plans sealant shall be 100 percent silicone sealant. Sealant shall be non corrosive to metals and meet Federal Specification TT-S-001543A. Sealant shall require no painting and be provided in color to match the application surface or in clear.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. General: The ambient temperature shall be within the limits of 40 to 90 degrees F when caulking and sealant are applied.

3.2 SURFACE PREPARATION

A. Surfaces should be clean and dry in accordance with manufacturer's recommendations prior to applying sealers.

3.3 APPLICATION

A. Paper Masking Tape: Paper masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or compound smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

B. Bond-Preventive Materials: Bond-preventive materials for No. 2sealant shall be installed on the bottom of the joint cavity and other surfaces indicated to prevent the sealant from adhering to the surfaces covered by the bond-preventive materials. The materials shall be carefully applied to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond-preventive materials.

C. Backstops: The back or bottom of joints constructed deeper than indicated shall be packed tightly with backstop material to provide a joint of the depth indicated. Where necessary to provide a backstop for caulking compound, the joint shall be packed tightly with rope yarn.

D. Primer: Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not receive primer.

E. No. 1 Caulking Compound: Compound shall be gun-applied with a nozzle of proper size to fit the width of joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Caulking shall be uniformly smooth and free of wrinkles and shall be left sufficiently convex to result in a flush joint when dry. One coat of sealer shall be applied over joint after compound has dried sufficiently to develop a surface skin so as not to deform the surface of the joint.

F. No. 2 Sealant: Compound shall be gun-applied with a nozzle of proper size to fit the width of joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Sealant shall be uniformly smooth and free from wrinkles. Joints shall be tooled slightly concave after sealant is installed. When tooling white or light-color sealant, dry or water-wet tool shall be used.

3.4 CLEANING

A. General: The surfaces adjoining the caulked and sealed joints shall be cleaned of smears and other soiling resulting from the caulking and sealing application as work progresses.

END OF SECTION

SECTION 08100 – STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide steel doors, complete in place with finish hardware installed, where shown on the plans, as specified herein, and as needed for a complete and proper installation.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Color Selection: Door colors shall be as selected by the Owner from color charts provided by the Contractor.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

B. Steel Door Storage: Store doors and frames at building site under cover. Avoid use of non-vented plastic or canvas shelters which can create humidity chamber. If cardboard becomes wet, remove carton immediately. Provide 1/4 inch spaces between stacked doors to promote air circulation.

1.4 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers.

PART 2 - PRODUCTS

2.1 STEEL DOORS

A. General: Provide steel doors and frames of the dimensions as shown on the plans that comply with SDI 100 and ASTM E 152. Exterior doors shall be 1 3/4 inches thick, and interior doors shall be 1 3/8 inches thick. Exterior doors shall include weather-stripping or seals on all edges to provide a weather-tight barrier when closed.

B. Face: Shall be minimum 18 gauge cold-rolled steel sheets completely flushed and seamless comply with ASTM A 569 and ASTM A 568.

C. Core: Interior doors shall be hollow core. Exterior doors shall be insulated.

D. Windows: Where indicated on the plans, doors shall be furnished with windows to allow visual inspection of areas.

E. Frames: Shall be fabricated of minimum 16 gauge, cold-rolled furniture steel complying with ASTM A 366 and ASTM A 568 or hot-rolled steel complying with ASTM A 569 and ASTM A 568.

F. Supports and Anchors: Shall be fabricated of not less than 18 gauge galvanized sheet steel.

G. Primer: Shall be rust-inhibitive enamel or paint as specified by ANSI A 224.1.

H. Finish: Shall be manufacturer's standard baking epoxy or enamel paint.

I. Hardware: Door hardware shall be as specified in Section 08700 - Door Hardware.

2.2 OTHER MATERIALS

A. General: Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

B. Caulking: All openings around doors shall be caulked with a silicone caulk of a color that will blend with surrounding surfaces. Joints shall be wide enough to permit the caulking to penetrate but not wide enough to necessitate backup.

PART 3 - EXECUTION

3.1 METAL FRAME AND DOOR INSTALLATION

A. General: Installation of metal frames and doors shall be done in accordance with final shop plans, manufacturer's data, as specified in this Section, and at locations shown on the plans.

B. Tolerances: Metal doors shall be installed accurately in frames within clearances specified in SDI 100.

C. Prime Coat Touch-up: Immediately after erection, any rusted or damaged areas of prime coat shall be sand smoothed and primer touched-up.

D. Protection Removal: Immediately prior to final inspection, all protective plastic wrappings shall be removed.

E. Final Adjustments: Check and re-adjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08360 – OVERHEAD DOORS

PART 1 GENERAL

1.1 DESCRIPTION

1. Work Included: Provide and install roll-up overhead doors, including weather-stripping, door operators, and accessories where shown on the plans, as specified herein and as needed for a complete and proper installation.

1.2 SUBMITTALS

1. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

2. Color Selection: Door colors shall be as selected by the Owner from color charts provided by the Contractor. Owner shall select from a palette of standard door colors.

1.3 DELIVERY, STORAGE, AND HANDLING

1. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

PART 2 PRODUCTS

2.1 MATERIAL

1. General: Door manufacturer shall have a minimum 30 years of experience producing roll-up doors for commercial and industrial applications. Doors shall be Overhead Door Model 625 Stormtite Insulated Heavy-Duty units, or approved equal.

2. Curtain: Curtain slats shall be insulated 24 gauge galvanized steel interlocking sections designed to meet 20 psf minimum wind load. Provide high strength endlocks fastened with two rivets each on alternate slats. Provide windlocks as required to meet design wind load, minimum 20 psf. Bottom bar to be structural steel angles with vinyl weather seal.

3. Guides: Guides shall be formed of structural steel, minimum 3/16 inch thick. Provide windlock bars as required to met design wind load, minimum 20 psf.

4. Insulation: Insulation shall be urethane foam with an in place R value of at least 6.0

5. Door Dimensions: Door opening dimensions shall be as indicated on the Drawings.

6. Hood: Hood shall be #24 gauge galvanized steel with a baked-on enamel primer. Provide minimum ¼ inch thick intermediate supports as required to prevent excessive sag.

7. Operation: Unit shall be equipped with 120V, single phase motorized operator rated as recommended by the manufacturer for door size and heavy duty application. Provide chain and sprocket secondary drive.

8. Weather-stripping: Equip bottom bar with vinyl weather-strip which extends into guides, to seal against exterior flat face of door curtain. Equip curtain side guide with vinyl weatherseal. Equip hood with interior air baffle to close space between top of hood and curtain.

2.2 FINISH

1. Provide manufacturer's standard factory powder coat finish consisting of primer and topcoat(s). Color to be selected by Owner from manufacturer's standard color palette.

PART 3 EXECUTION

3.1 INSTALLATION

1. General: Install doors complete with all operating equipment and necessary hardware in accordance with manufacturer's instructions.

2. Adjusting: Lubricate bearings and sliding parts as recommended by the manufacturer. Adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION

SECTION 08700 – FINISH HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide finish hardware for swinging doors.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Submit product data, cut sheets, and hardware schedule for use based on the requirements of the Drawings and Specifications.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer's recommendations.

1.4 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hinges, butts and pivots: Full-mortise, 5 knuckle ball-bearing type with nonremovable pins at exterior doors; Stanley or approved equal.

B. Locksets and latchsets: Each door shall be provided with keyless mechanical pushbutton lock to be coded to match existing treatment building locks.

C. Emergency Hardware: Where specified, doors shall be provided with push bar style emergency panic hardware on the interior of the door.

D. Closers:
   1. Low frequency doors: LCN 4030/4130 series or approved equal
   2. High frequency doors (fire-labeled doors, toilet room doors, entry doors): LCN 4010/4110 series or approved equal.

E. Door Trim: Kickplates, armor plate, plastic plates; Brookline or approved equal.

F. Stops: Ives or approved equal.

G. Weatherstripping and Thresholds: ADA Compliant; Reese or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow guidelines of DHI "Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames" and hardware manufacturers' instructions.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

C. Adjust operation, clean and protect.

END OF SECTION

SECTION 09910 – EXTERIOR PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install all materials, equipment and labor required for the paint, finishes as shown on the plans and as specified hereunder.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Color Selection: Paint colors shall be as selected by the Owner from color charts provided by the Contractor. The Contractor shall submit manufacturer's specifications, product data sheets and application recommendations to the Engineer for review along with shop plans.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer’s recommendations.

B. Adhesive, paint, and sealer shall be stored in dry area and protected against freezing at all times.

1.4 QUALITY ASSURANCE

A. To insure compatibility, all paints and primers used for a specific task shall be provided by a single manufacturer. In the event that a manufacturer cannot supply a specified finish or system, a letter of certification shall be required to be submitted by the manufacturer stating that the system supplied is compatible with the adjacent finishes. The Contractor shall have available on site such gages, thermometers and other devices necessary to insure that application of finishes is in conformance with the manufacturer’s recommendations.

PART 2 - PRODUCTS

2.1 PRIMER

A. Exterior Wood: Exterior wood trim shall receive one coat of a primer with a total of 1 mil dry film thickness. Primer shall be similar to O'Brien "220-23 Exterior Wood Primer" or approved equal.

B. Exterior Architectural Metals & Piping: Primer shall be a general purpose primer with a superior wetting and purpose primer with a superior wetting and penetrating properties applied as a single coat with a minimum 3 mil dry thickness. Material shall be similar to Carboline "Carboline II" or approved equal. Coating shall be according to the manufacturer product data sheet. Piping coating shall include all exposed pipe within vaults and tanks.

2.2 PAINT

A. Exterior Wood: Trim shall be painted with a semi-gloss acrylic latex applied at the rate to provide a total of 4 mils dry thickness. Paint shall be similar to O'Brien 664-XX Weather King Latex House & Trim Paint" or approved equal. Interior siding of sludge shed shall receive a coat of clear polyurethane.

B. Exterior Architectural Metals & Piping: Finish coat shall consist of two coats of a high build epoxy applied at a rate to provide minimum of 4 mils dry film thickness. Finish coat shall be Carboline "191 HB" or approved equal. Piping coating shall include all exposed pipe within vaults and tanks.

PART 3 - EXECUTION

3.1 PRIMING

A. General: All surfaces before receiving primer shall be prepared in accordance with the manufacturer's recommendations. Aluminum, stainless steel, bronze and plastic shall not be painted.

3.2 SURFACE PREPARATION

A. General: Woodwork finishes shall be sanded between coats. Metals shall be dry, clean and free from mill scale rust, grease and oil. After primer coat is dry, all visible suction spots shall be touched up before applying succeeding coats.

3.3 PAINTING

A. General: Contractor shall apply all paint in accordance with the manufacturer's recommendations. The Contractor shall provide protection at all times during application in strict conformance with the manufacturer's recommendations. The Contractor shall have available on site such gages, thermometers, and other devices necessary to insure the proper application of paints.

END OF SECTION

SECTION 09920 – INTERIOR PAINTING

PART 1 GENERAL

1.1 DESCRIPTION

1. Work Included: Furnish and install all materials, equipment and labor required for the paint, finishes as shown on the plans and as specified hereunder.

1.2 SUBMITTALS

1. Comply with pertinent provisions of Section 01330 – “Submittal Procedures”.

2. Color Selection: Paint colors shall be as selected by the Owner from color charts provided by the Contractor. The Contractor shall submit manufacturer's specifications, product data sheets and application recommendations to the Engineer for review along with shop plans.

1.3 DELIVERY, STORAGE, AND HANDLING

1. Comply with pertinent provisions of Section 01610 – “Delivery, Storage, and Handling” and with manufacturer’s recommendations.

2. Adhesive, paint, and sealer shall be stored in dry area and protected against freezing at all times.

1.4 QUALITY ASSURANCE

1. To insure compatibility, all paints and primers used for a specific task shall be provided by a single manufacturer. In the event that a manufacturer cannot supply a specified finish or system, a letter of certification shall be required to be submitted by the manufacturer stating that the system supplied is compatible with the adjacent finishes. The Contractor shall have available on site such gages, thermometers and other devices necessary to insure that application of finishes is in conformance with the manufacturer’s recommendations.

PART 2 PRODUCTS

2.1 PRIMER

1. General: All material shall be suitable for interior applications.

2. Interior Architectural Metals, Equipment, and Piping: Primer shall be a general purpose primer with a superior wetting and penetrating properties applied as a single coat with a minimum 3 mil dry thickness. Material shall be similar to Carboline "Carboline II" or approved equal.

3. Interior Wood: Primer shall be a high build alkyd enamel undercoat applied with 1.6 mil dry thickness. Material shall be similar to O'Brien "220-07 Enamel Undercoat" or approved equal.

4. Concrete Masonry Units: The prime coat shall be heavy-bodied highly pigmented product for filling open textured block surfaces, applied at not to exceed 100 square feet per gallon, and similar to Pennsbury “PVA Block Filler 17-W-3” or approved equal.

2.2 PAINT

1. Interior Architectural Metals, Equipment and Piping: Finish coat shall consist of two coats of a high build epoxy applied at a rate to provide a minimum of 4 mils dry film thickness. Finish coat shall be Carboline “890” or approved equal.

2. Wood Surfaces: Interior wood and surfaces shall receive two coats of an epoxy applied at a rate to provide a total of 4 mils dry film thickness. Paint shall be Pennsbury "Series 51", Koppers "Glamorglaze 200 Epoxy", Carboline "No. 193 Gloss", Mobil "Val-Chem 84", or approved equal.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

1. Surfaces shall be prepared in accordance with the manufacturer's recommendations and shall be generally free of oil, grease, stains, mill scale and loose rust.

3.2 PRIMING

1. General: All surfaces before receiving primer shall be prepared and primed in accordance with the manufacturer's recommendations. All equipment, piping, and miscellaneous metals shall receive a prime coat or touch-up coat of rust penetrating primer prior to finish coats. Aluminum, stainless steel, bronze, plastic and equipment nameplates shall not be painted.

3.3 PAINTING

1. General: Apply all paint in accordance with the manufacturer's recommendations. Provide protection at all times during application in strict conformance with the manufacturer's recommendations. The Contractor shall have available on site such gages, thermometers, and other devices necessary to insure the proper application of paints. All walls and ceilings shall have final paint finish applied prior to contractor hanging any conduit, fixtures, electrical devices, or other materials.

END OF SECTION

SECTION 16280 –MISCELLANEOUS EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all labor, materials, tools, equipment, and appurtenances as specified herein and where shown on the plans and as needed for a complete and proper installation.

B. Related Sections: Additional Sections of the Documents which are referenced in this Section include:

1. Section 01330 - Submittal Procedures
2. Section 01610- Delivery, Storage, and Handling

1.2 SUBMITTALS

A. General: Shall be in accordance Section 01330 – Submittal Procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. General: Shall be in accordance with Section 01610 - Delivery, Storage, and Handling.

PART 2 - PRODUCT

2.1 ACCESS HATCHES

A. General: Access hatches shall be the size and type indicated on the plans. Watertight hatches shall include a drain port from the frame which shall be plumbed to drain to the exterior of the tank. Door panels shall be 1/4 inch aluminum diamond plate, reinforced to withstand a live load of 300 pounds per square foot. Frame shall be constructed of 1/4 inch thick one piece extruded aluminum. A bituminous coating shall be applied to the frame exterior where it will come into contact with concrete. Doors shall open as indicated on the plans. Doors shall automatically lock in the open position and release by handles. Hold open arm shall incorporate a stainless steel spring assist. Doors shall close flush with the frame and rest on a built-in neoprene gasket. Lifting handle, hinges, and all fastening hardware shall be stainless steel. Unit shall lock with a stainless steel slam lock with removable key. Unit shall be guaranteed against defects in material and/or workmanship for a period of 10 years. Hatches shall be provided with interior hinged safety grate.

2.2 ACCESS DOOR

A. General: Access door at the Raw Water Intake shall be rated for submergence, of the minimum size indicated on the plans, opening to the outside, ready for installation, completely made from stainless steel. Door shall be fastened to the frame with stable maintenance-free hinges and have full perimeter rubber seal. Locking levers shall be provided and be operable from both sides. Frame shall be provided for bolted fixing on the exterior side of the structure, with associated fixing material and rubber seal between the frame and wall. Door and frame shielded arc-welded and acid bath cleaned before washing, drying and surface passivation. Door shall be provided with keyed lock or padlock attachment. Door shall be as manufactured by Huber Technology, or equal.

2.3 SWIVEL JOINTS

A. General: Decant pipe swivel joints shall be aluminum or stainless steel with flanged ends and designed for submerged use. Swivel joints shall have double ball bearing rows and raceways within a protected bearing chamber with O-ring seals on each side. Joints shall be permanently lubricated or provided with a grease fitting for maintenance. Swivel joints shall be OPW Engineered Systems Style 40FJ, or approved equal.

2.4 WINCHES

A. Electric Winch: Electric winches at Thickener Tanks shall be minimum 1,000 pound capacity weatherproof rated winch with automatic brake and minimum 40 feet of 3/16" stainless steel wire rope. Winch shall operate on 120 volt electric supply with local forward and reverse direction controls. Winch shall be pedestal stand mounted.

B. Manual Winch: Winch shall be 1,000 pound rated marine duty with automatic brake, minimum 2.85:1 gear ratio, corrosion resistant zinc plated finish, gear cover, and be provided with 28 feet of 3/16" stainless steel wire rope.

2.5 SLIDE GATES

A. General: Isolation slide gates to be installed at existing Solids Handling Basin inlet pipes shall be stainless steel upwards opening of the four sides sealing type designed for submergence in water or wastewater applications. They shall have flow control capability by allowing only flow through the open area in partial opening situations. Gates shall have non-rising stems and stand mounted handwheel or crank operators. The slide shall seat and travel on guides made of ultra high molecular weight polyethylene (UHMWPE) designed to perform for the life of the slide gate without replacement. The slide shall be kept in positive contact with the guides on both its upstream and downstream faces, all along its travel in the gate clear opening by an elastomeric cord. Above the gate clear opening, the guides shall extend high enough to ensure that the slide is supported on a minimum of 1/2 of its height when fully opened. Slide gates shall be Fontaine-Aquanox Series 20, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install all equipment in strict accordance with the manufacturer's recommendations. Supply all equipment and accessories not specifically provided by the manufacturer but required for satisfactory installation and operation. All anchor bolts shall be plated steel while all other miscellaneous fasteners shall be stainless steel. All bolts shall be of ample size for the purpose intended.

END OF SECTION

SECTION 11210 – WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, equipment, material, and appurtenances for the complete installation of the water pumps.

1.2 SUBMITTALS

A. Shop Drawings: Comply with the provisions of Section 01330 – Submittal Procedures.

1. Schedule: Submittals shall be provided to Owner within 3 weeks from date of purchase order.
2. Pump Units: Provide manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions. Performance curves shall show capacity versus total dynamic head, NPSH required, efficiency, brake horsepower, and power input at the design condition(s) required. Performance curves shall be provided for multiple VFD setting points to demonstrate multiple conditions under which the units are to operate between the design conditions as specified.
3. Drawings: Provide detail drawings containing a complete list of equipment and materials. Drawings shall contain complete pump dimensions, wiring and schematic diagrams, and any other details needed to demonstrate that the system has been coordinated and will properly function as a unit and within the system as depicted in the Contract Documents. Drawings shall show the proposed layout and anchorage of equipment and appurtenances and will show all weights and dimensions necessary for the installation of foundations, anchor bolts, piping, and valve connections.
4. Spare Parts: A complete list shall be included of spare parts to be provided.
5. Installation Instructions: Complete installation and startup instructions, as recommended by the manufacturer, shall be provided.
6. Verification and Warranty: A statement of verification shall be provided confirming that the Contract Documents have been reviewed and the submitted pumps and equipment comply with the dimensions, performance, and material requirement specified. Manufacturer shall specifically verify that the provided pump equipment is compatible for use with variable frequency drives as specified in the Contract Documents. Any variations or exceptions proposed shall be clearly noted for review by the Engineer. A copy of the manufacturer's warranty for the provided equipment shall be included.

B. Operating and Maintenance Manuals

1. Provide one digital and two (2) complete printed copies of operating manual outlining the step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, complete parts list, and brief description of all equipment and their basic operating features. Six complete copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include simplified wiring, layout, and control diagrams of the system as installed. The manuals should include a separate, concise, section detailing recommended routine

maintenance items and procedures including lubrication and wear item replacement schedules. Digital copies of manual shall also be provided.

1.3 QUALITY ASSURANCE

A. All equipment shall be supplied by a single manufacturer including bowls, impellers, column, shafting, heads, coupling, sleeves, seals, motors, guards, and appurtenances to ensure compatibility and integrity of the individual components and the manufacturer's warranty shall cover all provided equipment.

1.4 NAMEPLATES

A. Each major item of equipment shall have the manufacturer's name, address, type or style, model, serial number, and catalog number on a plate secured to the item.

B. The nameplate for each pump shall show the capacity in gallons per minute at rated head in feet and speed in revolutions per minute.

C. The nameplate for each electric motor shall show the horsepower, speed in revolutions per minute, full load current, voltage, frequency, phases, time rating, maximum ambient temperature, insulation class code letter, and service factor.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pump equipment should be stored with protection from the weather, humidity, and temperature variations.

B. Protect all pump equipment and appurtenances from dirt, dust, and damage.

C. Comply with manufacturer's written delivery, storage, and handling instructions.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: Vertical turbine pumps shall be installed as indicated on the plans. Pumps shall be deep well lineshaft type manufactured for water lubrication of the lineshaft bearings by the water being pumped and furnished with a specified driver and accessories. Pumps shall be provided with discharge head with above ground discharge flange connection. The pumping unit shall be designed and manufactured in accordance with the latest hydraulic institute and AWWA specifications for lineshaft turbine pumps. Pumps shall be product of Fairbanks Nijhuis, Hydroflo, or Peerless.

B. Operating Conditions: The pumps shall be designed and built to operate satisfactorily with a reasonable service life, when installed in a proper turbine pump application.

Raw Water Intake

1.	Service:	Raw Water
2.	Pump Quantity:	2
3.	Primary Design Point (each pump):	4,400 gpm @ 235 feet TDH
4.	Minimum Shutoff Head:	460 feet

5.	Maximum Pump Speed:	1800 rpm
6.	Minimum Bowl Efficiency:	79% (at primary design point)
7.	Allowable Sphere Size:	1.38” (minimum)
8.	Motor Horsepower:	350 HP & Non-Overloading on Curve
9.	Electric Supply:	480 Volt, Three Phase
10.	Pump Discharge:	16-inch (flanged)
11.	Pump Column:	16-inch (flanged)

Finished Water

1.	Service:	Potable Water
2.	Pump Quantity:	1
3.	Primary Design Point (each pump):	3,060 gpm @ 316 feet TDH
4.	Secondary Design Point (each pump):	2,250 gpm @ 360 feet TDH
5.	Minimum Shutoff Head:	450 feet
6.	Maximum Pump Speed:	1800 rpm
7.	Minimum Bowl Efficiency:	80% (at primary design point)
8.	Allowable Sphere Size:	1.5” (minimum)
9.	Motor Horsepower:	350 HP & Non-Overloading on Curve
10.	Electric Supply:	480 Volt, Three Phase
11.	Pump Discharge:	16-inch (flanged)
12.	Pump Column:	12-inch (flanged, minimum)

2.2 PUMP CONSTRUCTION

A. Discharge Head: Discharge head shall be manufactured of fabricated steel of the high profile type and have a suitable motor base. It shall be intended for pump operation with variable frequency drives and specifically designed to elevate the discharge head natural frequency above the operating speed. The head shall allow the top shaft to couple above the mechanical seal. The head shall be threaded to accept the desired column pipe in this specification.

A drive shaft of the same material as the lineshaft shall extend through the sealing assembly of the discharge head and be coupled to a vertical hollow shaft motor with shaft adjustment nut at top of motor shaft. The shaft sealing assembly shall consist of a cast iron or stainless steel seal box, cast iron gland, stainless steel components including housings, gland nuts and bolts and split-type mechanical seal. Seal shall be Chesterton 442 or Flex-A-Seal 85. Raw Water pump mechanical seals shall be provided with SpiralTrac throat bushing.

Discharge head openings shall be fitted with guards to prevent access to the rotating shaft and/or coupling.

B. Bowl Assembly: The intermediate bowls, discharge cases and suction bowls shall be flanged type constructed from close grain cast iron, and shall conform to ASTM A48, class 30. They shall be free from sand holes, blow holes or other faults and must be accurately machined and fitted to close tolerances. The intermediate bowls shall have glass lined enamel or epoxy enamel coated waterways for maximum efficiency. All threaded discharge cases shall be threaded to an 8 TPI butt standard for product lubricated column assembly. All assembly bolting shall be stainless steel.

Impellers shall be investment cast 201 stainless steel, ASTM A296 and shall be enclosed type. They shall be free from defects and must be investment cast, machined, backfiled and balanced for optimum efficiency and performance. They shall be securely fastened to the bowl shaft with stainless steel taper locks, C1045 steel will not be accepted. The impellers shall be adjustable by means of a top shaft adjusting nut.

Bowl shaft shall be constructed from PSQ 416 stainless steel, ASTM A582 pump shaft material. It shall be precision machined and straightened within .002 - .004 tolerance

C. Column Assembly: Intermediate column lengths and lineshaft bearing spacing shall not exceed 10 feet with pump speeds up to 2200 rpm. Column pipe shall be minimum grade B steel pipe with flanged ends designed to accept ¾" ring spider bearing retainers.

Spiders shall be 201 or 316 stainless steel and furnished for shaft stabilization at each column pipe coupling. A rubber fluted bearing, retained with a shoulder at each end, shall be installed in each spider.

Lineshaft shall be 416 stainless steel and sized according to the horsepower requirements of the designed pump. The butting faces shall be machined square to the axis of the shaft, with the maximum permissible axial misalignment on the thread axis with the shaft axis .002" in 6". These shafts shall be coupled with 416 stainless steel lineshaft couplings..

D. Motor: The motor shall be a heavy duty squirrel cage induction type, inverter duty rated for VFD operation, vertical hollow shaft motor shaft motor, with a non-reverse ratchet to prevent reverse rotation. A suitable thrust bearing shall be required to meet the designed pump's hydraulic thrust load plus the weight of the rotating parts under the operating conditions. The motor shall be premium efficiency with a TEFC enclosure, a 1.15 service factor, and match the required voltage and phase at 60HZ. Motor oil shall be food grade meeting NSF standards for contact with potable water.

E. Coating: Discharge head shall be coated with two coats of high build epoxy applied at a rate to provide minimum of 6 mils dry film thickness. Finish coat shall be Carboline "191 HB" or approved equal. Suction can interiors shall be coated with minimum two coats NSF approved epoxy, similar to Tnemec Series 20 Pota-Pox. Suction can exteriors shall be coated with high build epoxy, similar to interior can or discharge head coatings.

F. Equipment Guards: Equipment driven by open shafts, belts, chains, or gears shall be provided with all-metal guards enclosing the drive mechanism. Guards shall be constructed of galvanized or aluminum clad steel members. Guards shall be secured in position by steel braces or straps which will permit easy removal for servicing the equipment. The guards shall comply in all respects to applicable safety codes and regulations.

G. Spare Parts and Tools: A complete set of all special tools which may be necessary for the adjustment, operation, maintenance, and disassembly of all equipment shall be furnished with the pump. Sufficient spare parts shall be provided for all manufacturer recommended maintenance to occur during the first three years of pump operation.

PART 3 - EXECUTION

3.1 WARRANTY

A. Manufacturer's Warranty: The manufacturer of the equipment shall warrant it to be of quality construction, free from defects in material and workmanship. The equipment shall be warranted for a period of 24 months, excepting only those items that are normally consumed in service. Components failing to perform as specified by the ENGINEER, or as represented by the manufacturer, or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the OWNER.

B. Effective Date: The warranty shall become effective upon the service start of equipment as designated by the OWNER and Startup Technician.

3.2 START-UP SERVICES

A. The manufacturer of the pump equipment shall provide the services of a trained, qualified representative for at least three (3) days and three separate trips for the purpose of inspecting the installation to assure compliance with shop drawings, pump startup, and performance verification. Each pump shall be checked for lubrication, alignment, rotation, vibration, and starting and running electrical and efficiency characteristics. The representative shall notify the Contractor and the ENGINEER of anything in the installation which might render the manufacturer's guarantee null and void. The manufacturer's representative shall also instruct the operating personnel in the proper method of operation and maintenance of the equipment.

B. After installation of the pumping units and appurtenances is complete, operating tests shall be carried out to assure that the pumping installation operates properly. The Manufacturer's representative shall be onsite for the field testing. Each pumping unit shall be given a running field test for a minimum of 2 hours. Each pump unit shall be operated at its rated capacity or such other point(s) as selected by the Engineer.

C. Pumps and motors shall be tested to meet the Hydraulic Institute specification for vibration. The pumps shall meet vibration limits prior to acceptance.

D. Following the start-up of the pumps, the manufacturer shall provide a written certification verifying that the pumps have been installed and started up property and are performing in accordance with the specifications and confirming that nothing has been done to negatively impact the equipment warranty. The certification should document field tested pump and motor performance test results including vibration, pump operating flow and head conditions, electrical, and efficiency characteristics.

3.3 INSTALLATION

A. The CONTRACTOR shall install all equipment in strict accordance with the manufacturer's recommendations. The CONTRACTOR shall supply all equipment and accessories not specifically provided by the manufacturer but required for satisfactory installation and operation.

END OF SECTION

SECTION 11220 – STATIC MIXERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The Contractor shall furnish and install static mixers as indicated on the plans and specified in the contract documents.

1.2 QUALITY ASSURANCE

A. All products finished under this specification section shall be supplied by the one source. The complete mixing unit shall be supplied, tested, and warranted by the manufacturer.

B. Submit Shop Drawings for all supplied equipment and controls in accordance with Section 01330 – Submittals. Submit certificate of compliance for all products specified by reference standard. Submittal shall include headloss versus flow data and certification that the mixers will meet or exceed the required flow capacity without cavitation.

PART 2 - PRODUCTS

2.1 STATIC MIXER

A. The Contractor shall furnish and install three (3) static mixers in the Main Building to provide violent agitation to the raw water treatment train pipes following chemical injection. Two mixers will be installed, with each providing mixing to one treatment train. The third mixer shall stored in the Main Building as a spare.

B. Each mixer shall be an inline static mixer whose elemental construction is such that it divides and rotates the flow, promoting mixing of the fluid components. The mixer internals shall consist of a series of three segments rotating the flow either right or left 180 degrees as it moves axially. Each segment shall divide the process flow into two distinct streams. The mixer construction shall be Schedule 40 with a 316 stainless steel housing, flanged ends, and non-removable segments. The mixer shall be provided for flanged connection to the existing 12” pipes. Mixers with diameters larger than 12” may either have integral stainless steel end reducers to flanged 12” pipe diameter or be provided with separate ductile iron reducer fittings. Maximum overall length of static mixer and reducer assembly shall be 9 feet.

C. Each static mixer shall be designed for a nominal design flow of 2,200 gpm at a maximum 0.8 psi pressure drop. Each mixer shall be certified for flow capacity of at least 2,800 gpm without cavitation.

D. The static mixer shall be manufactured by Statiflo, Koflo, Komax Systems, TAH Industries, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all equipment in strict accordance with the manufacturer’s instructions as approved by the Engineer.

3.2 WARRANTY

A. The manufacturer shall warrant the equipment being supplied against defects in workmanship and material for a period of one (1) year from date of final water treatment plant acceptance by the Owner.

END OF SECTION

SECTION 11224 – GRAVITY DUAL MEDIA FILTER

PART 1 - SUMMARY

1.1 SUMMARY

A. Furnish and install equipment for one new gravity dual media filter and retrofit of two existing filters.

B. The Contractor shall furnish and install required materials and equipment to make the gravity dual media filters complete and operable including underdrain, filter media, filter troughs, and related appurtenances.

1.2 REFERENCE SPECIFICATIONS AND STANDARDS

Reference specifications and standards are referred to as follows:

A. National Science Foundation (Standard 61)……...NSF

1.3 SUBMITTALS

A. Shop Drawings: Comply with the provisions of Section 01330 – Submittal Procedures.

1.4 MANUFACTURER'S EXPERIENCE

A. The equipment and materials specified herein shall be the product of a recognized Manufacturer that has been regularly engaged in the design, manufacturing, and installing of this type equipment for at least ten years and has a minimum of fifty installations.

B. The manufacturer shall maintain a qualified staff of design, manufacturing and service personnel. This staff shall be full-time employees of the manufacturer with suitable training and qualifications.

C. The Manufacturer shall be responsible for detailed design of the filter underdrain and air scour equipment to be furnished, the preparation of the required submittal data including operation and maintenance manuals, and technical supervision for installation of the air scour equipment in one filter and the installation of the underdrain system. The Contractor shall furnish and install the media and troughs in each filter.

1.5 SHIPPING AND STORAGE AND HANDLING

A. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

C. Store products in a waterproof enclosure prior to installation. Protect products against weather, dirt, moisture and physical damage.

D. The media which, in the opinion of the Engineer, becomes contaminated with dirt or other unsanitary materials shall be rejected and replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 FILTER UNDERDRAIN SYSTEM

A. General: This section includes all labor, materials and equipment required to furnish and install the filter underdrain system as indicated on the drawings and as specified herein. The filter underdrain system is intended to be standard equipment of proven performance as manufactured by reputable concerns.

B. Hydraulic Criteria: The filter underdrain shall be capable of evenly distributing water in the intended application. When subjected to a backwash flow rate of 20 GPM/SF, the headloss through the underdrain shall not exceed 60" water column. Test data shall be submitted for approval by the Engineer.

C. Materials of Construction

1. The filter underdrain system shall be a Monolithic Wheeler Bottom constructed of reinforced concrete and supported by piers at a height of 2'7" above the structural floor of the filter, forming a chamber beneath the underdrain to which the filter effluent and wash water piping is connected.

2. The reinforced concrete filter structure shall be constructed with ledges provided in the walls for the support of the filter underdrain about its periphery. The Contractor shall construct the reinforced concrete underdrain, and the piers supporting it, complete, including all steel reinforcements required to anchor the piers and the underdrain to the structural floor and walls of the filter.

3. The filter underdrain shall consist of a series of inverted pyramidal depressions cast into the concrete at spacing of 12" from center to center, each connecting with the chamber beneath the underdrain by means of a porcelain thimble extending downward through the concrete below the apex. The pyramidal depressions shall be mathematically accurate in form, and accurately spaced and oriented. The surfaces of the depressions and the tops of the ridges shall be smooth, hard and dense, and of the best grade of concrete finish known to the trade.

4. The porcelain thimbles shall be molded with a collar or water stop midway along their length and accurately finished to specified dimensions. Each Monolithic Wheeler bottom hopper shall receive a porous plate insert to act as a diffuser plate for backwash flow.

5. A total of fourteen porcelain spheres shall be installed in each of the cone-shaped depressions. Five of the porcelain spheres shall be approximately 3" diameter, one of the porcelain spheres shall be 1⅜" diameter, and the eight remaining porcelain spheres shall be approximately 1¼" diameter. One of the 3" porcelain spheres shall be installed directly over the porcelain thimble positioned in the bottom of the cone-shaped depressions. The remaining four 3" balls shall be installed directly above the porcelain sphere positioned over the thimble. The 1⅜ inch porcelain sphere shall be located in the center of the four 3" porcelain spheres, and the remaining eight 1¼" porcelain spheres shall be positioned on the outer periphery of the four 3" spheres. All spheres shall have NSF 61 certification.

6. The filter underdrain and supporting piers shall be constructed of 5,000 psi concrete, vibrated in place, using gravel of ¾" nominal maximum size. The underdrain and supporting piers shall be reinforced and anchored to the filter structure with steel reinforcement.

2.2 FILTER MEDIA

A. The support gravel and filter media system shall be installed in one (1) filter. The materials covered by this specification are intended to be standard materials of proven performance as manufactured by reputable concerns. All filter media shall conform to ASWWA B100-96 and shall be NSF 61 listed. Media selection shall be confirmed by filter underdrain manufacturer.

B. Materials of Construction

1. Support Gravel: Support gravel shall consist of clean, hard, durable, rounded particles of high quality, which shall meet or exceed AWWA B 100 and be consistent with the recommendations of the underdrain manufacturer. New filter support gravel shall be furnished and installed in five (5) different grades for a total finished depth of 12".

Size	Depth
1-1/2" x 3/4"	Hopper Potfill
1" x 5/8"	3"
5/8" x 3/8"	3"
3/8" x 3/16"	3"
3/16" x #10	3"

2. Silica Sand: Shall be composed of hard, durable grains and shall be furnished and installed in each filter unit for a finished depth as indicated on the plans. An extra inch of filter sand shall be supplied for backwashing and skimming of fines. The sand shall be free from clay, loam and all organic materials. The sand shall have a specific gravity of not less than 2.6. The sand shall have an acid solubility of less than five percent (5%) and shall have an effective size of 0.35 to 0.50 mm with a uniformity coefficient of 1.5 maximum.

3. Filter Anthracite: shall be clean and free from foreign matter and shall be furnished and installed in each filter unit for a finished depth as indicated on the plans. An extra inch of anthracite shall be supplied for backwashing and skimming of fines. The anthracite shall have a hardness of not less than 2.7 on the MOH scale and a specific gravity of not less than 1.5. It shall be free from iron sulfides, clay, shale and all foreign matter. Its acid solubility shall not exceed five percent. The anthracite shall have an effective size of 0.8 to 1.2 mm and a uniformity coefficient not to exceed 1.7.

2.3 FIBERGLASS TROUGHS

A. General

1. There shall be furnished and installed where shown on the plans three (3) washwater troughs in each filter. Each trough shall have a capacity of 2647 GPM at a minimum freeboard of 2". Each trough shall be at least 18 inches wide, and 23 inches deep, having straight vertical sides, and a rounded bottom. The troughs shall be manufactured by Fiberglass Fabricators, Inc., Automated Process Systems, Inc., or approved equal.

B. Design Criteria

1. The washwater troughs shall be designed to withstand all downward loads including the weight of the troughs, attachments and appurtenances as well as the weight of water in the troughs. The washwater troughs shall be designed to withstand the buoyant upward forces of the water and lateral forces.

C. Materials of Construction

1. Top edges of each trough shall be straight with no more than 1/8" deviation from a true plane. Longitudinal stiffening ribs shall be integrally molded on the outside of the troughs to assure rigidity. Sufficient plastic spacer rods shall be included to maintain a uniform width over the entire length of each trough.

2. Each trough shall be laminated of NSF 61 Listed fiberglass reinforced polyester resin to a minimum thickness of ¼". The inside surface of each trough shall have a smooth gel coat finish with no exposed glass fibers. Color shall be molded in and an ultraviolet inhibitor provided. All fasteners shall be Type 304 Stainless Steel.

3. Each trough shall be designed to support the applied water loadings and shall be made of laminate with the following minimum physical properties:

Tensile Strength	14,000 psi
Flexural Strength	25,000 psi
Flexural Modulus	10 x 106 psi

4. A 2" wide, ½" thick wall grouting rib shall be molded to the outside of each trough at the gullet end to act as a water stop when the trough is grouted in place. Slotted holes shall be provided on the closed end of each trough to allow a minimum vertical adjustment of 1 inch.

5. Each trough shall be set in place with weir edges at elevation shown on the plans. Weir edges shall be leveled to within 1/16" of true horizontal over their entire length. Each trough shall be grouted in place after leveling.

2.4 AIR SCOUR SYSTEM

A. General

1. The new filter shall be constructed with an air header system to operate from the existing filter air scour blower installed with the three existing filters.

B. Design Criteria

1. The filter air scour system shall provide for proper cleansing of the filter media at air flow rates of 2.5 SCFM/SF or less. The filter air scour system shall be capable of being installed and removed within the filter units by immersing the unit in a fluidized bed.

C. Materials of Construction

1. The air scour system shall consist of an air header, lateral piping and air diffusers. All individual components shall be interlocking to form a complete and independent operating system.

2. The air scour system shall consist of Schedule 5 Type 304 stainless steel headers and fitting drilled to accommodate 18 gauge stainless steel laterals by means of transition pieces. Each lateral shall be complete with unitized air diffusers.

3. The air scour system shall be designed to accommodate installation without the need for lower support and securement hardware for air scour modules located within the filter bed. Systems requiring lower support and securements hardware shall not be allowed.

4. Each air diffuser assembly shall be of one piece Type 304 stainless steel construction. Each diffuser assembly shall contain a metering orifice. The metering orifice shall open into a larger chamber in the body of the diffuser with Type 304 stainless steel screens at the discharge ends.

5. Screen and chamber shall be sized as required to prevent clogging by media or extraneous material. Plastic air diffusion nozzles with or without detachable caps shall not be allowed.

2.5 FILTER CONSOLE

A. The filter console shall be a 36” wide by 15” deep and 38” high and constructed of 14 gauge 304 stainless steel. The console shall be continuously welded and ground smooth with a solid bottom and back and side panels. The top shall be ergonomically designed so the operator can stand, observe the filter backwash, and control filter operations. The console shall be Hoffman, Catalogue CFC383616SS or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all equipment in strict accordance with the manufacturer’s drawings, instructions and recommendations as approved by the Engineer.

3.2 FILTER UNDERDRAIN

A. The filter underdrain manufacturer shall install the filter underdrain system and assume responsibility for the underdrain system to include concrete, rebar, form work, and porcelain spheres for all filters.

B. Care shall be exercised in preparing the filter floor slab and in setting the rebar to assure proper alignment and elevation. Steel reinforcing rods for the pier construction and manways shall be furnished by the underdrain manufacturer for installation by the Contractor.

C. The ledges on the periphery of the filter basin shall be formed as detailed on the plans. The support piers shall be carefully formed and poured with 5,000 psi concrete. Support piers are to be constructed as shown on the plans. Piers are to be level with each other and the peripheral ledge. Maximum concrete aggregate shall be ¾”.

D. The monolithic Wheeler bottom underdrain shall be constructed as detailed on the shop drawings and poured with 5,000 psi concrete. Maximum concrete aggregate shall be ¾”. Portland cement shall be Type I and water used in mixing shall be potable.

E. All underdrain structural forms shall remain for a minimum of 28 days prior to removal. Following the underdrain installation, the system shall be completely cleaned and washed free of all loose materials and debris.

F. The filter underdrain shall be tested with clean, clear water from the backwash supply as per the recommendations and instructions of the Manufacturer.

G. The underdrain shall be installed by the manufacturer.

3.3 FILTER MEDIA

A. The Contractor shall install the filter media in strict accordance with the Manufacturer's installation drawings, instruction and recommendations.

B. All gravel, sand and anthracite depths shall be marked on the filter unit walls. The filter gravel shall be washed once prior to the addition of the filter sand to the filter.

C. Sufficient quantities of filter sand and anthracite shall be furnished so that the finished depths correspond to the specifications once the filter beds have been backwashed and skimmed of fines.

D. The filter sand and anthracite shall be backwashed and skimmed a minimum of three (3) times each in order to remove all fines. The filling of the filter with water shall only be permitted using the backwash supply. Extreme care shall be employed to ensure a slow removal of all entrained air from the filter bed prior to increasing the backwash rate to maximum. Once the air has been removed from the filter bed, the backwash rate can then be increased.

E. All filter media shall be sampled and tested prior to shipment in accordance with the latest version of AWWA B-100. Media shall be sampled on site upon arrival of all media and prior to placement in the filter. Media shall be tested for all specific values. Filter media will be tested by an independent laboratory and the results submitted to the Engineer for approval prior to placement in the filter. Each truckload of media will be sampled and tested, and a composite sample of the project quantity for each media shall be sample and tested.

F. On-site sampling shall require composite sampling. Composite samples shall be reduced to representative samples by the use of quartering in a 40 cu.ft. box and a mechanical splitter. Samples shall be weighed, bagged, and sealed on site and forwarded to an independent testing laboratory for testing. Sampling shall be performed by a firm specifically experienced in filter media sampling and shall submit proof of qualifications and experience in similar projects.

G. The installing Contractor shall provide all labor and materials required to disinfect each of the filter beds prior to placing the units in service. Only products approved for the disinfection of potable water shall be used to disinfect the filters and the product shall be calcium or sodium hypochlorite. All filter disinfection shall be performed in accordance with ANSI/AWWA C653.

3.4 FILTER TROUGH

A. Each trough shall be set in place with weir edge at elevations shown on the plans. Weir edges shall be leveled to within 1/16" of true horizontal over the entire length. Each trough shall be grouted in place after leveling.

3.5 AIR SCOUR SYSTEM

A. The Contractor shall install the filter air scour system in strict accordance with the Manufacturer's installation drawings, instruction and recommendations. The Contractor shall obtain the services of a field supervisor employed by the filter air scour manufacturer for the supervision of Contractor's installation and startup. All necessary precautions recommended by the Manufacturer and as specified herein shall be followed to ensure that the air distribution system and piping connected thereto is completely clean and fee of any debris, dirt, or other foreign materials which could clog the system or interfere with flow. Piping shall be flushed with air only.

B. Following installation of air supply piping within the filter units, the individual modules shall be assembled on top of the filter bed. Once assembled, the individual modules shall be positioned and the

backwash flow started and maintained until the filter bed is fluidized and the modules are lowered into place. The modules shall then be connected to the air supply piping using fittings furnished by the Manufacturer.

C. The air scour system shall be tested in the air only mode at 2.5 SCFM/SF with six inches (6") of water over the filter bed. Test flow rates shall be sustained for approximately two (2) minutes while visual observations are made. Tests shall be extended or repeated if required.

D. During each test, the water surface shall present a uniformly turbulent appearance, without dead spots or boils. The Contractor shall take such measures as are necessary to correct any deficiencies revealed by these tests, and shall repeat the specified tests until such deficiencies are corrected.

3.6 DISINFECTION

A. After all work is completed and before each filter is placed into service, the owner will disinfect the facilities by chlorination in accordance with AWWA C653. Note Section 02510 of these project specifications also apply. Following disinfection of each filter and piping, the owner will filter to waste to remove highly chlorinated water prior to sampling. The filter to waste procedure will continue until normal filter effluent turbidity and chlorine residuals are indicated. Two bacteriological samples will then be collected from the respective filter effluent tap following the filter modifications - samples must be collected at least 24 hours apart and sent to a laboratory certified by the Division of Consolidated Laboratory Services for analyses. Following receipt of two successful coliform absent bacteriological tests, the owner may place the respective filter in operation. If coliform bacteria is present in samples, the disinfection procedure will need to be repeated until two coliform absent samples are indicated.

3.7 MANUFACTURER'S SERVICES

A. The filter underdrain and air scour manufacturer as well as the media and trough suppliers shall maintain a qualified staff of factory trained field service personnel. This staff shall include regular, full-time employees of the Manufacturer with suitable training and experience with installation of the type of equipments being supplied.

B. Installation of the filter underdrain shall be performed by the Manufacturer

C. Supervisory Services

1. Supervisory services of a factory trained field service Engineer shall be provided for the following equipment.

    a. Support Gravel and Filter Media
    b. Washwater Troughs
    c. Air Scour System (installation)
    d. Air Scour System (testing)
    e. Final Review and Start-Up

D. Equipment supplier shall submit written certification to the Engineer as soon as the installation is complete and tested where applicable that the installation is complete and that the equipment is ready for normal operation.

E. Should the equipment not be satisfactorily installed or is not ready for normal operation, submit a list of corrections to be made.

3.8 Warranty

A. The manufacturer shall warrant the equipment being supplied against defects in workmanship and material for a period of one (1) year from date of final water treatment plant acceptance by the Owner.

END OF SECTION

SECTION 11240 - CHEMICAL FEED EQUIPMENT

PART 1 – GENERAL

1.1 – DESCRIPTION

1. Work Included: Provide all equipment for the chemical feed system. The whole work shall be done as shown on the plans and as specified hereunder.

PART 2 – PRODUCTS

2.1 PROCESS CHEMICALS

1. General: The following chemicals shall be provided by Owner for process treatment. Sodium Bisulfate is used to dechlorinate waste stream water prior to discharge to the outfall. All other chemicals shall be NSF 60 approved for potable water treatment. All potable water chemical feed equipment in contact with water or chemicals shall be NSF 61 approved.

Chemical	Solution Strength	Application
Sodium Hypochlorite	12.5%	Disinfection
Hydrofluosilicic Acid	23%	Fluoridation
Soda Ash	Dry	pH/Alkalinity Adjustment
Sodium Bisulfite	40%	Dechlorination

2.2 HYPOCHLORITE FEED EQUIPMENT

1. Metering Pump: A total of six (6) hypochlorite metering pumps shall be provided. Five (5) pumps shall be installed as shown on the plans, with the sixth provided as a shelf spare. Metering pumps shall be positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pumphead, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings. Pump roller and tube assembly shall provide integral anti-siphon protection. Pump shall be Blue-White FLEXFLO M3 or A3 model with Flex-A-Prene tube and shall be approved for use with 12.5% sodium hypochlorite. Pump shall be capable of meeting the following design point:

   33 gph @ 30 psi backpressure

   Pump shall have no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only. Pump shall be capable of 24-hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure. Pump shall be capable of running dry without damage and operating in either direction without output variation. Suction lift shall be 30 feet of water. Pump shall be warranted by the manufacturer for a period of five years.

Pump shall include the following inputs and outputs:

a. Run Input (DI)
b. Speed Reference (AI)
c. Flow Rate Output (AO)
d. Pump Fault Alarm (DO)
e. Tube Failure Alarm (DO)

2.3. HYDROFLUOSILICIC ACID FEED EQUIPMENT

1. Metering Pump: Three hydrofluosilicic acid pumps shall be provided and installed as shown on the plans. Metering pumps shall be positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pumphead, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings. Pump roller and tube assembly shall provide integral anti-siphon protection. Pump shall be Blue-White FLEXFLO M1 or A1 model with Flex-A-Chem tube and shall be approved for use with 23% hydrofluosilicic acid. Pump shall be capable of meeting the following design point:

   3.09 gph @ 50 psi backpressure

   Pump shall have no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only. Pump shall be capable of 24-hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure. Pump shall be capable of running dry without damage and operating in either direction without output variation. Suction lift shall be 30 feet of water. Pump shall be warranted by the manufacturer for a period of three years.

   Pump shall include the following inputs and outputs:

   a. Run Input (DI)
   b. Speed Reference (AI)
   c. Flow Rate Output (AO)
   d. Pump Fault Alarm (DO)
   e. Tube Failure Alarm (DO)

   Pump shall include power cable and signal cables for inputs and outputs.

2. Chemical Storage Tank: Solution tank shall have minimum volume as shown on the plans and shall be constructed of clear high density cross-linked polyethylene with graduated volume markings. Tank shall have gas-tight threaded access cover and be provided with bulkhead fittings for suction and vent piping connections.

3. Spill Containment Berm: Spill containment protection in fluoride feed room shall be provided by a field installed vinyl covered foam core berm applied to the floor with chemical resistant sealant. Berm system shall include straight lengths, 90° corner bends, and end wall attachments. Berm shall have nominal 2” height with soft foam core designed for easy rollover with hand trucks, foot traffic, or other equipment. Berm system shall be PIG Build-A-Berm, or approved equal.

2.4. SODA ASH FEED EQUIPMENT

1. Metering Pump: Three soda ash metering pumps shall be provided and installed as shown on the plans. Metering pumps shall be positive displacement, peristaltic type hose pump with a 2 HP inverter duty rated motor, roller assembly located in the pumphead, and integral hose failure detection system. Pump roller and hose assembly shall provide integral anti-siphon protection. Pump shall be Verder Dura 35 model or

equal with NSF approved hose for use with soda ash solution. Pump shall be capable of meeting the following design point:

456 gph @ 200 psi backpressure

Pump shall have no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump hose assembly and connection fittings only. Pump shall be capable of 24-hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure. Pump shall be capable of running dry without damage and operating in either direction without output variation. Suction lift shall be 30 feet of water. Pump shall be warranted by the manufacturer for a period of two years.

Pump shall include the following inputs and outputs:

a. Run Input (DI)
b. Speed Reference (AI)
c. Flow Rate Output (AO)
d. Pump Fault Alarm (DO)
e. Tube Failure Alarm (DO)

Pump shall include power cable and signal cables for inputs and outputs.

Variable frequency drives rated for soda ash pump motor horsepower shall be provided and installed in existing soda ash pump control panels or in new replacement pump control panels.

2.5 DECHLORINATION METERING PUMPS

1. Metering Pump: Two dechlorination metering pumps shall be provided and installed to feed sodium bisulfite. Metering pumps shall be positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pumphead, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings. Pump roller and tube assembly shall provide integral anti-siphon protection. Pump shall be Blue-White FLEXFLO M3 or A3 model with Flex-A-Prene tube and shall be approved for use with sodium bisulfite or sodium metabisulfite. Pump shall be capable of meeting the following design point:

   33 gph @ 30 psi backpressure

   Pump shall have no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only. Pump shall be capable of 24-hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure. Pump shall be capable of running dry without damage and operating in either direction without output variation. Suction lift shall be 30 feet of water. Pump shall be warranted by the manufacturer for a period of five years.

Pump shall include the following inputs and outputs:

a. Run Input (DI)
b. Speed Reference (AI)
c. Flow Rate Output (AO)
d. Pump Fault Alarm (DO)
e. Tube Failure Alarm (DO)

2. Spill Containment Berm: Spill containment berm shall be installed for containment of spills from up to two 55 gallon chemical drums. Containment berms shall be of the soft rubber or foam wall type to allow loading dolleys to readily roll over the berm wall. Units shall include a removable grating base to protect the liner and raise the drums.

3. Accessories: Metering pump in Sludge Dewatering Building shall be provided with bracket for wall mounting, suction tube with weighted foot valve, and calibration column as detailed on the plans.

2.3 PIPING & ACCESSORIES

1. PVC Tubing: Tubing for chemical solution shall be clear PVC with braided polyester reinforcement. Tubing shall be utilize food grade resin and be NSF approved. Tubing shall be rated for a minimum 250 psi working pressure.

2. Pressure Tubing Fittings: Couplings and fittings for PVC tubing shall be compression style with grip ring rated for minimum 250 psi working pressure. Units shall be manufactured from PVDF, polypropylene, or other material recommended for compatibility with chemical solution and approved by Engineer. Units shall be of food grade material for potable water contact.

3. Retractable Injector: Chemical feed injectors shall be retractable design with lead free bronze corp stop, PVC quill, and either integral or separate check valve assembly. Injection assembly shall come complete with ball valve, solution tube, solution tube adapter, packing nut, safety chain and threaded inlet connection. Solution tube shall be for sufficient length to extend into the process pipe to between one third and one half the pipeline diameter. Injector should allow for rodding in place. Connection must include an acceptable safety device to prevent accidental withdrawal of injection solution tube while under pressure and/or surge conditions. All wetted components shall be compatible with the chemical services. Injector shall be rated for minimum 150 psi working pressure.

2.4 SCALES

1. Scale Platform: One day tank scale shall be provided for measurement of hydrofluorosilicic acid tank. Scale shall be of the digital readout/electronic load cell type. Scale platform shall be sized to accept tanks from 30” – 40” diameter. Platform height shall be no more than 3¼". Platform scale coating system shall be a minimum dry thickness of 80 mils and be resistant to moisture, chemicals, abrasion, impact and UV light. Scale shall be of the single load cell design. Weight shall be transferred via a pivoted platform to a single load cell of the shear beam strain gauge type. Flexible cable shall connect load cell to indicator to allow easy remote installation of the readout. Scale shall carry a Full Five (5) Year Factory Warranty. Scale shall be Force Flow Drumm-Scale, or approved equal.

3. Controls: Scales shall be provided with advanced indicator and usage recording control unit. Indicator shall be housed in a NEMA 4X, UL approved enclosure. Indicator shall have a 20 key digital keypad & ability to display 2 scales at a time on a backlit alphanumeric display. If more than 2 scales are being monitored, display shall automatically scan all scales in the system. Indicator shall have adjustable 4-20mA signals that output net weight and chemical feed rate for each scale. Indicator shall display an alarm in any of the following conditions: Low level, high level, low feed rate, high feed rate, max daily use, min daily use, supply exhausted and load cell failure. An alarm log shall store the most recent 10 alarm

conditions with time and date of occurrence. A minimum of two relays shall be provided for remote alarm indication. Indicator shall be enabled with MODBUS protocol for remote RS-485 serial communications.

Both a numerical and a bar graph display shall give operator the ability to monitor chemical by weight, volume or percent full. Each channel shall have a user selectable, two digit scale ID number and shall display net remaining, pure chemical remaining, feed rate, daily usage, total amount used, days until empty, gross weight and tare weight. A data log shall store the DAILY USAGE for each of the previous 31 days. Indicator re-calibration in the field shall be accomplished through the keypad and shall not require the use of dead weights. Control indicator shall carry a Full Five (5) Year Factory Warranty. Control indicator shall be Force Flow Wizard 4000, or approved equal.

2.5 PUMP WALL SHELF

1. General: Wall shelves for pump mounting shall be constructed of fiberglass grating with angle support brackets. Grating shall be molded fiberglass with minimum 1" thickness in either yellow or grey color. Grating shall be molded to the minimum sizes indicated on the plans with closed edges on front and sides. Shelf wall brackets shall be 2 ½" wide heavy duty bracket constructed of steel or aluminum with angle support and protective coating. Bracket shall be Original Granite Bracket LS or LSI series, or equal.

PART 3 – EXECUTION

3.1 INSTALLATION OF NEW CHEMICAL EQUIPMENT

1. General: All specified equipment shall be installed in accordance with the manufacturer's instructions and at the locations shown on the plans.

END OF SECTION

SECTION 11310 WASTEWATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall furnish, install, test and place in satisfactory operation, as shown on the Plans and specified, wet-pit submersible pumps complete with all appurtenances, accessories and spare parts as will be required to produce a complete and workable installation.

1.2 SUBMITTALS

A. Submittals shall be provided showing Total Dynamic Head, Pump Efficiency, Brake Horsepower, Power Input to Electric Drive Motor of Pumping Unit for the various conditions under which the units are to operate along with descriptive data and specifications describing in detail the construction of the complete units. Shop drawings shall be provided showing all weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.

B. The manufacturer shall have a minimum of five installations of the exact combination of pump and motor model proposed to be furnished for this project. Installations must be in operation for a minimum of five years and shall list the pump model, motor model and horsepower, date of installation, duty point, and contact information including telephone number. A list of these installations shall be furnished to the Engineer with submittals.

PART 2 - PRODUCTS

2.1 GENERAL

A. The sludge pumping station units shall be vertical, non-clogging, centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be direct driven by integral squirrel cage, electric induction motors. Each pump shall include motor, bearings, quick removal system, anchor bolts and all accessories specified herein. Pumps shall be Flygt Model NP 3127 MT, or approved equal.

B. Pump Performance: Each pump shall be capable of the following performance:

1.	Primary Duty Point Flow (gallons per minute):	500 GPM
2.	Total Dynamic Head at Primary Rating Point (T.D.H):	40 FT TDH
3.	Minimum Hydraulic Efficiency at Primary Rating Point:	70 %
4.	Minimum Motor HP:	10 HP (Non-Overloading on Full Curve)
5.	Maximum Motor speed (RPM):	1780 RPM
6.	Minimum Shut off Pressure (Ft.):	68 FT. TDH
7.	Discharge Diameter:	6” (or 4” w/ 6”x4” Eccentric Reducer)

C. Volute: The volute casing shall be constructed of ASTM A48 minimum Class 40B cast iron (GG25) capable of prolonged resistance to raw sewage. Suction and discharge flanges shall be 125# and meet ANSI standard B16.1. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel. All mating surfaces requiring a watertight seal shall be machined and fitted with Buna-n O-rings.

D. Impeller: Pump impellers shall be of the solids handling non-clog type. The impeller vane shall be smooth, finished throughout, and shall be free from sharp edges. Pump impellers shall be manufactured from ASTM A48 Class 40B cast iron (GG25). Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation. The impeller shall be capable of passing a three inch solid non-deformable sphere through the bottom inlet and out between the two shrouds.

E. Wear Rings: The impeller shall be provided with an AISI 329 (1.4462) duplex stainless steel wear ring which is drive fitted to the suction eye of the impeller. The impeller wear ring shall be hardened to a Brinell hardness of 200-250.

The casing shall be provided with an AISI 304 (1.4308) stainless steel wear ring which is drive fitted to the bottom suction inlet. The volute wear ring shall be hardened to a Brinell hardness of 275-325.

F. Submersible Motors:

1. Each pump shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with all variable frequency drive systems.

2. Motors shall be certified for variable frequency drive systems without de-rating the motor output power. The motors shall be capable of installation in either the wet pit or dry pit installation without adding or removing any items to the motor’s interior or exterior.

3. The motors shall be air or oil-filled with moisture resistant NEMA Class F or H insulation and Class H slot liners and constructed to NEMA B design standards. The copper wound stator shall be triple dipped in epoxy enamel and baked to withstand a temperature of 155 degrees (or 180 degrees) Centigrade as defined in NEMA Standard MG-1. Each winding phase or layer shall be laced with type H glass lined paper. The use of cable ties to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum amortisseur bars and short circuit rings. The constructed motor shall be certified for continuous duty with a service factor of 1.15 and shall be non-overloading for the primary and secondary duty point – or- shall be non-overloading over the entire range of the impeller.

4. Motors shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.

5. Motors shall be capable of uninterrupted operation with a voltage drop of 10%.

6. The power cables entering the motor housing shall connect to individual terminal pins, which separates the incoming service from the pump motor.

7. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with two (2) thermal switches, embedded in the end coils of the stator and spaced directly across from each other in the stator. Thermal switches shall automatically de energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.

8. The pump manufacturer's nameplates shall be engraved or stamped on stainless steel and fastened to the motor casing with stainless steel screws or drive pins.

G. Shafts: Pump shafts shall be AISI 420 (1.4021) stainless steel. The shaft shall be one piece construction without joints or stubs attached. Multiple row lower bearings for axial thrust and a single row upper bearing for radial thrust shall support the motor/pump shafts. Bearings shall be sized to provide a

minimum L-10 life of 50,000 hours anywhere on the flow versus head curve. Thrust bearings shall be restrained from thrust in both directions.

All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. The oil contained and circulated in the motor shall lubricate all pump/motor bearings. Grease lubricated bearings shall not be provided or acceptable.

H. Mechanical Seals: Each pump shall be provided with an enclosed block mechanical seal with the seal housing and spring system constructed of 316 stainless steel. The block seal housing shall be constructed such that it can be dismantled allowing the seal faces and springs to be renewed and the seal system to be put back into service. Cartridge seals constructed such that they cannot be repaired or renewed shall not be acceptable. Both upper and lower seal faces shall be silicon carbide versus silicon carbide.

The seal shall be mounted in a separate and isolated seal chamber. The seal chamber shall be filled with non-conductive lubricating oil as recommended by the manufacturer.

A moisture sensor shall be furnished to sense seal failure for each pump. This sensor shall be wired to the Pump Control Panel and shall activate an alarm light upon seal failure. The sensor probe shall be mounted in the seal chamber and shall be of the conductive type, sensing moisture intrusion above the lower seal, but below the upper seal.

I. Power and Control Cables: Power and control cables shall be furnished in lengths to run unspliced from the pump to the pump control panel. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be provided to confirm that all strands of each conductor is terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.

Cables shall be of the "SO" type and shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The cables shall enter the pump through a heavy duty galvanized cast iron entry assembly which shall be provided with an external clamp assembly to protect against tension once secured providing a strain relief function as part of standard construction.

The cables for each pump shall pass through the galvanized cast iron strain relief component and then through a series of stainless steel disks and Buna-n grommet that is sandwiched between the disks to control compression of the grommet. These components shall work to compress the cable jacket by the inner diameter of the grommet while the outer diameter of the grommet seals against the inside surface of the cable entry chamber in the top of the motor.

J. Removal System: The removal system shall consist of a discharge base elbow that mounts in the bottom of the wet pit, a replaceable pump coupling, guide pipes and supports and hardware as required for a complete and operational system. Connections to piping shall be standard ANSI flanges.

The ASTM A48 Class 30B or higher cast iron discharge base elbow shall be provided to support the full weight of the submersible pump in the installation and provide a leak proof connection in which the pump coupling mates using a conformed Buna-N seal which is held in place by the combined weight of the cantilevered pump and motor. The hydraulic pressure generated while the pump is in operation also aids the sealing. The discharge base elbow shall be provided guide pipe retention lugs.

The pump coupling shall be close grained gray cast iron construction. The coupling shall be located between the pump discharge flange and the vertical face of the discharge base. The purpose of the coupling shall be to allow use of a standard ANSI drilled pump-casing flange on the pump. The coupling acts as the intermediate part between the pump and the discharge base. The coupling vertical face is designed to seal against the vertical face of the discharge base using a replaceable Buna-N elastomeric compressible one piece seal that acts as both the discharge face seal and the gasket between the coupling and the pump flange.

Guide rails constructed of 304 stainless steel and supported by upper and intermediate brackets of 316 stainless steel shall guide each pump. The guide rails shall consist of standard dimension schedule 40 piping with a minimum diameter of 1-1/4"" and a maximum diameter of 4". The guide rails shall be supported by a 316 upper guide rail bracket that will be mounted in the opening of the access cover to support and guide the pump/motor into and out of the wet well. Intermediate guide rail brackets will be provided for all installations deeper than 20 ft, or as recommended by the manufacturer.

Each pump shall be supplied with a lifting chain of 316 Stainless Steel, rated for 5 times the installed pump and coupling weight. The manufacturer shall provide information on recommended testing parameters that shall keep the lifting system capable of service for the life of the station. Recommendations shall be in written form and shall be discussed during startup training for the installation.

K. Shop Painting: Shop apply to all exterior ferrous surfaces of the pump and motor with primer and finish coat. Shop apply to exterior and interior surfaces of elbow. Coating shall be Solvent-free ceramic coating, impregnated with aluminum oxides.

L. Pump Protection Relay Modules: Pump supplier shall provide over-temperature and seal monitoring protection relay modules as recommended for to ensure proper operation with pumps. Protection modules shall be provided to control panel supplier for integration.

PART 3 - EXECUTION

3.1 WARRANTY

A. Warranty: The pumps and motors will be covered by a full five (5) year non-prorated warranty that shall comprise the following terms: The initial 5 years from start-up of the equipment shall be covered 100% for parts and labor. This warranty shall not be limited by hours of running time or operation from variable speed drives.

3.2 START-UP SERVICES

A. Field Service: The services of a factory trained field service technician shall be provided to inspect the completed installation, make all adjustment necessary to place the system in satisfactory operation and instruct the operating personnel in the proper care and operation of the equipment.

The field tests shall determine the head, discharge flow and overall efficiency characteristics of each pumping unit and in addition, shall demonstrate that under all conditions of operation each unit:

- Has not been damaged by transportation or installation.
- Has been properly installed.
- Has no mechanical defect.
- Is in proper alignment.
- Has been properly connected.
- Is free of overheating of any parts.
- Is free of all-objectionable vibration and noise.
- Is free of overloading of any parts.

3.3 SPARE PARTS

A. The manufacturer shall furnish one set of the following spare parts:

1. Impeller and casing wear rings
2. Mechanical seal or seal repair kit with all seal faces and o-rings
3. Upper and Lower Bearings set
4. O-Ring Set

B. A written description of each spare part and the storage recommendation shall be provided.

3.4 INSTALLATION

A. The CONTRACTOR shall install all equipment in strict accordance with the manufacturer's recommendations. The CONTRACTOR shall supply all equipment and accessories not specifically provided by the manufacturer but required for satisfactory installation and operation.

END OF SECTION

SECTION 11390 SLUDGE DEWATERING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. The contractor shall furnish and install the centrifuge and associated piping, conveyors, valves, controls, wiring, appurtenances, and spare parts as will be required to produce a complete and workable installation and meet the specified minimum performance and quality requirements.. The centrifuge system specified in this section shall be provided by a single manufacturer to ensure coordination and compatibility of equipment. The contractor shall be responsible for insuring a complete and operable centrifuge and conveyor system.

B. Equipment furnished and installed under this Section shall be fabricated, assembled, erected and delivered in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted and approved by the engineer prior to installation. Any request for exceptions to any specification and/or stated requirement must be submitted and received a minimum of 10 working days prior to bid date. All work associated with accommodating alternate equipment, shall be at no additional cost to the owner, including but not limited to engineering fees and all construction change cost.

C. All equipment shall be factory assembled and tested prior to shipment to ensure proper operation of all systems, and be readied for field connections as shown on the project drawings. Any and all parts that may be easily damaged during shipping, storage and installation and that can be easily field assembled after installation shall be packaged separately.

1.2 SUBMITTALS

A. Submit Shop Drawings for all supplied equipment and controls in accordance with Section 01330 – Submittals. Complete assembly, foundation, and installation drawings, together with detailed specifications and data covering materials used, power drive assembly, parts, instrumentation devices and other accessories forming a part of the equipment furnished shall be submitted for review. The following information shall also be submitted with shop drawings.

1. Detailed drawings and descriptions of all items of equipment, including centrifuge control panels, showing all dimensions, parts, construction details, and materials of construction signed and stamped by a professional engineer registered in the United States of America and directly employed by the centrifuge manufacturer.
2. All weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.
3. Complete motor rating including all nameplate data; guaranteed minimum rated efficiency, and speed torque curves.
    a. Complete electrical system drawings and description including, but not limited to, the following:
    b. Complete system interconnection diagrams between power supply, control panels, drive motor, secondary drive motor, and all ancillary equipment connected to control system, including terminal number connection points.
    c. Control panel overall dimensions and layout of external and internal mounted components.

d. Complete electrical schematics with power wiring and control wiring in accordance with current standards, schematics shall include all component ratings.

e. Description of control system in written form including functions monitored, controlled, and alarmed. Include sequence of operation and interface requirements.

f. Control component itemized information and data.

4. Certified calculations of AFBMA L-10 bearing life.

5. Type of lubrication recommended for all equipment.

6. Information on field and installation requirements, including mounting and access requirements and total weight of each component and each complete assembly.

7. List of spare parts to be furnished.

8. Statement for machine warranties.

B. Submit Operation and Maintenance Manuals and Data for all supplied equipment and controls in accordance with Section 01330 – Submittals.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Protect equipment and controls from dirt and damage.

C. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

1.4 GENERAL SYSTEM DESCRIPTION

A. Only pre-approved units meeting minimum performance requirements as well as minimum system requirements shall be considered acceptable. The unit shall be the model D4L as manufactured by Andritz Separation, or "equal". Any "equal" product shall perform a full scale on site pilot demonstration confirming ability to meet performance requirements.

B. Performance Requirements: The centrifuge shall operate within the design criteria conditions listed in this section 1.04 and meet the following performance criteria:

1.	Number of centrifuge(s)	One (1)
2.	Maximum flow rate (GPM)	> 25 gpm
3.	Maximum solids loading (dry lb/hr)	1,100 lb/hr
4.	Minimum dewater sludge solids (% TS)	30%
5.	Minimum solids capture (% TSS)	97%
6.	Maximum polymer dosage (Active lb/ton)	15 lb/ton

C. Design Criteria: The centrifuge shall be designed to extract water from the sludge specified herein after conditioning of the sludge with a polymer solution. The process of dewatering shall produce a finished sludge product based on the following design requirements:

a.	Type of Sludge	Potable Water Treatment Sludge (River Source)
b.	Solids Concentrations (% TSS)	4% - 9%
c.	pH	7.0 – 8.0
d.	Sludge Volume Index (SVI)	37

1.5 QUALITY ASSURANCE

A. All equipment specified under this Section, shall be furnished by a single manufacturer, who is fully experienced, reputable, and qualified in the production of the major equipment items to be furnished. The manufacture shall be responsible for the overall sludge dewatering and conveying system as noted.

B. Other than the named suppliers, all bidders proposing equipment described herein, shall provide a detailed qualification submittal package which shall consist, at a minimum of all information and details prescribed in Section 1.05 of this specification.

C. If submitted equipment requires arrangement differing from that indicated on the drawings or specified, prepare and submit for review complete structural, mechanical, and electrical drawings and equipment lists showing all necessary changes and detailing all special features of equipment proposed with pre-qualification package required above. Any changes are at no additional compensation and the bidders shall be responsible for all necessary engineering costs for redesign by the Project Engineer.

D. Only those manufacturer's capable of providing irrefutable evidence of a minimum of five (5) years experience in the manufacture and installation of the exact model proposed and ten (10) North American operating installation references with a minimum of five (5) years operating history of the exact model proposed shall be considered.

E. Alternate "or equal" manufacturers shall perform a full scale pilot demonstration study to confirm ability of the equipment to meet the performance requirements. Demonstration study shall use a similar sized unit of exact model series proposed by the manufacturer and shall be completed at no cost to the Owner. Pilot demonstration study shall be performed before submittals are officially provided or approved.

PART 2 - PRODUCTS

2.1 Centrifuge

A. General: The centrifuge system shall consist of a horizontal solid bowl, fitted with an inner contoured scroll conveyor utilizing a cyclo gear speed inducer for changing the differential speed between the rotating bowl and scroll conveyor. Additional components included in this specification that are to be independently mounted include the control panel(s) and centrate deaerator. System shall include, as a minimum, all controls and instrumentation as specified herein and presented on the drawings. Materials and general design of the centrifuge systems shall be the manufacturer's standard, except as specified hereinafter. The centrifuge shall discharge to a screw auger and belt conveyor system to transport dewatered solids to the dry storage shelter.

B. Plans and contract documents are based on the Andritz Model D4L centrifuge system. Manufacturers proposing "or equal" centrifuges must meet all technical and mechanical requirements as specified herein and must comply with the pre-approval requirements and pilot demonstration requirements specified. Any changes to the installation due to use of another manufacturer will be at the bidder's sole expense.

2.2 Material of Construction

A. All wetted parts of the centrifuge contacted by process material shall be a minimum of 316 stainless steel except O-rings or abrasion-resistant materials. The O-rings shall be made of Buna-N Viton unless specific processes such as high temperature or food applications require alternate material. The centrifuge bowl shall be constructed of statically cast 316 or duplex stainless steel. The outer bowl cover shall be of reinforced fiberglass and of one-piece construction. The centrifuge conveyor shall be constructed of a minimum 316 or duplex stainless steel.

B. Miscellaneous hardware, including bolts, nuts, washers, and fastener clips, shall be ASTM A320, of 316L stainless steel.

C. No dissimilar metals shall be in direct contact unless properly electrically insulated with a 2 mm thick continuous neoprene gasket.

2.3 Components

A. Bowl

1. The centrifuge bowl shall consist of a horizontal cylindrical-conical assembly. To insure performance capabilities the minimum bowl diameter and length shall be 16.92 inches and 62.67 inches respectively. Proposed units with less than the specified bowl geometry shall not be acceptable. Maximum bowl speed shall be 3,600 RPM, driven by a 40 HP main drive, producing a gravitational force not less than 3,115 G's. The bowl shall be statically cast from 316L / duplex stainless steel. All welded joints shall be examined for cracks, porosity, or other defects by means of a liquid dye penetrate test. Bowl inspection report shall be supplied on request.

2. The front and rear bowl hubs shall be a minimum of 316 stainless steel, statically cast or fabricated from a solid piece of 316 stainless steel. The bowl shall be supported on a cylindrical roller bearing at both the feed and discharge ends of the machine. Each of which shall be fitted for convenient external, high speed grease lubrication.

3. The pond depth in the centrifuge bowl shall be adjustable through the use of adjustable weirs at the large diameter (front) end of the bowl where liquid is discharged. Pond depth adjustment by individually, specific dimensioned, interchangeable plate dams shall not be allowed. Cake solids shall be discharged from the small diameter (rear) end of the bowl, opposite from the liquid discharge.

4. The bowl shall be manufactured with longitudinal grooves integrally machined into the bowl wall that shall prevent circumferential slippage of the sedimented solids and provide for the formation of a protective cake solids layer. The bowl shall be warranted against wear for a period of up to 35,000 operating hours. Proposed equipment utilizing longitudal strips attached to the bowl wall in lieu of integrally machined grooves shall be provided with a spare bowl assembly complying with item five (5) below. The dewatered cake shall be discharged from the bowl through multiple cake discharge ports spaced evenly around the diameter of the small diameter end of the bowl. The solids discharge ports shall utilize weight balanced, field replaceable, mechanically attached wear nozzles. Nozzles utilizing chemical bonding or metallic brazing attachment methods are not acceptable.

5. The bowl shall be dynamically, independently balanced to allow for exchange of a replacement bowl without need for balancing of the assembled rotating assembly.

B. Scroll Conveyor

1. The centrifuge shall include a 316 stainless steel horizontal cylindrical-conical scroll conveyor supported by a spherical roller type thrust bearing at the feed (front) end and ball type bearings internal of the gearbox cake discharge (rear) end and shall be equipped with helical, open design

flights independently mounted concentrically within the centrifuge bowl. To insure maximum loading and dewatering efficiencies, solid, full depth flight designs are not acceptable. Bearings shall be protected by seals and be provided with grease fittings for lubrication. To convey sedimented solids to discharge, the internal scroll conveyor shall rotate at a slight differential speed from the bowl. The scroll will be driven by a 10 HP non connected load, power generating, alternating current back drive system.

2. Sludge feed shall be introduced to the bowl through a multi port feed chamber fabricated within the body of the scroll conveyor which evenly distributes the feed into the rotating assembly. The feed chamber wall assemblies shall be protected from abrasion wear by flame sprayed tungsten carbide hard surfacing. Replaceable urethane and inverted type accelerators within the feed chamber are not acceptable. The sludge feed shall enter the bowl from the feed chamber through multiple sludge feed ports spaced evenly around the diameter of the feed chamber. The sludge feed ports shall utilize weight specific, mechanically attached, field replaceable wear nozzles. Nozzles utilizing chemical bonding or metallic brazing attachment methods to the scroll body are not acceptable.

3. The scroll conveyor edge and face of the flights shall be protected against abrasion with full flighting length, weight specific, sintered tungsten carbide tile insert. The tungsten carbide tile insert shall be attached to a 316 stainless steel backing plate and the backing plate shall be attached to the conveyor flight by an electric welding attachment procedure. To eliminate tile backing plate detachment from the mother flighting, the wear tile assemblies shall not extend more than 5/16" past the top of the mother flighting. Wear tile hardness shall meet or exceed 2500 Vickers hardness and pass the requirements of ASTM G-65 testing procedures. A 15,000 hour wear guarantee shall be provided for the wear tile assemblies. In lieu of the 15,000 hour wear guarantee a spare, replacement scroll may be provided. Partial flighting length tile assemblies and flame sprayed configurations are not acceptable.

4. Tile wear shall be monitored by means of visual inspection. Measurable wear to the outer tile edge tips and face shall indicate service schedules. Tile replacement shall be capable of being made in the field without creating unbalanced conditions by removal of the old assembly and welding a new assembly in place.

5. The centrifuge conveyor shall be removable without disconnection and displacement of the main drive, backdrive or removal of the bowl from the unit's base framework.

6. The scroll shall be independently balanced at full operational speeds prior to shipment. Certification of the balancing procedure shall be provided from a professional engineer licensed in the United States of America. A verifiable scroll exchange and refurbishment program shall be provided to the end user as part of the centrifuge scope of supply. A verifiable reference that has benefited from the supplying manufacturer's scroll exchange program is required for approval of the proposed centrifuge supplier for this project.

C. Bowl Cover

1. The outer cover shall be molded of fiber reinforced plastic (FRP) material. The outer cover shall be protected from abrasion in the solids discharge area by a stainless steel inner shroud designed to resist abrasion and prevent direct contact of material with the outer cover. The inner casing shall be a minimum of 0.5" thick stainless steel. The wetted interior surface of the shroud shall be coated with tungsten carbide wear surfaces. The solids discharge inner shroud shall be field removable without removal or displacement of any rotating assembly component.

2. The outer cover shall be bolted directly to the main frame of the centrifuge.

D. Main Drive Motor

1. The centrifuge shall be furnished complete with a main / bowl drive motor utilizing a V-belt drive system. The main drive motor is to be rated for continuous duty and to have a horsepower output sufficient for operating conditions of maximum bowl speed and sludge feed rate. The motor

service factor is not to be used in determining a non-overload condition. The motor torque shall be adequate for all operating conditions.

2. The main drive motor shall be a minimum of 40 HP, 1800 RPM, 60 Hertz, 3 phase, 1.15 S.F. high efficiency design as manufactured by Baldor or equal.

3. The main drive motor shall include the following features:

   a. Frame motor

   b. TEFC

   c. Horizontal squirrel-cage type

   d. High efficiency

   e. Class F insulation

   f. 1.15 service factor

   g. Corrosion resistant rotor and stator

   h. Condensate drain

   i. Gasketed conduit box

   j. Low noise design

   k. Stainless steel nameplate

   l. Thermal switch

4. Sound level of the main drive motor not to exceed 80 dBA at a distance of one (1) meter as measured at the factory with all inlet and outlet openings closed, and running without any process liquids.

5. For easy access the drive belts and sheaves shall be covered with a molded fiber reinforced plastic (FRP) material protective guard independent of the main centrifuge cover.

E. Backdrive Motor

1. Each centrifuge shall be equipped with a backdrive system to allow the adjustment of the differential speed between the centrifuge bowl and conveyor during operation. The backdrive system shall utilize an AC/VFD arrangement meeting the following requirements:

2. The backdrive motor shall be a minimum of 10 HP, 1,750 RPM, 60 Hertz, 3 phase, 1.15 S.F. high efficiency design as manufactured by Baldor or equal.

3. The backdrive motor shall be mounted directly below and vertically in-line with the main drive motor. Due to space considerations, designs not utilizing a vertical in-line main and backdrive configuration will not be acceptable. Secondary or backdrive motors that operate as a connected load shall not be acceptable. Hydraulic backdrive shall not be acceptable.

4. The backdrive motor shall include the following features.

   a. NEMA frame motor

   b. TEFC

   c. Horizontal squirrel-cage type

   d. High efficiency

   e. Class F insulation

   f. 1.15 service factor

   g. Corrosion resistant rotor and stator

h. Condensate drain

i. Gasketed conduit box

j. Low noise design

k. Stainless steel nameplate

l. Thermal switch

F. Base: The centrifuge shall be supported on a fabricated carbon steel base mounted on vibration isolators. The vibration isolators shall be selected and provided by the manufacturer for the service required to isolate the centrifuge unit from the building structure. Isolators shall be specifically sized depending on bowl speed and service conditions so that they have a minimum dampening effect of 98% of all vibration loads in all directions. Machined surfaces shall be provided at all points where support loads are transferred to the base. Lifting holes in the base shall be provided as required for lifting of the base by overhead crane. Overall dimensions of the centrifuge shall not exceed 133 inches long by 43 inches wide by 59 inches tall. Total dry weight of the equipment shall be a minimum of 6,614 lbs.

G. Chutes & Connections: Chutes to direct the flow of discharged cake solids out of the solids casing shall be supplied by the installing contractor and be connected to the centrifuge solids casing via a flexible coupling. A centrate chute shall be provided by the installing contractor and directly coupled to the liquid outlet flange via a flexible coupling. All piping connections for the sludge feed slurry, wash water, polymer injection, cake solids and centrate discharge chute connections, shall be equipped with flexible sleeves fabricated from neoprene and designed such that no exterior loads are transferred to the other equipment. The centrifuge manufacturer shall provide the above referenced flexible connectors.

H. Feed Manifold: The centrifuge shall be equipped with 316L Stainless Steel manifold which shall contain a triple tap connector assembly supplied by the centrifuge manufacturer at the feed inlet providing for feed, polymer, sample, and wash water connections. Depending on site installation and application the installing contractor shall provide for alternate polymer injection points in the sludge feed piping as directed by the engineer or equipment manufacturer.

1. Sludge feed tap - Shall be a 2 inch ANSI Standard Flange

2. Sludge feed sample tap - Shall be a 1 inch female NPT with a 1 inch female full port 316L Stainless Steel ball valve for manual sampling

3. Polymer feed tap - Shall be a 1 inch female NPT

4. Wash water tap - Shall be a 1 inch female NPT with an electrically controlled solenoid valve

5. The minimum feed pressure shall be 7.5 psi at the centrifuge.

I. Sample Taps: Sample taps shall be provided by the installing contractor in the cake and discharge chutes addressed in paragraph G above. Sample collection points shall be oriented for easy access according to the installation site requirements.

J. Main Centrifuge Bearings: Two main bearings shall support the entire rotating assembly. Pillow block bearings shall be cylindrical roller, each of which shall be equipped with an external grease lubrication point. Bearings shall have an AFBMA L-10 life of 100,000 hours minimum.

K. Speed Reducer: Each centrifuge shall be equipped with a cyclo speed inducer unit which is used to achieve differential speed between the centrifuge bowl and conveyor. The speed inducer shall have a torque capacity to meet the expected service conditions and shall be capable of withstanding a 500% momentary overload and 150% intermittent overload. Torque overload control shall be provided to initiate centrifuge shutdown in the event of conveyor overload. Mechanical over torque protection devices are not acceptable. The centrifuge manufacturer shall select the reduction gear ratio as required for the solids to be handled and to be consistent with satisfactory operation. The gear unit shall be grease lubricated. All standard units shall be provided with seals of Nitrile-Butadiene-Rubber (NBR 3760). The

power transmitting elements shall be made of bearing steel, hardened, tempered and ground. A reinforced fiberglass safety guard / cover shall be provided to cover the speed inducer. The speed inducer shall be independently balanced to allow speed inducer replacement without re-balancing of the rotating assembly. Hydraulic, Viscotherm / Rotodiff, Eddy Current, or gearboxes requiring external lubrication systems will not be acceptable.

L. Machine Wiring: The centrifuge shall be supplied with the following NEMA 4X rated components: stainless steel terminal box, bearing temperature probes for the rotating assembly support bearings and vibration sensor. All components shall be wired complete to the terminal box excluding power leads for the centrifuge drive motors.

M. Wire runs from machine mounted electrical control components to the machine mounted terminal box shall be rigidly mounted to the centrifuge frame.

N. Main and backdrive motor field connections shall be flexible, meeting all applicable electrical codes and provided by the installing contractor.

O. Fasteners: All fasteners supplied with the centrifuge unit which are subject to contact with any process flow or cake discharge shall be 316 stainless steel.

P. Anchor Bolts: All anchor bolts and accessories necessary for equipment attachments and incorporation into the concrete supporting structure shall be supplied by the contractor, according to manufacturer's recommendations.

Q. Paint: All carbon steel surfaces shall be painted / coated to a minimum of the following criteria.

1. Minimum surface preparation of thorough removal of burrs, complying with SSPC-SP3 standards, sandblasting complying with SSPC-SP5 standards, and complete grease removal.
2. A minimum coating of primer utilizing a two-part, zinc chromate epoxy, anti-rust primer meeting AFNOR: FAMILY I Class 6b requirements. Each coat shall have a dry film thickness of 2.5 to 3.0 mils.
3. A minimum of one paint undercoat of epoxy, phenolic, polyamide coating meeting AFNOR FAMILY I Class 6b requirements with a minimum dry film thickness of 4 to 6 mils.
4. One finish coat of epoxy, phenolic, polyamide coating meeting AFNOR FAMILY I Class 6b with a minimum dry film thickness of 4 to 6 mils.
5. Total thickness of coatings must be a minimum dry film thickness of 12 mils.

2.4 POLYMER FEED/BLEND SYSTEM

A. The emulsion polymer dilution/feed system shall consist of an integrated equipment package capable of metering neat polymer, adjusting dilution water rate, activating and metered feeding of the activated polymer solution.

B. The system shall include the following components:

1. Mechanical liquid polymer activation/high shear mixer
2. Neat polymer metering pump
3. Dilution water inlet manifold with flow control
4. Low water pressure switch and solenoid valve
5. Miscellaneous equipment
6. NEMA 4X electrical enclosures

C. The mechanical hydrodynamic blending device specifically designed to dilute and activate emulsion, dispersion and solution type polymer with viscosities ranging from 200 to 3,000 cps. and active contents up to 50% shall be provided.

D. The liquid polymer activation mixing energy shall be staged such that it provides for high, non-damaging mixing energy over the full operating range of the system. The system shall be designed for use with either potable or non-potable dilution water.

E. System's which are "retention time dependent" - a system which is prone to induce insufficient or excessive mixing energy depending on flow rate and the subsequent retention time in the mixing chamber, or which utilize conventional static mixers shall not be considered. All components which require periodic maintenance shall be readily accessible.

F. Provide a diaphragm type or peristaltic neat polymer metering pump capable of viscous liquid. The pump shall have an output range of up to 8 GPH and mounted within the frame of the polymer system.

G. Provide a neat polymer check valve specifically designed to isolate neat polymer from dilution water. The valve shall be constructed of stainless steel, PVC and viton. The valve shall be readily accessible for cleaning.

H. The dilution water inlet assembly shall be connected to the skid water supply manifold, NEMA 4X dilution water solenoid valve, Rota-meter type flow meter, stainless steel liquid filled dilution water inlet pressure gauge. Bronze PRV water supply regulating valve. Post dilution shall not be required to meet total specified flow range.

I. The solution discharge assembly shall be plumbed into the polymer injection system, including a stainless steel liquid filled pressure gauge to monitor polymer injection pressure.

J. Provide an industrial duty differential pressure switch sensing loss of dilution water pressure rated NEMA 4. Pressure switches with plastic construction and or fittings or mechanically actuated switches shall not be acceptable. On loss of dilution water pressure the entire system shall shut-down an alarm will be displayed on the HMI touch screen. Manual restart is required after fault is acknowledged.

K. An enclosed polymer aging tank shall be mounted within the skid frame allowing additional time for the polymer to activate.

2.5 SLUDGE FEED PUMP

A. A positive displacement rotary lobe sludge feed pump design shall be used to provide adjustable and even feeding of the sludge stream to the press.

B. The inlet connection to the pump shall be a 4" ANSI 150# flange.

C. The pump shall be driven by a variable frequency drive motor with a minimum service factor of 1.15, rated for wash down service mounted to a in line helical reduction box with a minimum service factor of 1.5, coupled to the input shaft of the sludge feed pump. This combination shall be mounted on one common base and securely fastened to skid base.

D. The sludge feed pump shall be capable of supplying 125% of the specified maximum capacity of sludge flow rate. The pump shall be able to accomplish this at a maximum speed not to exceed 400 rpm.

E. Sludge pump speed shall be able to be controlled from the main operator control panel and interconnect with the polymer feed/blend system for automatic adjustment when selected by the operator.

2.6 FLOW METER

A. The skid system shall have a magnetic type sludge flow meter mounted in the main feed piping to the sludge retention piping.

B. The flow meter shall be connected to the PLC in the main control panel for sludge readouts, and process totalizer calculations.

2.7 DRY SLUDGE CONVEYOR

A. Furnish one auger and belt cleated belt conveyor system to transport dewatered solids from the centrifuge to the discharge locations in the dry solids shelter.

B. The conveyor control system shall be integrated into the sludge press control panel for integrated operation.

C. Centrifuge supplier shall be responsible for coordinating all integration between the centrifuge and the conveyor, including controls, discharge location and load point skirting, and locations and dimensions of the centrifuge unit and conveyor system to ensure integrated operation and lack of installation conflicts. Modifications necessary to integrate these systems into a completely functional centrifuge and conveyor system shall be made at no expense to the Owner.

D. The conveyor motor shall be totally enclosed fan cooled TEFC, and generally rated for severe duty. The motor shall be connected to an AGMA Class II, helical gear shaft mount reducer.

E. Belt conveyor bend areas shall be supported on the carrying side of the belt by a series of 4” diameter polymeric stub can idlers at the belt edge (three per side).

F. Pulley bearings shall be self-aligning, double row, regreaseable roller bearing pillow blocks with jackscrews for alignment. Tall pulley to be supported by screw takeup assemblies with 12” travel.

G. The conveyor belt shall be 24” wide, 2 ply, 220 P/W cross-rigid belting with 1/8” x1/16” oil resistant covers and 3” high sidewalls, recessed from the belt edge to result in an effective belt conveying with of 14.5 inches, and 2-1/2” cross cleats on 18 inch centers.

H. Idlers shall be CEMA Design-C, 5” diameter flat carrying and return idlers with urethane coated rollers and regreaseable bearings. Load point idlers to be mounted on 18” centers. Remaining idlers to be mounted on 3’ centers. Return idlers mounted on 3’-6” centers.

I. Load point skirting (hopper plate) will be provided to direct the sludge for proper belt loading. Skirting shall be #12 gage type 304 stainless steel with hot dipped galvanized supports to the conveyor frame.

J. The drip pan belt cleaner shall be #16 gage 304 stainless steel, six inches wider than the overall belt width. A 1 HP motorized belt rapper shall be mounted near the head pulley.

K. The conveyor system shall include a safety stop switch with orange vinyl coated cable pull cord.

L. Conveyor frame and supports shall be fabricated from mild steel structural shapes and plates with spreaders as required. Frame and supports shall be hot dip galvanized after fabrication. Supports shall be located as required by the manufacturer for a complete and stable installation.

M. Finish: Fabricated mild steel items to be hot dip galvanized after fabrication. Stainless steel and non-ferrous components shall remain unfinished. Component hardware to have manufacturer’s recommended finish. Shafting and other exposed machined surfaces to be coated with a rust inhibitive compound.

N. Wall Opening: A rubberized mounting seal with air flaps shall be provided to seal the wall opening penetrated by the conveyor assembly

2.8 INSTRUMENTATION AND CONTROL

A. General: The control system shall be complete with one (1) industrial grade control panel.

B. Centrifuge Control Panel (CCP)

1. The CCP shall be a NEMA 4X stainless steel, double door free standing enclosure with a side mounted air conditioner for the temperature and humidity control. The CCP shall be UL508A listed.

2. The CCP shall include a main circuit breaker with a disconnect handle that can be locked in the off position. The main circuit breaker shall be a 22,000 symmetrical amp thermal magnetic breaker sized in accordance with centrifuge system requirements.

3. Main control power components shall consist of variable frequency drive controllers with short-circuit and overload protection for bowl and scroll motors, power line reactor, DC bus fuses equipped with blown fuse switches and a control transformer.

4. Main Internal Control Components Shall Consist of: Programmable Logic Controller (PLC), surge suppressor, power supply, Ethernet switch, communications modem, control relays, and terminal points for interconnection with ancillary equipment.

5. Door mounted components shall consist of VFD interface keypads (one (1) for each VFD) shall be door mounted for safe access to parameters while the panel is under power. This port shall limit maintenance personnel's exposure to arc flash dangers as detailed in NFPA 70E. NEMA 4X illuminated selector switch, mushroom head maintained emergency stop, NEMA 4X 120 VAC laptop receptacle with an Ethernet programming port, and a 10" color touch screen Operator Interface Terminal (OIT) NEMA 4X indoor rated. Third party controllers and interface units and European imports will not be allowed.

6. The CCP panel shall operate from a 480V AC, 3 phase.

7. Each centrifuge VFD shall be Allen-Bradley 755 series

8. The backdrive system shall provide for the regeneration of electrical power to the main drive motor as follows:

a. The main drive motor and backdrive motor shall be electrically connected to a main and secondary variable frequency drive (VFD) at their respective AC circuit outputs.

b. The positive and negative terminals of the DC circuits of both VFD's shall be electrically connected.

c. The cycloidal properties of the speed reducer outlined in Paragraph 2.05.K of these specifications will allow the backdrive motor to function as a generator.

d. The power generated by the backdrive motor shall be recovered by the secondary VFD and transmitted through the DC bus to the main VFD, thereby reducing power consumption from the outside grid.

e. The power generated by the backdrive motor shall allow for and provide flying restart capabilities. Drive designs that do not provide flying restart capabilities are not acceptable.

f. Backdrive systems which regenerate power to the outside grid shall not be acceptable due to higher overall power consumption.

g. Backdrive systems utilizing eddy current brakes, direct current or hydraulic drives are not acceptable.

9. The CCP shall comply with IEEE 519 at the point of common coupling.

10. The control transformer shall be sized for a minimum of 150% of the calculated load.

11. The PLC shall be Allen-Bradley CompactLogix. All control logic and algorithms shall reside within the PLC. Third party and proprietary controllers and interface devises will not be allowed. The PLC shall have adequate memory allowing 25% space for future program additions. The PLC shall be capable of interfacing directly with a plant SCADA system via Ethernet IP. An Ethernet switch with a minimum of two (2) spare ports shall be provided for this connection.

12. The OIT shall be Allen-Bradley PanelView+CE with a minimum 10" screen measured diagonally or approved equal. The OIT shall communicate via Ethernet IP to the PLC. Third party and proprietary controllers and interface devises will not be allowed.

13. The OIT is a color display with touch sensitive technology and shall be 120 VAC. All operator functions and displays shall be provided with clear intuitive graphic touch cells and displays on the OIT.

14. The PLC shall be configured to accept process optimization code for future control upgrades.

15. An industrial din rail mounted Ethernet switch shall be provided with enough ports to link all required network connections. A minimum of one (1) spare port is required for future connections.

16. A door mounted maintenance interface port shall be provided to assist in programming and troubleshooting. This port shall limit maintenance personnel's exposure to arc flash dangers as detailed in NFPA 70E.

17. A backplane mounted elapsed time meter shall be provided for the main drive.

18. All components in the CCP shall be factory wired. All external control connection points shall terminate on terminal points. There shall be a minimum of 20% spare digital and analog inputs and outputs all factory wired from the I/O cards to its corresponding terminal strip.

19. Control wire shall be #16 AWG minimum, shall conform to UL standards, and shall be type THHN, THW or MTW.

20. A ground lug shall be supplied on the panel.

21. All customer interface contacts are provided through isolated 10 amp interposing relays. Contacts shall be suitable for 24 VDC or 120 VAC control.

22. Each wire segment shall be numbered at each end using white tubular heat shrinkable markers with black permanent mechanically stamped legends. The wire numbers shall correspond to those on the wiring diagram. Wrap around or clip type numbers are not acceptable.

23. Each internal component shall be labeled and shall agree with the wiring diagram. Letters shall be black on a white background to prevent obscuring text

24. Field mounting of the control panel and interconnecting wiring between the centrifuge, operator panel, and starter panel shall be provided by the installing contractor.

25. A modem shall be installed capable of communicating directly with the PLC, OIT and VFDs for remote diagnosis and updates.

C. The OIT shall as a minimum be capable of:

1. Automatic one touch starting and stopping.

   a. Including automatic torque control and conveyor/diverter gate operation based on operator settable parameters.

   b. Automatic status indication and individual component status.

   c. Auto start and stop adjustments shall be configurable via password protected operator inputs.

1) Wake Mode - Defined as an early start feature in which the centrifuge will start, unattended, at a predetermined time before an operator starts his shift.

2) Sleep Mode - Defined as an automatic shutdown feature that will shut down and flush out the centrifuge, unattended, at a predetermined time after an operator has ended his shift.

d. Pause Mode

1) Pause for process repairs

2) Pause for Bin Removal

2. Manual stop and start operations and status of each individual system component.

a. Status indication and control including.

1) Centrifuge Start Stop

2) Wash water valve

3) Sludge pump

4) Polymer pump

5) Conveyor forward and reverse

b. Safety interlocks shall remain active in manual mode.

3. Clean-in-Place (CIP) one touch starting and stopping.

a. CIP status indication and individual component status.

b. CIP adjustments shall be configurable via password protected operator inputs.

4. The OIT shall be capable of displaying and adjustment of all pertinent system variables and settings.

a. Display of system variables

1) Centrifuge drive motor amps and percent of full load

2) Centrifuge bowl speed (Actual and Setpoint)

3) Back drive speed (RPM) (Actual and Setpoint)

4) Differential speed (Actual and Setpoint)

5) Torque (Actual and Setpoint)

6) Bearing temperatures

7) Vibration

8) Sludge flow rate

9) Polymer flow rate

10) Wake time

11) Sleep time

b. Display of all system related alarms

1) Centrifuge shutdown alarms. When one of these alarms is triggered an automated stop shall be initiated.

a) Main motor over temperature

b) Main drive VFD fault

c) High High vibration

d) Backdrive motor over temperature

e) Backdrive VFD fault

f) High High Torque

g) 3 STRIKES YOU'RE OUT alarm

h) High High feed end bearing temperature

i) High High drive end bearing temperature

j) Cake discharge conveyor/ system fault

2) Ancillary related alarms. A Pause shall be initiated stopping all process related equipment. Once the alarm has been cleared the operator shall be able to resume the process. If the operation has not been reestablished within an hour the centrifuge shall be forced into Auto Stop mode.

a) Sludge related faults

b) Polymer related faults

3) Centrifuge 3 STRIKES YOU'RE OUT ALARM. This shall initiate a flush sequence. If three high vibration or high torque alarms occur within a ten-minute time limit an auto stop sequence will be initiated.

a) High torque

b) High vibration

4) Warning alarms. These will only set a warning horn and light but will not trigger any other actions.

a) High drive end bearing temperature

b) High feed end bearing temperature

c. Operator input control variables

1) Centrifuge operation and processing

a) Differential speed (Set point in RPM)

b) Torque (Set point in percentage)

c) Sludge flow (Set point in GPM)

d) Polymer flow (Set point in GPH)

e) Wake time (Set point in 24 hour format)

f) Sleep time (Set point in 24 hour format)

2) Operator input variables related to process and operations calculations.

a) Sludge feed flow solids content (registered in percent total solids (% TS) and based on lab analysis of samples collected).

b) Polymer make down dilution (registered in percent dilution of polymer by volume), if an automatic polymer dilution system is provided. The system shall provide the system the proper inputs / outputs to the CCP.

c) Centrate solids content (registered in percent suspended solids (% TSS) and based on lab analysis of samples collected).

d) Dry cake solids (registered in percent total solids (%) & based on lab analysis of samples collected).

3) Sum of mathematical calculations for determining production and optimization.

a) Sludge feed flow in GPM

b) Sludge feed flow in GPD (To be automatically reset by internal clock at 12:00 am daily)

c) Previous day total flow

d) Gallons processed (Totalized) Wet pounds per hour

e) Daily run time (To be automatically reset by internal clock at 0:00 daily)

f) Run time totalized (Run time with sludge feed)

g) Dry pounds per hour processed (Based on real time feed flow rates)

h) Pounds per ton of polymer dosage (Based on real time polymer feed flow rates)

i) Cubic yards of cake production per hour (Based on real time feed flow rates)

j) Supervisor input system variables

k) Capture Efficiency

4) Supervisor input parameters (Password protected)

a) Centrifuge bowl speed (Setpoint)

b) Centrifuge configuration settings. (Machine specific)

c) Alarm limits

d) Scaling values

e) CIP settings

f) Torque PID settings

d. The centrifuge setup parameters shall be fully configurable from password protected screens including alarm set points, scaling variables and CIP settings.

e. A screen shall be provided within the OIT to provide the operator with on-line help pages for each controlled device. The help pages shall include relevant flow charts and written descriptions as provided in the O&M manual.

f. A screen shall be provided to display the input and output statuses for both digital and analog signals of the PLC. This is to be used to limit maintenance personnel's exposure to arc flash dangers as detailed in NFPA 70E while performing trouble shooting duties.

5. Interface Requirements

a. Centrifuge Control Panel (CCP)

1) Power input from customer supply

a) 460 VAC, 3 Phase, 60 HZ, 50 amps

2) Power output from CCP to motors

a) Bowl drive motor

b) Scroll drive motor

3) Inputs from Motors

a) Bowl drive motor temperature switch

b) Scroll drive motor temperature switch

4) Inputs to CCP from customer supplied equipment (digital)

a) Polymer pump run confirm

b) Polymer pump fault

c) Sludge pump run confirm

d) Sludge Pump fault

e) Conveyor running forward

f) Conveyor running reverse

g) Conveyor overload signal

5) Inputs to CCP from machine junction box (Analog)

a) Centrifuge vibration

b) Drive end bearing temperature

c) Feed end bearing temperature

6) Inputs to CCP from customer supplied equipment (Analog)

a) Polymer pump flow and / or speed

b) Sludge pump flow and / or speed

7) Outputs from CCP to customer supplied equipment (Digital)

a) Polymer pump run command

b) Sludge pump run command

c) Cake conveyor run command forward

d) Cake conveyor run command reverse

8) Outputs from CCP to field mounted devices

a) Wash water valve open command

b) Cake conveyor water valve open command

9) Outputs from CCP to field mounted devices (Analog)

a) Polymer pump speed setpoint

b) Sludge pump speed setpoint

6. Description of Operation

a. CCP emergency stop shall de-energize the master control relay to interrupt all run commands for immediate shutdown. To restart system, the emergency stop(s) must be manually reset.

1) Starting and Stopping modes

a) On the “Main” screen select the system operating mode by touching one of the mode select touch zones. All equipment must be stopped to change modes; this will be indicated by the mode select enabled indicator.

b) Manual Mode – In this mode, system components shall be started with their respective start pushbuttons, which shall be accessed by touching the manual control touch zone that displays the “Manual Control” screen. Emergency stop will always stop all equipment. This mode of operation is provided for maintenance purposes only. (This mode is password protected).

c) Auto Mode – (Wake and Sleep Mode) In this mode, start-up and shutdown shall be controlled from the auto start/auto stop pushbuttons or Start-up shall

be controlled from the "Wake Mode" screen by operator entering a predetermined time for system to begin process operation, up to a maximum of 24 hour delay. Auto start will initiate the sequence of events described below. At any time while in the Auto mode the operator can begin a start-up or shutdown. After a start-up has been completed the operator shall be capable of entering a shutdown time on the "Sleep Mode" screen to end a process run. At the end of the run time the control system will automatically begin a shutdown and cleaning cycle. The OIT shall display all automatic conditions and allow control of all time settings.

d) CIP Mode – Clean in Place (CIP). In this mode, start-up and shutdown shall be controlled from the CIP start/stop pushbuttons.

e) Pause Mode – Pause refers to the temporary stopping and starting of the process pumps etc. When a process alarm triggers or the Pause pushbutton is pressed the sludge and polymer will come to a stop. With a Bin change pause, the sludge and polymer shall stop, the wash water valve will open for a variable time to push the majority of the material out the solids end of the machine. Once the wash water de-energizes, spillage will be at a minimum allowing a cleaner method of changing cake bins. In either case, depressing the Resume push button, the process pump shall restart at the last know settings.

2) The Auto Start cycle will initiate the following sequence of events

a) Centrifuge bowl drive starts (instantly)

b) Centrifuge backdrive starts (3 second delay from bowl starting)

c) Polymer system starts (once bowl and back drive come to speed)

d) Sludge feed pump starts (duration as set on "Setup 2" screen)

e) Conveyor starts in reverse direction (instantly)

f) Conveyor starts in forward (when torque is reached as on "Setup 2" screen)

g) While Auto start is in progress the Auto start indicator light will flash "STARTING IN AUTO". After start-up is complete the indicator light will stay on steady "RUNNING IN AUTO".

3) The Auto Stop cycle will initiate the following sequence of events

a) Sludge feed pump (instantly)

b) Polymer system stops (instantly)

c) Centrifuge goes to relative speed control (instantly)

d) Centrifuge goes to auto stop preset speed #1 (at normal deceleration ramp)

e) Wash water valve opens (once centrifuge is at preset speed #1)

f) Centrifuge remains at this preset speed #1 (duration as set on "Setup 2" screen)

g) Centrifuge goes to auto stop preset speed #2 (at normal deceleration ramp)

h) Centrifuge remains at this preset speed #2 (duration as set on "Setup 2" screen)

i) Centrifuge stops (at normal deceleration ramp)

j) Wash water valve closes (at bowl speed set on "Setup 2" screen)

k) The conveyor will stop once the purge cycle times out

l) CIP will be initiated

m) While Auto stop is in progress the Auto stop indicator light will flash "STOPPING IN AUTO" while in progress and go on steady "STOPPED IN AUTO" when complete.

4) CIP Mode – Clean in Place (CIP). In this mode, start-up and shutdown shall be controlled from the CIP start/stop pushbuttons. Operating the CIP start pushbutton or an auto stop will initiate a CIP cycle as described below.

a) Centrifuge bowl drive starts (instantly)

b) Centrifuge backdrive starts (3 second delay from bowl run confirm)

c) Wash water valve opens (instantly)

d) The duration and speeds for the CIP cycle are set on "Setup 2" screen.

e) Operating the CIP Stop pushbutton will initiate the following sequence of events:

5) Torque / Relative Speed Control – The centrifuge shall operate in two different control modes torque control (PI Auto) or relative speed control (PI manual). The active control mode is indicated below the centrifuge graphic on the main screen. To access control mode selection and setpoint entry, touch the centrifuge graphic, this will display the Torque control screen. The control mode is selected by touching either the Auto or Manual touch zones. Touching the numeric display of the current setpoint, which brings up a numeric entry keypad, enters the setpoint. The setpoint range is 0-100% * for Torque setpoint and 0-XX ** for Relative speed setpoint. This range can be limited to a maximum below 100% to prevent possible process upsets and equipment damage. This is configurable in the "system" setup.

6) Feed Control – Touching either pump graphic shall access the speed/flow setpoints for the polymer and sludge pumps. The "Polymer and Sludge Setup" screen will be displayed. Touching the numeric display below the word setpoint will bring up a numeric entry keypad. The setpoint range is 0-XXX GPM or GPH. This range can be limited to a maximum to prevent possible process upsets and equipment damage. This is configurable in the "system" setup screen.

7) Alarm Control – Alarm conditions shall be indicated with red background on the alarm screen and shall cause alarm horn to sound and beacon to flash. Alarm indicator will go on steady as long as condition is still in fault condition. Operating silence pushbutton will silence horn and cause indicator to flash only if condition has been cleared. Operating reset button will clear alarm indicator and allow system start-up. Normal none alarm condition shall be indicated by alarm indicator text in green. High vibration or high torque shall initiate a pause and flush sequence, Duration of the flush time shall be operator adjustable through touch screen. Once the high vibration or high torque alarm condition clears, feed to the centrifuge shall automatically resume. If three high vibration or high torque alarms occur within a ten-minute time limit, an auto stop sequence shall be initiated.

8) Passwords – The OIT shall be capable of storing several different passwords allowing access to several levels of operation / maintenance or adjustments. There shall be at a minimum four (4) passwords. The passwords (numerical) shall be for the following, up to 5 different passwords can be provided for each level, except the SYSTEM password. The OIT will retain the date / time and password utilized for any of the password types below for up to 10 entries / instances.

a) System – The system password shall be the top level password known only by ANDRITZ. This password is to access manufacturer only areas of the OIT that allow for OEM set points and setup parameters to be maintained. The system password will be provided either after the warranty period or if a

maintenance service contract is in affect once it has been expired. The system password once activated allows unrestricted movement through all of the OIT functions as described within the "PASSWORDS" area. The OIT will require a password re-entry if no activity is detecting after 15 minutes.

b) Operator – The operator password is required to operate the centrifuge and is for the most part a generic password. This password allows for Automatic operation of the centrifuge only. The operator is only able to make changes that affect the performance of the centrifuge such as flow, torque and polymer. The OIT will require a password re-entry if no activity is detected within 120 minutes. The requirement for an "OPERATOR" password can only be bypassed in the OEM setup parameters.

c) Maintenance – The maintenance password shall be provided to the owner for distribution as needed and allows for the full operation of the system in Automatic as described above for the "OPERATOR" level as well as being able to operate the system in "MANUAL" mode. The OIT will require a password re-entry if no activity is detected within 15 minutes. The requirement for a "MAINTENANCE" password can only be bypassed in the OEM setup parameters.

d) Lube Reset – The Lube Reset password shall be provided to the owner for distribution as needed and allows for the reset of the lubrication indicator for the Main Bearings. If the lube reset is not reset 10 hours after the prescribed time, the centrifuge will either automatically shut down or not start.

PART 3 - EXECUTION

3.1 WARRANTY

A. The centrifuge manufacturer shall warrant the following components:

1. The manufacturer shall warrant against any defects in material or workmanship to the centrifuge for a period of 12 months from start-up.

2. The manufacturer shall repair or replace any parts of the centrifuge system that are found to be defective in workmanship or materials during the warranty period, provide said equipment is operated in accordance with the manufacturer's written operating instructions, and provided that the Owner notifies the manufacturer in writing within 10 days after such defect becomes apparent.

3.2 START-UP SERVICES

1. Manufacturer's Representation for Start-Up and Testing

a. A manufacturer's technical representative for the equipment specified herein shall be present at the jobsite and/or classroom designated by the Owner for eight (8) workdays (a workday is an eight (8) hour period on site) for the services listed below. The following services shall be provided with allocation of workdays as established by the owner with the following distribution as a guide:

1) Four (4) workdays for onsite inspection, certification of installation and for pre-start-up classroom and onsite equipment instruction and maintenance training.

2) Four (4) workdays for start-up and performance testing and for post-start-up classroom and onsite equipment instruction, troubleshooting, and other follow-up services.

b. Workdays shall be eight (8) hour days, Monday through Friday, with dates determined by the Owner after a request by the contractor.

2. FIELD TESTS

a. Functional Test: Functional testing shall be performed for each centrifuge installed. Prior to system start-up, system components shall be inspected for proper alignment, proper connection, and satisfactory operation. The Manufacturer's representative shall inspect installation, check for lubrication and minor adjustments, provide certification that the system components have been installed correctly and are ready for operation. The performance test shall not begin until functional testing has been completed to the Owner's and Engineer's satisfaction.

b. Performance Test

1) After plant start-up, the Manufacturer shall conduct a performance test using the Owner's sludge to determine the actual system operating conditions and verify that the unit meets the minimum requirements specified herein.

2) Prior to the performance tests, the Manufacturer shall perform testing as necessary to determine and recommend the most effective type of polymer to produce the specified performance.

3) The Owner shall provide sludge feed, water, electrical power, and sludge cake disposal necessary to conduct the performance tests. The polymers required shall be provided by the Owner at the recommendation of the centrifuge manufacturer.

4) The cost of laboratory testing necessary to confirm centrifuge performance for the initial test shall be borne by the Owner.

5) If, after a minimum of two 4-hour test runs, with three (3) rounds of sampling per run in the opinion of the Owner, the system meets the minimum performance requirements specified herein, the Engineer will recommend, by letter, the official acceptance of the centrifuge. If, in the opinion of the Engineer, the performance test results do not meet the requirements specified herein, the Engineer will notify the Owner and Contractor of non-acceptance performance.

6) In the case of non-acceptable performance, the manufacturer shall then have 60 days in which to perform at its sole expense, any supplemental testing, equipment adjustments changes or additions and to perform a retest of the non-acceptable system.

7) If in the opinion of the Engineer, a performance acceptance test or retest is successful and meets the requirements specified herein, the Engineer will recommend, by letter, the official acceptance of the equipment.

3.3 SPARE PARTS

A. Manufacturer shall provide sufficient spare parts for 1 full year of operation of the rotary press at design capacities as indicated in this Section. Manufacturer shall also provide all polymer and other miscellaneous items as required for system startup and testing.

3.4 INSTALLATION

A. The CONTRACTOR shall install all equipment in strict accordance with the manufacturer's recommendations. The CONTRACTOR shall supply all equipment and accessories not specifically provided by the manufacturer but required for satisfactory installation and operation.

END OF SECTION

SECTION 11610 – CONICAL DISC MIXER

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, equipment, material, and appurtenances for the complete installation of the water vertical shaft conical disc mixers in the sludge thickener tanks.

1.2 SUBMITTALS

A. Shop Drawings: Comply with the provisions of Section 01330 – Submittal Procedures.

B. Provide manufacturer's descriptive data and technical literature, performance data, catalog cuts, and installation instructions.

C. Drawings: Provide detail drawings containing a complete list of equipment and materials. Drawings shall contain complete equipment dimensions, wiring and schematic diagrams, and any other details needed to demonstrate that the system has been coordinated and will properly function as a unit and within the system as depicted in the Contract Documents. Drawings shall show the proposed layout and anchorage of equipment and appurtenances and will show all weights and dimensions necessary for the installation of foundations, anchor bolts, piping, and valve connections.

D. Verification and Warranty: A statement of verification shall be provided confirming that the Contract Documents have been reviewed and the submitted equipment complies with the dimensions, performance, and material requirement specified. Manufacturer shall specifically verify that the provided equipment is compatible for use with variable frequency drives as specified in the Contract Documents. A copy of the manufacturer's warranty for the provided equipment shall be included.

1.3 QUALITY ASSURANCE

A. All equipment shall be supplied by a single manufacturer including mixing disc, column, shafting, heads, coupling, sleeves, seals, motors, guards, and appurtenances to ensure compatibility and integrity of the individual components and the manufacturer's warranty shall cover all provided equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Equipment should be stored with protection from the weather, humidity, and temperature variations.

B. Protect all pump equipment and appurtenances from dirt, dust, and damage.

C. Comply with manufacturer's written delivery, storage, and handling instructions.

PART 2 - PRODUCTS

2.1 GENERAL

A. The bridge mount mixer shall consist of a heavy-duty gearbox with a top mounted electrical motor to be mounted on a support structure with vibration absorbers fixed to and fully supported from the top of the bridge. The vertical shaft shall drive a conical shaped impeller equipped with mixing and diffusing flaps to provide low speed mixing of the basin contents. The mixing ribs on top of the conical disc shall radially spread the water 360° around the unit. The mixer shall be rated for continuous duty. Mixer shall be Aqua Turbo Model MIX-GS 0550-30, or approved equal.

B. Performance Requirements:

1.	Service:	Potable Water Treatment Sludge
2.	Number of Mixers:	2 (1 Per Basin)
3.	Horsepower:	7.5 HP
4.	Nominal Mixer Disc Diameter:	78 inches
5.	Nominal Maximum Mixer Speed:	30 RPM (Reducible via VFD)

2.2 GEAR DRIVE AND ELECTRIC MOTOR

A. The gear unit shall be SEW (RF Series) or Sumitomo equivalent with parallel shaft helical gears and a solid shaft design.

B. The motor shall be SEW or Sumitomo equivalent and shall be mill and chemical duty, totally enclosed, fan cooled with all cast iron construction: conduit box, frame, end shields, and fan cover.

C. The unit shall deliver the appropriate RPM at gearbox shaft based on the size of unit.

D. The motor shall be inverter duty rated and operate from 460Volts, 60 Cycle, 3 phase service.

E. The gear unit housing shall be cast iron coated with epoxy.

F. The motor shall in all cases meet or exceed current IEC or NEMA specifications, depending on what is applicable

G. The motor windings shall be non-hygroscopic with tropicalized protection.

H. The motor insulation shall meet or exceed IEC or NEMA class F with Class B temperature rise providing a service factor of 1.15.

I. The motor shall have a one-piece solid shaft; the driveshaft shall not be exposed to wastewater.

J. The motor/ shaft assembly shall be sufficiently rigid that no support bearings are required below the motor.

K. The motor and gearbox bearings shall be designed for a minimum L10 bearing life of 100,000 hours.

L. The motor terminal box shall be firmly bolted to the motor frame at four points. The terminal box shall be sized to meet the IEC or NEMA standards.

M. The terminal box shall be drilled and tapped to receive one compression watertight fitting to accommodate the appropriate electrical service cables.

2.3 MOUNTING BASE

A. The geared motor shall be flange-mounted and attached with vibration insulators to a support bolted to the bridge structure.

B. The vibration absorbers shall be of type Novibra® EH or equivalent to achieve effective vibration insulation.

C. All mounting plates shall be constructed of 304 stainless steel.

2.4 SHAFT

A. The shaft shall be constructed of 304 stainless steel.

B. The shaft shall include flange connections, to the gearbox, mid-shaft coupling and to the conical disc impeller at the bottom.

2.5 CONICAL DISK MIXER BODY

A. Each mixer shall impart energy into the water using a conical disk mixer body equipped with 8 mixing flights on the top side. The diameter of conical disc shall be sized according to basin dimensions and mixing requirements.

B. The conical disc shall be fabricated from 304 stainless steel.

C. The speed of rotation is sized according to basin dimensions and mixing and aeration requirements. Variable speed Range 15 - 30 RPM.

2.6 HARDWARE

A. All nuts, bolts, fasteners, anchoring hardware, etc. that are submerged shall be stainless steel 316 or 316L.

PART 3 - EXECUTION

3.1 WARRANTY

A. Manufacturer's Warranty: The manufacturer of the equipment shall warrant it to be of quality construction, free from defects in material and workmanship. Each unit shall be fully guaranteed against failures of materials and workmanship for a period of twenty-four (24) months after start-up. Additional warranty shall be included covering the Shaft and Conical Disk for (5) Years.

B. Effective Date: The warranty shall become effective upon the service start of equipment as designated by the OWNER and Startup Technician.

3.2 START-UP SERVICES

A. The mixer manufacturer shall provide the services of a trained, qualified representative for at least two (2) days for the purpose of inspecting the installation to assure compliance with shop drawings, startup, and performance verification. Each unit shall be checked for lubrication, alignment, rotation, vibration, and starting and running electrical and efficiency characteristics. The representative shall notify the Contractor and the ENGINEER of anything in the installation which might render the manufacturer's guarantee null and void. The manufacturer's representative shall also instruct the operating personnel in the proper method of operation and maintenance of the equipment.

B. Following the start-up of the mixers, the manufacturer shall provide a written certification verifying that the units have been installed and started up property and are performing in accordance with the specifications and confirming that nothing has been done to negatively impact the equipment warranty.

3.3 INSTALLATION

A. The CONTRACTOR shall install all equipment in strict accordance with the manufacturer's recommendations. The CONTRACTOR shall supply all equipment and accessories not specifically provided by the manufacturer but required for satisfactory installation and operation.

END OF SECTION

SECTION 11680 – SLUDGE COLLECTOR

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, equipment, material, and appurtenances for the complete installation of the hoseless sludge removal system within the sedimentation basins. The Contractor shall provide and install sludge collector system(s) which include collector assembly, sludge exit pipe, electric drive assembly, drive cables, cable pulleys, control system for fully automatic operation, and all other miscellaneous accessories and hardware as required for a complete installation.

1.2 SUBMITTALS

A. Shop Drawings: Comply with the provisions of Section 01330 – Submittal Procedures.

B. The Manufacturer shall provide product data, drawings and calculations as follows:
1. Basin design and layout of equipment indicating all dimensions.
2. Head loss calculation through the sludge collector at design flow.
3. List of spare parts which could be purchased and kept on hand.
4. Complete submittal drawings of all equipment furnished.
5. Connection locations and support attachment details.
6. Manufacturer’s literature and cut sheets for all equipment.
7. Weights for major components and materials of construction
8. Provide equipment certification by NSF to ANSI Standard 61. To ensure public safety, only certificates issued by NSF are acceptable. Seals or certifications by any agency other than NSF are not acceptable.
9. Statement indicating terms of the warranty.
10. Operation & Maintenance Manuals

1.3 QUALITY ASSURANCE

A. To assure system integrity and responsibility, all items of equipment described in this section shall be manufactured by a single manufacturer regularly engaged in the production of the specified equipment.

B. All Hoseless sludge collector manufacturers must have at least fifty (50) Hoseless sludge collector installations. Installations shall have been in operation for at least five (5) years, be of a similar design complying with these specifications for use in municipal applications as described above. Sludge collector shall be by Meurer Research, Jim Myers & Sons, or approved equal.

PART 2 - PRODUCTS

2.1 PROCESS DESIGN AND CONDITIONS

A. Number of Basins: Two (2)

B. Dimensions of each Basin Per Plans

C. Number of units per Basin: Two (2)

D. Sludge Flow per unit: 150 - 200 gpm

E. Solids removal concentration: 0.5 - 2.0%

2.2 MATERIALS OF CONSTRUCTION

A. All major components of the sludge collector shall be fabricated of stainless steel materials accept as noted.
1. Cross bracing - ASTM A240, AISI Type 304
2. Header Assembly and Pipe - AISI Type 304
3. Bushings, Flow Balancing Ring and Tangential Orifices – UHMW-PE
4. Cable Pulleys, collector pipe supports and wall casters - Polyurethane
5. Bolts, Nuts, Fasteners – IFI-104 GRADE 304

B. All fabricated stainless steel components shall be properly cleaned to prevent future corrosion. All welds shall be passivated by mechanical cleaning per ASTM A-380. Nitric acid or other hazardous chemicals shall not be allowed for cleaning. Non welded parts shall be supplied with standard mill finish.

2.3 SHARED REEL DRIVE ASSEMBLY

A. Each drive assembly shall consist of an SEW Eurodrive 3 Phase 230 VAC ¼ HP inverter duty motor and SEW Eurodrive gearbox which shall be coupled to a single rotating drum for manipulation of the cable that is attached to the tandem suction header assembly. Food grade lubricant shall be included. DC drives are not acceptable.

B. Only single drum drives are acceptable. Two or more cable drums are not allowed due to the high fleet angle created between drum and floor pulley.

C. The cable shall be firmly attached to the rotating drum to prevent slippage. Tensioning the cable between multiple pulleys or use a cable tensioning device to prevent slippage will not be allowed.

D. The cable shall store on the reel in a single layer, the placement of which shall be organized by the drive mechanism. To minimize cable travel and the fleet angle, the cables shall share the same space on a single drum.

E. The complete drive mechanism shall be packaged on a single powder coated stainless base

F. A two-piece powder coated aluminum safety cover with handles for ease of handling shall be supplied, requiring complete coverage of both the reel and drive assembly. Covers made of steel or stainless steel will not be allowed due to excessive weight during maintenance.

G. The drive cable shall be Type 304 Stainless Steel with a minimum diameter of 1/4". Cable lengths over 150-feet shall use pre-stretched cable. Pneumatic or steel tape drive systems are not acceptable.

H. The drive assembly shall be capable of ceasing operation on an excessive load without physical damage to the drive unit. During an overload, protection built into the VFD will cease operation and activate an alarm. Operation will continue after alarm is reset. Back up protection in the form of a shear pin is required.

I. The drive assembly shall have integral position sensors which determine when the collector is at the end of the basin or the beginning of the basin. No under-water position sensors shall be required or allowed.

J. The drive shall have an emergency disconnect button pre-wired to a junction box assembly which shall be a large, red, palm operated single button.

2.4 HOSELESS COLLECTOR ASSEMBLY

A. To ensure public safety, sludge collectors shall be certified by NSF to ANSI Standard 61. Systems that do not have stamped NSF-61 certification for the collectors as specified in the manufacturers name will not be accepted. Other agencies or certificates will not be allowed.

B. The sludge collector assembly shall be manufactured entirely of Type 304 Stainless Steel, except for non-metallic parts such as casters, bushings, orifices, etc. which will be manufactured of non-metallic materials.

C. Each collector assembly shall consist of four sludge collection header pipes each equal to half the basin width. Each header pipe shall have helical flow orifice blocks of UHMW-PE material spaced by the manufacturer to insure proper distribution across the length of the header. Header pipes shall have removable end caps for easy clean out.

D. Header pipes shall be 3-inch diameter attached to the collection chamber by means of a flanged connection. Use of clamps or other pipe connection methods will not be allowed.

E. The helical flow orifice blocks shall be designed to cause flow to enter tangentially into the header pipe for more efficient sludge removal and reduced head loss. Orifices shall be ¾-inch in diameter shaped to cause a spiral flow inside the header pipe to prevent solids from settling and shall point forward to remove the settled solids ahead of the pipe as it travels down the basin. Holes drilled in the bottom of the header pipe shall not be allowed. Systems without forward facing tangential flow orifice blocks of UHMW-PE will not be allowed.

F. The 6-inch collection chamber shall “telescope” over the smaller 4-inch fixed sludge exit conduit. Articulating pipes, flexible sludge hoses, flexible hose joints, or swivel joints are not allowed.

G. The collection chamber shall be isolated against the horizontal sludge exit conduit by means of a UHMW-PE bushing. The bushing shall be designed to pass small amounts of water to act as a lubricant during operation. A fully sealed connection between the two pipes is prone to binding and not acceptable.

H. The sludge exit conduit shall include a UHMW-PE flow balancing ring designed by CFD analysis to assure equal flow from the front and back sludge collection headers. Systems without a flow balancing ring will not be allowed. Lateral piping or flow diagonals from sludge headers to the collection chamber shall not be an acceptable alternative to the flow balancing ring.

I. Each header pipe shall be equipped with a blade which is triangular and is roughly equal in length to the header pipe. These blades will move the settled solids away from the end walls.

J. The Hoseless collector assembly shall be guided along basin length by means of horizontal casters on the ends of the header pipes.

K. Flow through the Hoseless sludge collector shall be controlled by a sludge valve as directed by the collector control panel. Submerged pump systems shall not be acceptable.

L. Each Hoseless collector shall be complete with polyurethane rolling casters to support the collector assembly and horizontal side wall casters located near the end of each of the four sludge collector headers. Use of anti-rocking skids in lieu of casters are not acceptable. Include all necessary mounting hardware.

M. Concrete curbs with a minimum 6-inch vertical profile shall be provided by the Contractor as required between multiple units. Material vendor can also provide stainless steel curbing that allows for manual hose cleaning under and between installed curbing if concrete curbing is not appropriate.

N. Include stainless steel end stops to be anchored to the basin floor at the header assembly's end of travel.

O. All shop and field welds shall be performed by qualified welders in accordance with AWS D1.6. All seal welds shall be continuous, and all welds shall be mechanically cleaned per ASTM A-380. Any field welding of pipe to complete the assembly shall include use of a pickling paste.

P. All underwater bearings shall be specifically designed for underwater use.

2.5 CONTROL SYSTEM

A. There shall be one collector control panel to operate all sludge collectors. The control panel shall communicate to the Master Control Center (SCADA) via Ethernet communication or dry contacts.

B. The sludge valve(s) or pump shall be supplied by others and controlled from the collector control panel.

C. Collector Control Panel- PLC type control system.
1. The collector control panel shall include an Allen Bradley Micro 850 PLC based electronic control panel which shall automatically control all of the functions and operations of the sludge collector system.
2. Each control panel shall arrive to the jobsite internally pre-wired ready to connect to each drive unit by utilizing (11) 14 gauge wires.
3. Each control panel shall operate by use of a 120/240 VAC 50/60Hz single phase circuit furnished to each panel location.

D. Each main control panel shall consist of the following:
1. Real time clock for programmable run initiation.
2. Programmable Logic Controller.
3. Unmanaged Ethernet communication switch.
4. Allen Bradley PowerFlex VFD with manual operation keys and speed control. 120/240Vac single phase input and 230Vac, 3 phase output, ¼ HP minimum. DC motors are not allowed.
5. Power supply with 24 VDC control voltage.
6. Properly sized protective circuit breakers and terminal blocks.
7. 6" HMI (touch screen) shall be Allen Bradley PanelView displaying the following controls and indication:
    a. Manual start sequence
    b. Drive mode – Reverse / Off / Forward
    c. Valve position
    d. Real time clock settings
    e. Collector speed control
    f. Alarm reset
    g. Drive direction
    h. Home and End position indication
8. One three position HOA switch and one three position valve open/auto/close switch per unit will be provided on the panel face for manual operation.
    a. Provide Ethernet IP communication with the Plant SCADA system. The minimum following communication shall be provided:
        1) Remote start input
        2) Run condition indication
        3) Alarm condition indication

E. The control panel components shall be installed inside a NEMA 4X rated aluminum or stainless steel control panel housing. It shall be the responsibility of the sludge collector manufacturer to provide all of the necessary control hardware, programming and components as required for a complete installation.

2.6 SPARE PARTS

A. At a minimum, provide the following spare parts:
   1. Two shear pins for the cable drive
   2. One 8" polyurethane v-groove pulley
   3. Twelve UHMW Delrin wheel bushings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment shall be stored in a secure area in strict accordance with the manufacturer's drawings and recommendations prior to installation. Any control panels shall be stored in a secure and dry area.

B. Install sludge collection equipment as indicated on the contract drawings and in accordance with the manufacturer's recommendations.

C. Hoseless Sludge Collectors
   1. Anchor 4-inch fixed sludge pipe at basin centerline
   2. Bolt up 3-inch collection headers and cross bracing to 6-inch collection chamber
   3. Anchor pulleys, end stops and drive stand
   4. Mount drive and control panel as shown on drawings
   5. Run power and control wiring from panel to drive and valve actuator

3.2 WARRANTY

A. Manufacturer's Warranty: The manufacturer shall guarantee that the system and all equipment are appropriate for the intended service and shall be free of manufacturing and fabrication defects in material and workmanship for a period of 12 months commencing from the date equipment is satisfactorily placed in service.

3.3 START-UP SERVICES

A. Provide a factory certified service technician to inspect the installation and observe start-up and initial operation of the sludge collector system(s).

B. The manufacturer shall provide a factory trained representative to perform the following:
   1. Inspect installation of the sludge collector(s). Provide a field report certifying that the equipment is properly installed, fully operational and ready for use.
   2. The start-up technician will install drive cables and set travel limits of the sludge collector.
   3. Support start-up and train the Owner's personnel on operation and maintenance of the equipment.
   4. Include a minimum of one trip of at least one eight-hour day for inspection, startup, adjustment and training.

END OF SECTION

SECTION 11690 – TUBE SETTLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, equipment, material, and appurtenances for the complete installation of the sedimentation basin tube settler system including tube settler modules, collection launders, end baffles, supports and anchorage, and all other miscellaneous accessories and hardware as required for a complete installation.

1.2 SUBMITTALS

A. Shop Drawings: Comply with the provisions of Section 01330 – Submittal Procedures.

B. The Contractor shall provide product data, drawings and calculations as follows:
1. Basin design and layout of equipment indicating all dimensions.
2. Trough calculation at maximum and design flow.
3. List of spare parts which should be purchased and kept on hand.
4. Complete shop drawings of all equipment furnished.
5. Connection locations and support attachment details.
6. Manufacturer's literature and cut-sheets for all equipment.
7. Weights for major component and materials of construction.
8. Statement indicating terms of the warranties.
9. 1'x1'x1' sample of an actual tube settler module for material verification.

1.3 QUALITY ASSURANCE

A. To assure system integrity and responsibility, all items of equipment described in this section shall be manufactured by a single manufacturer regularly engaged in the production of the specified equipment.

B. Manufacturer shall have been in continuous business for a period of at least 15 years, engaged in the manufacture of tube settlers for municipalities and shall have at least 15 years experience in the design and building of clarification equipment of the specified design.

PART 2 - PRODUCTS

2.1 DESIGN CONDITIONS

A.	Design flow rate; all sedimentation basins:	6.33 MGD
B.	Total number of basins:	Two (2)
C.	Design flow rate per clarifier:	3.165 MGD
D.	Design loading rate:	2 gpm per square foot

2.2 TUBE SETTLERS

A. The tube settler modules shall consist of a number of sheets in which are molded a multiplicity of channels; said sheets bonded together to form the completed bundles of tubes. Each tube shall be closed along its sides so the flow cannot pass from one tube to another. “Tubes” which have open sides allowing “short circuits” from one tube to another will not be acceptable.

B. The tubes shall have a cross-sectional area of at least 4.0 square inches but not greater than 7.0 square inches and be oriented on an angle of approximately 600 from the horizontal to promote gravity drainage of the solids collected on the tube bottoms.

C. The tube settler modules shall be built up of a number of molded sheets of virgin PVC. Regrind material or ABS plastic shall not be allowed. Proof of virgin material for the specific lot will be required. The sheets shall be bonded together to form a durable homogenous structure with "whole" tubes running from the bottom of the module to the top eliminate mixing currents that could interfere with the settling process and thereby allow the escape of an excess amount of settlable solids. The molded sheets shall have the tube configuration molded integrally therein.

D. The tubes shall be molded of virgin PVC that has a finished thickness of 20 mils +/- .003 inches for the formed sheets, and 25 mils +/- .003 inches for the straight sheets. Vacuum forming of tubes is acceptable if the finished product meets the material thickness specified above.

E. The plastic shall have a minimum tensile strength of 5,000 PSI, and a modulus of elasticity in tension of 35 x 104 PSI. The plastic shall have a hardness on the Shore D scale of 78-82. It shall have a specific gravity of 1.41 +/- .02. The material shall contain carbon black as a UV stabilizer. The tube modules shall be designed to support a dead load of 4.25 lbs/ft2 and a live load of 15 lbs/ft2 or a concentrated load of 250 lbs. when supported on a 10’ span.

F. The completed modules shall be manufactured to the necessary widths and lengths to minimize field installation difficulties and field modifications.

2.3 COLLECTION TROUGHS

A. The effluent collection troughs shall be manufactured of Type 304L Stainless Steel and shall be as shown in the contract drawings. The troughs shall be of a round bottom design with Type 304 Stainless Steel V-notch weirs. The trough material thickness shall be minimum 16 gauge as determined the manufacture. The trough shall not deflect under a maximum load of more than 1/240th the span. Maximum load shall be defined as the dead load plus the live load generated by an empty trough in a full basin or a full trough in an empty basin. Troughs or weirs of FRP construction shall not be acceptable.

B. The Stainless Steel shall have a tensile strength of not less than 80,000 PSI and a modulus of elasticity of 30 x 106 PSI. All welds shall be cleaned and polished to produce a consistent appearance. All welds shall be cleaned per ASTM A-380 by bead blasting or use of a stainless wire brush and a citric based cleaner approved for potable water use. All brackets, trough supports, reinforcing sections, stiffeners, flanges and fasteners shall also be of Type 304L Stainless Steel.

C. The collection troughs shall be manufactured from a single sheet, without welds or seams running the length of the collection trough. The collection troughs shall have welded in place stiffeners along the entire length of the trough for torsional rigidity. Horizontal struts shall be included between troughs as required to maintain structural integrity and trough spacing.

2.4 SUPPORT STRUCTURE

A. The support structures for the tube settlers, troughs and baffles shall be manufactured entirely of Type 304 Stainless Steel tubes and shapes. Said tubes and shapes shall be welded into truss-like structures which integrate the functions of supporting tube settlers and providing support for the troughs and baffles as well. The support system shall be designed and manufactured by the maker of the tube settlers.

B. The support structures shall be designed to support 200 lbs. per lineal foot, or a concentrated load of 300 lbs. placed anywhere on the structure. The maximum deflection of the structure under full live load shall be 1/240 of the span.

C. Support structures which are below the tube settlers shall be smooth and rounded, and shall not provide surfaces which might snag or otherwise impede the operation of the sludge collectors.

D. Trough support posts and saddles shall be integral with the tube settler support structure.

2.5 BAFFLES

A. The baffles shall attach to the support structure previously described and include all necessary appurtenances and the baffle panels themselves. All structures, baffle panels and fasteners shall be manufactured of Type 304 Stainless Steel. FRP or corrugated plastic baffles shall not be acceptable.

B. All components of the baffle system shall be designed and fabricated by the manufacturer of the supports to insure a uniform fit and nicely finished appearance.

C. The baffle panels shall be type 304 Stainless Steel with a minimum tensile strength of 150,000 PSI, elastic modulus of 30 x 106 psi, a coefficient of thermal expansion of 0.5 x 10-5 in/in/0F.

D. The panel shall be of a dimension as indicated in the contract drawings. The panels, when mounted in their structural support system, shall be square and accurately sized to minimize gaps between the frame members and the panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment shall be stored in a secure area in strict accordance with the manufacturer's drawings and recommendations prior to installation. Any control panels shall be stored in a secure and dry area.

B. Install equipment as indicated on the contract drawings and in accordance with the manufacturer’s recommendations.

3.2 WARRANTY

A. Manufacturer's Warranty: The manufacturer shall guarantee that the system and all equipment are appropriate for the intended service and shall be free of manufacturing and fabrication defects in material and workmanship for a period of 12 months commencing from the date equipment is satisfactorily placed in service.

3.3 START-UP SERVICES

A. Provide a factory certified service technician to inspect the installation and observe start-up and initial operation of the sludge collector system(s).

END OF SECTION

SECTION 12300 – MANUFACTURED CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install the furniture described herein and as indicated on the plans.

1.2 SUBMITTALS

A. General: Comply with the pertinent provisions of Section 01330 – Submittal Procedures. Each submittal shall be identified with precise, use, line and location.

B. Shop Drawings: The Contractor shall submit to the Engineer for approval shop plans and product data to show compliance with the plans and specifications.

1.3 QUALITY ASSURANCE

A. General: Products used in the work under this section shall be produced by manufacturers regularly engage in the manufacturer of furniture and cabinets.

PART 2 - PRODUCTS

2.1 CABINETRY

A. General: Cabinetry shall be of the prefabricated type. Contractor shall furnish, install and dress all counters and cabinets to give a continuous finished appearance.

Cabinets shall be self-supporting and sufficiently strong and rigid to support counter tops, sinks, or heavy laboratory apparatus without vibration or sway. Contractor shall be responsible for taking all dimensions to insure proper fit and for all trim necessary to achieve a good final appearance.

B. Base Cabinets: Base cabinets shall be of wood construction of the sizes and types shown on the plans. Exposed interior and exterior surfaces shall be finished smooth and coated with multistage acid, alkali, solvent, water, and abrasion resistant finish. No screws, bolts, or other fastening devices shall be visible from the exterior of the cabinets. Drawer and cabinet door closures shall be of the automatic closing no-slam type.

C. Wood Construction: Cabinets shall be fabricated from air and kiln-dried hardwood, oak and Douglas Fir Plywood. All exterior surfaces exposed to view shall be oak, and cabinets shall have full horizontal frame construction with glued, blind mortise and tendon joints further secured with screws. Drawers shall be easily removable and have automatic stops to prevent accidental removal. Exposed exterior and interior surfaces shall be sanded smooth before finishing. Veneers shall not be allowed.

D. Counter Tops & Shelf: Laboratory counter tops and shelf shall be fabricated to the sizes shown on the drawing from a 1” thick epoxy resin with maximum resistance to acids, alkali, solvents, and physical abuse. Back and side curbs shall be provided in maximum lengths to minimize joints. Sink cutouts shall be finished to the same degree as top and sink surfaces.

E. Shelf Wall Bracket: Shelf wall brackets shall be 2 ½" wide heavy duty bracket constructed of steel or aluminum with angle support and protective coating. Bracket shall be Original Granite Bracket LS or LSI series, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Cabinets shall be installed as recommended by the manufacturer. Furniture and cabinets shall be located as shown on the plans.

END OF SECTION

SECTION 13340 – FRAME SUPPORTED MEMBRANE STRUCTURE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install a Dry Solids Shelter as shown on the plans consisting of a membrane tensioned shell over a metal framework. Work includes design, manufacture, shipping, handling and erection of the structure.

1.2 CODE COMPLIANCE

A. Design of the Frame-Supported Membrane Building shall comply with requirements of the most recent Virginia Construction Code: Part I of the Virginia Uniform Statewide Building Code (VCC). Include all load combinations in accordance with ASCE 7-10. The structure shall be classified as Type IIB construction for noncombustible frame and membrane.

1.3 SUBMITTALS

A. General: Comply with the pertinent provisions of Section 01330 – Submittal Procedures.

B. Design Submittal: The frame-supported membrane building shall be designed by a Professional Engineer familiar with this type of structure. Calculations shall be prepared for the proposed design and submitted with the Shop Drawings. The calculations shall include structural reactions for all load combinations as identified in ASCE 7-10 including a summary of reactions for the worst case. Design shall also include loads from dewatering screw conveyor system. Shop drawings, including the calculations, shall be signed and sealed by a professional engineer licensed in the Commonwealth of Virginia.

C. Qualification & Certification Data: Provide certifications for manufacturer, welder, and erector.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer registered in the Commonwealth of Virginia. Include the following:
   a. Name and location of Project.
   b. Order number.
   c. Project Code.
   d. Name of manufacturer.
   e. Name of Contractor.
   f. Building dimensions including width, length, height, and roof slope.
   g. Indicate compliance with applicable standards for each building component, including edition dates of each standard.
   h. Governing building code and year of edition.
   i. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads. Design shall clearly identify the additional structure loads from the solids conveyor system.
   j. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
   k. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Prodcut Data: Each submittal shall be identified with precise, use, line and location. For each type of building system component include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Structural-framing system.
2. Membrane fabric.
3. Accessories.

E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

F. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Membrane Fabric: Nominal 12 inches long by 12 inches wide.
2. Metal Framing Members: Nominal 12 inches long.

G. Test Reports: For each of the following products:

1. Structural metal (steel or aluminum) including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Membrane and coatings including evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.

H. Provide certification from the zinc application source that the galvanize specifications have been met.

I. Maintenance Documents: Include parts list and maintenance schedule.

J. Warranty Certificate

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer with minimum 5 years experience in design and production of similar structures. Structure shall be manufactured by GNB Global Inc, Guard-All Building Solutions, or approved equal.

1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the Commonwealth of Virginia.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

D. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

E. Structural Aluminum: Comply with ASTM B429 / B429M - 06 “Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube”.

F. Fire-Resistance Ratings: Identify products with appropriate markings of applicable testing agency.

1. Membrane:
   a. NFPA 701 “Standard Method of Fire Tests for Flame Resistant Textiles and Films”.
   b. ASTM E 84- 10 “Standard Test Method for Surface Burning Characteristics of Building Materials”.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01610 – Delivery Storage & Handling.

B. Deliver components, membrane, and other manufactured items so as not to be damaged or deformed. Package metal framing for protection during transportation and handling.

C. Unload, store, and erect metal framing in a manner to prevent bending, twisting, and surface damage.

D. Protect membrane from damage.

E. Damaged galvanized finish shall be coated with two coats of galvanize repair paint

1.6 COORDINATION

A. Contractor shall coordinate sizes and locations of frame mounting plates anchor-bolts into foundation walls.

PART 2 - PRODUCTS

2.1 FRAME-SUPPORTED MEMBRANE BUILDING SYSTEM PERFORMANCE

A. Delegated Design: Design of frame-supported membrane building system, including comprehensive engineering analysis shall be accomplished by a qualified professional engineer registered in Virginia, using performance requirements and design criteria applicable to building site location.

2.2 STRUCTURAL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes clearspan structural tubing truss rafters; sidewall; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.

B. Structure for fabric roof shall be hot-dipped galvanized steel framework (batch dip after fabrication) of the manufacturer’s standard configuration and meeting the design constraints indicated on the drawings and specified herein. In addition, apply the following design constraints:

1. Structure shall be capable of withstanding the effects of a rainfall up to 4 inches per hour for at least two hours.
2. Design for a maximum allowable deflection of 1/120 of the clear span width when subject to the design loads and subject to fabric membrane stresses.
3. Load Combinations: Loads shall be applied acting simultaneously with concentrated loads according to the Virginia Uniform Statewide Building Code.

C. Provide temporary and permanent bracing, continuous bridging and truss bracing according with the manufacturer's standard details.

D. Secondary Framing shall be manufacturer's standard including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members.

E. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.

F. Steel Materials:

1. Cold-Formed Hollow Structural Sections: ASTM A500/A513, structural tubing.
   a. Finish: Hot-dip Galvanized Coating: ASTM A123 (batch dip after fabrication).
2. Plate or Bar Stock: ASTM A36.
   a. Finish: Hot-dip Galvanized Coating: ASTM G-90.

G. High-Strength Bolts, Nuts, and Washers: ASTM A325 Type 1, heavy-hex steel structural bolts; ASTM A563 heavy-hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

H. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A carbonsteel, hex-head bolts; ASTM A563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.

1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

I. Headed Anchor Rods: ASTM A307, Grade A.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436 hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

J. Aluminum Materials:

1. Aluminum structural components shall be 6061-T6 aluminum alloy: ASTM B308.
2. Alloy and temper designations shall be in accordance with ANSI H35.1.

2.3 MEMBRANE COVERING

A. Fabric shall provide a weather tight shield over the steel framework. Sufficient tensioning of the membrane will be required to eliminate wrinkles induced by packaging. Formed aluminum extrusion shall be utilized to secure fabric membrane to steel structure. Aluminum extrusion shall be installed to allow for membrane tensioning in the horizontal direction. Horizontal and vertical tensioning loads shall not exceed 40 lbs/ft. Aluminum extrusion shall be a natural mill finish, unpainted and uanodized to prevent scratching and chipping. The aluminum alloy used in the structure shall meet or exceed 6063-T5 and shall carry a minimum pro-rated warranty of 25 years. An adjustable tensioning system shall be utilized to control tensioning of the membrane in the vertical direction. Termination trim shall be provided to allow for complete perimeter sealing of the membrane. The fabric shall not be designed or installed to function as part of the structural framing system. The structural steel frame shall act independently in the event the fabric becomes damaged. The membrane covering shall be fabricated in sections that permit ease of future replacement in sections rather than as one unit.

B. Fabric membrane shall not be used to brace the structure.

C. Fabric shall be non-combustible as set forth in VCC Section 703.5 or meet the fire propagation performance criteria of NFPA 701 and the manufacturer's test protocol in accordance with Section 3102.3.1.

D. Roof covering shall be a Class C roof assembly per VCC Section 1505.

E. The membrane fabric shall be UV stabilized, puncture and tear resistant and crack resistant in temperatures down to -67 degrees F.

F. Materials: The following membrane material will be acceptable for installation over the structural metal frame:

FABRIC TYPE	PVC COATED POLYESTER
Unit weight (oz./sy)	28
Tensile Grab Strength ASTM D751 (lbf)	700
Tongue Tear ASTM D751 (lbf)	275
Trapezoidal Tear ASTM D4533 (lbf)	85

G. Color shall be selected by Owner from manufacturer standard product offerings. Intended color is to be semi-transparent white.

PART 3 - EXECUTION

A. EXAMINATION

1. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Before erection proceeds, verify elevations and locations of concrete- and masonrybearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
3. Proceed with erection only after unsatisfactory conditions have been corrected.
4. Wall mounting plates shall have full contact with the wall surface.

B. ERECTION OF STRUCTURAL FRAMING

1. Erect frame-supported membrane building according to manufacturer's written erection instructions and erection drawings.
2. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
3. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
4. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   a. Level and plumb individual members of structure.
   b. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
5. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line.
   a. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for bolt type and joint type specified.

6. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
7. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
   a. Tighten rod and cable bracing to avoid sag.

C. MEMBRANE INSTALLATION, GENERAL

1. Examination: Examine primary and secondary framing to verify that membrane support members and anchorages have been installed within alignment tolerances required by manufacturer.
2. Anchor membrane securely and tightly in place with provisions for thermal and structural movement.

D. CLEANING AND PROTECTION

1. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

E. TRAINING

1. Manufacturer’s representative shall conduct a minimum of two (2) hours training for Owner personnel. Training shall include, but not limited to, adjustment of fabric tension and repair of minor damage to fabric.

END OF SECTION

SECTION 15250 – PIPE SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide all material, equipment, and labor required for installation of pipe supports. Contractor is responsible for providing all pipe supports as required to properly support piping, valves, and related equipment.

PART 2 - PRODUCTS

2.1 PIPE HANGERS

A. Material: Pipe hangers shall be made of steel with plain finish.

B. Design Load: Pipe hangers shall be capable of withstanding the design loading of a minimum of 190 pounds.

2.2 PROTECTIVE COATINGS

A. Pipe supports and hangers shall be coated as required in Section 09910 – Exterior Painting, and 09920 – Interior Painting.

2.3 PIPE SUPPORTS

A. General: Pipe support shall be designed to support pipe running close to the floor and provide vertical adjustment. U-Bolt shall be used to secure the pipe to the saddle.

B. Material: Pipe support shall be made of steel with plain finish.

C. Spacing: Maximum spacing of supports shall be 5 feet apart for plastic pipe and 10 feet apart for other pipe.

D. Threaded Base Stand: Support base stand shall have threaded end to provide vertical adjustments. Plate shall be secured to the floor by 4 typical concrete anchors. Height shall be as necessary.

E. Pipe Saddle Support with U-Bolt: Saddle support shall have threaded end to provide vertical adjustments.

F. Design Load: Pipe supports shall provide secure support of pipe loading based on pipe material weight, full fluid fill, span, and recommended safety factor.

PART 3 - EXECUTION

3.1 PIPE SUPPORTS INSTALLATION

A. Pipe supports shall be installed at locations designated on the Drawings and any other location where support is required to properly install piping as shown on the drawings.

B. All pipe supports shall be installed according to manufacturer's instructions.

END OF SECTION

SECTION 15400 – PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Plumbing system shall include all cold potable water distribution, non-potable water distribution, vents and wastes, floor drainage, and all plumbing items indicated on the plans or described in these specifications. The CONTRACTOR shall furnish all labor, materials, supplies and equipment necessary for the complete and satisfactory construction of the plumbing system shown on the plans.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Submit the following information:

1. Complete materials list of all items proposed to be furnished and installed under this Section.
2. Catalog cuts and other data required to demonstrate compliance with the specified requirements.
3. Manufacturer's recommended methods of installation.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer’s recommendations.

1.4 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Products used in the work of this section shall be produced by manufacturer's regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer.

B. Qualifications of Installers: Use sufficient journeymen plumbers and competent supervisors in execution of this portion of the work to ensure proper and adequate installation throughout.

PART 2 - PRODUCTS

2.1 PIPES

A. Pipe shall conform to Section 02080 - Utility Pipe and Materials.

B. Unless specifically stated otherwise, all pipe, fittings, and appurtenances shall be new, free from defects or contamination, and shall, whenever, possible, be the standard product of a single manufacturer.

2.2 PIPE HANGERS AND SUPPORTS

A. General: Pipe supports shall be installed according to Section 15250 - Pipe Supports.

B. Horizontal Piping: Horizontal piping shall be supported such that forces are transmitted from the piping system to the hangers and sagging is eliminated. Hangers shall be pipe ring, split pipe ring, extension split pipe clamp or clevis type, with adjustable length hanger rods. Hanger rods shall be attached to trusses. Perforated pipe straps, thin strap or wire shall not be an acceptable means of supporting pipe.

C. Vertical Piping: Vertical piping shall be supported with riser clamps. Piping on walls shall be supported with one hole clamp, U-bolts or other means as approved by the Engineer.

D. Materials: Piping shall be supported with copper, brass, copper plated, or plastic covered malleable iron hangers and supports.

E. Hanger Spacing: PVC and steel pipe supports shall be as follows:
   1. 1/2 inch and smaller, not greater than 4 feet apart.
   2. 3/4 inch and larger, not greater than 6 feet apart.

F. Hangers shall be located at all points where pipes change direction.

2.3 FLOOR DRAINS

A. Drains shall conform to ANSI/ASME A 112.21.1. Floor drains shall be coated cast iron with double drainage flange, weepholes, threaded outlet connection, integral bell trap, and adjustable polished nickel alloy round removable strainer. Strainer shall be 6 inches in diameter and shall be made with light duty grate in buildings except in traffic areas where medium duty shall be used.

2.4 TRAPS

A. General: All traps shall be "P" traps. Visible traps shall be adjustable cast brass, chromium plated escutcheon plates.

2.5 WATER HEATERS

A. Soda Ash Solution Instantaneous Water Heater: Water heater for soda ash solution makeup and flushing water shall be an instantaneous electric water heater operating on 480VAC three phase service. Unit shall have 36 KW rating to provide a minimum 49°F temperature rise at 5 gpm demand and 25°F temperature rise at 10 gpm demand with maximum operating pressure of 145 psi. Unit shall have a NEMA 4 enclosure and digital thermostatic control in 1° increments over a range of 60-180°F. Heater shall be Stiebel Eltron CE Plus, or approved equal.

B. Drench Hose Water Heater: Drench hose and eyewash water heater shall be an instantaneous electric water heater operating on or 240VAC single phase service. Unit shall have 13 KW rating to provide a minimum 45°F temperature rise at 2.54 gpm demand. Unit shall have digital thermostatic control in 1° increments over a range of 80-140°F. Heater shall be EcoSmart ECO 11, or approved equal.

C. Point-of-Use Water Heater: Point-of-Use water heater shall be a 4 gallon, 1.44 KW, 120 volt mini electric water heater, similar to EcoSmart Eco Mini 4.

2.6 EYEWASH/ DRENCH HOSE

A. Eyewash/Drench Hose: Unit shall be wall mounted, hand-held eyewash/drench hose with chrome-plated brass stay-open ball valve, nylon handle, powder-coated mounting bracket and flag handle, 12ft. nylon coiled hose, and ANSI compliant sign. Unit shall have (2) polypropylene spray heads with integral "flip-top" dust covers, filters and 1.6 GPM flow control orifices mounted on a chrome-plated brass eyewash assembly. Unit shall be fully factory assembled and hydrostatically tested to meet or exceed ANSI Z358.1 – 2014, and come with a full 2-year warranty. Unit shall be Guardian G5014, or approved equal.

B. Thermostatic Mixing Valve: Thermostatic mixing valve shall be supplied to regulate and temper water to the eyewash/ drench hose. Valve shall have a precision thermal actuator to accurately blend hot and cold water. Valve shall be factory preset to deliver 85° F (29° C) tepid water with high temperature limit stop at 90° F (32° C). Temperature shall be field adjustable and lockable. Valve shall have a flow capacity of 13 GPM (49 L/min) at 30 PSI (2.1 bar) pressure drop.

In event the hot water supply fails, the valve shall deliver cold water only (i.e. bypass mode) at a flow rate of 9 GPM (34 L/min) at 30 PSI pressure drop. In the event the cold water supply fails, the valve shall close and not deliver any water at all.

Valve shall be furnished with lockable shutoff valves on the hot and cold water supplies, internal check valves to prevent cross-mixing of hot and cold water and stainless steel basket filters to remove debris from the water flow. Valve shall be furnished with outlet temperature gauge and stainless steel mounting bracket. Valve shall meet the requirements of the U.S. Safe Drinking Water Act as lead-free.

Valve shall have ½" NPT female inlets and outlet. Valve shall be third-party certified to comply with ANSI/ASSE 1071 and shall be fully assembled and factory tested prior to shipment. Valve shall be Guardian G6020, or approved equal.

2.7 FIXTURES

A. Wall Sink: Bathroom sink shall be ADA compliant wall hung style manufactured of vitreous china with self-draining deck area, contoured back and side splash shields, white finish, and 8 inch spread faucets of chrome or nickel finish. Sink shall be American Standard Lucerne series lavatory with Kohler Sundae faucet, or approved equal.

B. Toilet: Toilet shall be ADA compliant elongated chair height toilet with white finish. Toilet shall be Kohler Cimarron, or approved equal.

C. Countertop Sink: Countertop sink shall be undermount style constructed of 18 gauge stainless steel with 9" depth and 23" width. Sink shall be Hamat Enterprise collection with Apex series faucet, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Code: Comply with all applicable State and local building codes.

B. General: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PLUMBING SYSTEM LAYOUT

A. General: Lay out the plumbing system in careful coordination with the plans and other trades determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Follow the general layout shown on the plans in all cases except where other work may interfere. Lay out all pipe to fall within partition walls, or roof cavities, unless shown otherwise.

3.3 LOCATION OF PIPING

A. General: Arrange and install piping approximately as indicated, straight, plumb, and as direct as possible. Form right angles or parallel lines with building wall and floor. Keep pipe close to walls, partitions and ceilings. Offset only where necessary to follow walls. Pipes shall be sloped as necessary for proper functioning of the system, including drain down of water pipe. Install piping so as to leave parts of the system readily accessible for repairs and maintenance.

B. Parallel Pipes: Where several pipes are run together, they shall run parallel and shall be spaced at distances which will permit access for servicing, unless provisions for pitching the pipes dictate different elevations.

C. Interferences: Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing all doors and passageways to the approval of the Engineer.

3.4 INSTALLATION – GENERAL

A. General: Do not cut or reduce size of any load-carrying structural member without the prior approval of the Engineer. Install all pipes to clear all beams and obstructions in accordance with the following:

1. Install all piping promptly, capping or plugging all open ends.
2. Install all piping, with slopes as noted, and plumb, free from traps, and in a manner to conserve space for other work.
3. Cushion all traps and bearings to minimize transfer of sound. Provide complete isolation of all dissimilar materials. Firmly anchor all pipes into position.
4. Provide uniform pitch of at least 1/4 inch per foot for all horizontal waste piping within the building.

3.5 INSTALLATION OF PIPING

A. General:

1. Pipe shall be protected during handling against impact shocks and fee fall.
2. Piping shall be cut accurately to measurements established at the site and shall be emplaced without springing, forcing, excessive cutting or weakening of the building structure. Pipes shall be installed in a manner permitting proper drainage, venting, and free expansion and contraction. Changes in direction shall be made with factory manufactured fittings.
3. Reductions in pipe shall be made with reducing fittings only. Bushings are prohibited unless shown on the plans or approved by the Engineer.
4. Nipples shall be the same material and pressure rating as the remainder of the piping system. Use nipple of higher pressure rating when length of unthreaded part of nipple is less than 1-1/2 inches.
5. Unions or flanged spool pieces shall be used to facilitate piping installation, and shall be installed between valves and equipment to facilitate removal of equipment for repair.
6. Installation practices shall be in accordance with the best standards of the trade. All piping shall be reamed after cutting to remove burrs and rough edges. All piping shall be cleaned free of

cuttings and oil prior to installation. All pipe lines shall be capped during construction to avoid the entry of foreign materials into the piping.

7. Installation of the piping system shall be such as to allow for thermal expansion and contraction while preventing undue stresses and strains on the systems and connected equipment. Contractor shall take proper care that lines will be installed so as to allow proper drainage, avoid trapping of air, and allow for normal expansion movements. Contractor shall be held liable to correct any defects in installation or proper performance of the piping systems under Contract.
8. Piping shall be installed parallel with or at right angles to building walls or piping and supported by approved methods.

B. Pipe Cleaning:

1. The Contractor shall make every effort to handle and place all material so that no foreign matter may enter either before, during, or after being installed. Any such matter which unavoidably gets into the pipe shall be carefully removed by the Contractor.
2. Clean pipe, pipe fittings, and valves before erection.
3. After threading any pipe, clean pipe ends carefully to remove cutting oil and particles. Any pipe which is stored shall have threading protected until installation commences.
4. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry.

C. Below Grade Piping:

1. Pipe lines shall be laid to alignment and depth shown on the Contract Plans. A minimum depth of cover of 36 inches over the top of the pipe shall be provided, if no depth or grade is indicated on the Drawings.
2. Blocks shall not be used under any pipe except where absolutely necessary and only with the expressed approval of the Engineer.
3. Trenches shall be kept free of water and as dry as possible during bedding, laying and jointing. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings. No end of pipe trench shall remain open overnight.
4. As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade.

D. Joining of Pipes: Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. Pipe shall be installed in accordance with the manufacturer's recommendation.

E. Threaded Joints:

1. Screwed connections shall have full threads of true taper, accurate to gauge, and conforming to ANSI B 2.1.
2. Pipe shall be reamed and threaded. Remove cutting oil and make up joints with Teflon threaded tape or pipe dope on the male connection only.

F. Dissimilar Metals:

1. Wherever possible, connections between equipment, piping hangers of dissimilar metals shall be avoided.
2. Wherever such a connection or contact between dissimilar metals is to occur, insulate the two different materials using a best quality dielectric insulating material.

3.6 STERILIZATION OF PIPES

A. Chlorination:

1. After preliminary purging of the system, chlorinate the entire potable water system in accordance with the current procedures of the American Water Works Association (AWWA C 651) for flushing and disinfecting water mains, and in accordance with all other pertinent rules and regulations.
2. A minimum of two consecutive satisfactory samples taken from the outlet furthest from the building supply, shall be obtained and analyzed by a State certified laboratory with satisfactory results prior to potable use.
3. Chlorinate only when the building is unoccupied.
4. Upon completion of sterilizing, thoroughly flush the entire potable water system.

3.7 TESTING

A. General: Furnish all test pumps, gages, equipment, and personnel required to demonstrate the integrity of the finished installation. Notify the Engineer and all pertinent approval authorities five days before the tests are to be performed. No piping shall be covered up or concealed until all testing is performed, leaks stopped and the system retested and approved. All tests shall be observed by the Owner's representative.

B. Procedures:

1. Drain: Unless otherwise directed, plug all openings and fill with water to a height equal to the lowest vent. Allow to stand one hour or longer as required by regulation. Remake leaking joints as directed and then retest.
2. Other: Test all piping specialties for proper operation. Test all air vent points to ensure that air has been vented.

C. Record Data: Upon completion and approval of testing, submit in writing the following:

1. That all tests have been satisfactorily performed.
2. Dates the tests were performed.

END OF SECTION

SECTION 16280 – LOW VOLTAGE ACTIVE HARMONIC FILTER

PART 1 - GENERAL

1.1 SUMMARY

A. This specification defines the requirements for active harmonic filter systems in order to meet IEEE-519-2014 electrical system requirements for harmonic current limits. The active harmonic filter shall have the capability to maintain power factor between 0.0 to 1.0, either leading or lagging when operated within limits.

1.2 STANDARDS

A. The active harmonic filter system shall be designed in accordance with the applicable sections of the following documents.

1. IEEE std 519-2014
2. UL 508

B. The products shall include third party approvals by cULus.

1.3 SYSTEM DESCRIPTION

A. The active harmonic filter shall electronically supply the non-fundamental current demanded by the non-linear load that results in a near sinusoidal current being drawn from the supply. Contractor shall coordinate with supplier of filter and any variable frequency drives on the system to ensure that all load inductive impedance and other factors are compatible. Filter shall be as manufactured by Allied Power TCI, or approved equal.

B. System Rating

1. Voltage: 480 Volts, 60 Hz, 3 phase, 3 wire plus ground.
2. Current Rating: 150 Amp
3. Current Transformers:
    a. Two current transformers are required and mounted on phases A & C.
    b. Current transformers are an integral part of the active harmonic filter. When current transformers are installed external to the active harmonic filter equipment, the contractor shall be responsible for the installation of manufacturer provided current transformers.
    c. Current ratings of the current transformers shall be according to full load current of the circuit on which installed.
    d. Current transformers shall be rated for 400 Hertz.

C. Performance Requirements

1. Response Time:
    a. In a steady state condition, the active harmonic filter shall have a response time of less than one (1) line cycle.
    b. In the event of a load change or transient condition, the response time shall be within three (3) line cycles.
2. Input Power:
    a. Voltage: 480 Volt, 3 phase, 3 wire plus ground
    b. Voltage Tolerance: +/- 10% of nominal
    c. Frequency: automatically adapted to 60Hz, +/- 3%
    d. Input Circuit Breaker: 65 kAIC (min)

3. Output Performance

a. Performance of the active harmonic filter shall be independent of the impedance of the power source. All performance levels shall be attained whether on the AC lines, backup generator, or output of UPS.

b. Harmonic Correction:

1) Limit THD (I) to less than or equal to 3% while in closed loop control and filter is 50% or more loaded.

2) Limit the 2nd through 50th order harmonic current to <5% TDD. Levels for individual harmonic orders shall comply with respective levels established in ANSI/IEEE Std 519-2014, Table 2.

3) Limit the THD (V) added to the electrical system immediately upstream of the active line conditioner location(s) to less than or equal to 5%.

c. Reactive Current Compensation shall be capable of improving displacement power factor to a user programmable minimum value setpoint. The setpoint shall be programmable via the HMI to any value from 0.0 to 1.0, either leading or lagging.

D. Environmental Conditions: The active harmonic filter shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics or life.

1. Operating Ambient Temperature: 0°C to 40°C.
2. Operating Ambient Temperature for selected open chassis units: -20°C to 50°C.
3. Storage Temperature: -40°C to 65°C.
4. Relative Humidity: 0 to 95%, non-condensing.
5. Altitude: Operating to 1000 meters (3300 ft).

PART 2 - PRODUCT

2.1 ENCLOSURE

A. Each filter shall be provided in a UL Type 12 rated enclosure.

B. All enclosed units shall have means to prevent the door from being opened when the unit is energized. This can be achieved by either:

1. A door-interlocked circuit breaker that provides power interruption when the door is opened. The circuit breaker shall be lockable in the power-off position. Units shall be disconnected from the power source by a disconnect device or circuit breaker contained in the power distribution center as defined by local and national codes for branch circuit protection. OR
2. A mechanism that locks the door when the unit is energized. The unit may be fed using an external disconnect or breaker.

C. Filter shall includes door mounted digital HMI operator interface.

D. Unit shall be provided with a grounding lug. Grounding by the contractor is to be performed according to local and national standards.

2.2 OPERATOR CONTROLS AND INTERFACE

A. The active harmonic filter shall require minimal field programming.

B. The active harmonic filter shall contain a color touch screen display with the following features:

1. Easily navigable screens, including Home, Status, Fault, and Setup screens.
2. Display voltage and current waveform data along with RMS metering data.

3. A gauge-based indicator of active filter current usage, from 0 to 100% of capacity. Dual state indications of nominal operation and “at capacity” operation.
4. An alarm history buffer saved in non-volatile memory. Buffer information shall persist between power outages, with a minimum of 128 event entries.
5. Ability to set the end user Line/Load CT ratio of the active harmonic filter system.
6. The Operator Interface shall show THD, Power Factor, RMS Current, RMS Voltage, and Fault History.
7. Ability to adjust the polarity and phase allocation of the A & C phase CTs to other phases via the HMI.

C. The active harmonic filter shall have the ability to operate in the following three (3) modes, which shall all be configurable from the local operator color touch screen display:

1. Harmonic correction only mode
2. Power factor correction only mode
3. Combination harmonic and power factor mode

D. The active harmonic filter shall have a configurable relay-based run/stop command input in addition to the manual and auto run/stop commands. The active filter shall have a configurable relay-based fault output. Each contact shall be rated for 2.0 Amperes at 250 volts.

E. The filter shall have a configurable network-based run/stop command input in addition to the manual and auto run/stop commands.

F. The filter shall have the ability to load and save operational parameters in non-volatile persistent memory and the ability to revert to factory default parameter settings.

G. The filter shall possess an integrated industry standard serial TIA/EIA-485 / RS-485 fieldbus slave network connection such as Modbus RTU for remote monitoring and operation of the active filter.

H. The filter shall have the ability to communicate over a standard industrial Ethernet communications network such as Ethernet/IP or Modbus TCP/IP.

I. The unit shall automatically begin to correct harmonic currents after power up without the need for operator intervention.

J. The unit shall have the ability to display trend history data for line voltage, line current, filter current, current THD, filter bus voltage, and filter heatsink temperature.

2.3 DESIGN

A. All active harmonic filters shall be defined as power electronic devices which consist of power semiconductors and a DC bus that acts to inject current into the AC line that will cancel undesirable harmonic currents drawn by the load. A DC bus shall store power for power semiconductor switching. A digital microcontroller shall control the operation of the power converter.

B. The active harmonic filter shall feature fully digital synchronous frame controls for selected harmonics to enhance drive load compatibility.

C. The active harmonic filter shall feature a fully digital, broadband current regulator with progressive gains to eliminate system resonance tuning issues and simplify startup and commissioning.

D. The active harmonic filter shall feature single processor control of all power electronic devices per a single active filter to reduce fault response latency and harmonic correction loop times

E. Each unit shall be designed with over-current and current limiting self-protection. Operation shall continue indefinitely at manufacturer defined safe operating levels without trip off or destruction of the active harmonic filter.

F. Units shall detect heatsink temperature and have the ability to fold back the current limit based on the temperature measurement.

G. Two distinct levels of faults shall be employed: Critical and Non-critical levels. Non-critical level faults will provide automatic restart and a return to normal operation upon automatic fault clearance. Critical level faults stop the function of the unit and await operator action to restart.

1. Faults such as AC line power loss shall be automatically restarted upon power restoration. Upon removal of these fault conditions, the active line conditioner shall restart without user action.
2. All other faults shall be considered critical faults and stop the active harmonic filter. The run relay shall be disabled, and the fault relay enabled. User shall be required to initiate a power reset (cycle power off and on) to restart the active harmonic filter.

H. The logic of the active harmonic filter shall monitor the load current by utilizing two (2) current transformers (CTs) mounted on phases A and C to direct the function of the power electronic converter.

I. Multiple active harmonic filters may be installed in parallel to inject current. The units will function independently. If one unit is stopped or faulted, the remaining units will continue to operate normally.

2.4 FACTORY TEST

A. Each active filter shall undergo a functional test and a full load current burn-in test at its original manufacturing plant. Equipment including a harmonic producing load, current sense CTs, and an active filter under test shall be used for the following tests:

1. A harmonic correction performance test to ensure harmonic correction and attenuation specifications are met. The unit shall be tested at greater than 80% of rated current at rated voltage.
2. A full load current burn-in test to reach thermal steady state within the unit. The test duration shall be from 1 hour to 4 hours depending on the active filter current rating. The filter shall operate at greater than 95% of rated current with at least 80% of the current comprising of harmonics.

B. Factory test report shall be provided with the active filter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in compliance with all manufacturer requirements, instructions, and contract drawings, including:

1. Space surrounding the active harmonic filter to maintain adequate cooling.
2. Conditioning of space surrounding the active harmonic filter enclosure to maintain the manufacturer’s ambient temperature and humidity ranges.
3. Accessibility of the active harmonic filter diagnostic lights and communication ports – these components shall be free from obstructions at all times.
4. Ensure that communication connections and wiring are properly protected in accordance with manufacturer recommendations.

3.2 START-UP SERVICES

A. The supplier of the filter shall provide the services of a trained, qualified representative for at least one trips and one day of field service per filter provided for the purpose of inspecting the installation to assure compliance with shop manufacturer and Owner requirements and initial startup of the equipment. The manufacturer's representative shall also instruct the operating personnel in the proper method of operation and maintenance of the equipment. At a minimum, the start-up service shall include:

1. Pre-power check:

a. Verify proper active filter installation and clearances
b. Inspection of the filter for damage and debris
c. Verify critical electrical and mechanical connections are tight
d. Tug test internal connections and verify wiring
e. Update hardware if appropriate
f. Verification of proper power connection at filter input terminals
g. Verification of proper CT installations and electrical connections

2. Active harmonic filter power-up and commissioning:

a. Power the active harmonic filter and perform operational checks
b. Update software if appropriate
c. If applicable run the filter with VFD load and tune filter to system attributes

3. Performance measurements shall be recorded
4. Active harmonic filter parameter listing shall be provided

B. Following the start-up of the equipment the supplier shall provide a written certification verifying that the units have been installed and started up property and are performing in accordance with the specifications and confirming that nothing has been done to negatively impact the equipment warranty.

3.3 WARRANTY

A. Manufacturer's Warranty: The manufacturer shall provide a minimum 12 month warranty commencing from the date equipment is satisfactorily started up and placed in service.

END OF SECTION

SECTION 16482 – VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 70 National Electrical Code
2. NFPA 101 Life Safety Code

B. National Electrical Manufacturers' Association (NEMA):

1. NEMA 250 Enclosure Description and Application

1.2 SUMMARY

A. Work includes furnishing and installing variable frequency drives for operation of the indicated equipment motors. Equipment shall be provided with all appurtenances as necessary to provide a complete system.

1.3 SUBMITTALS

A. Materials and equipment will be approved based on the manufacturer’s published data.

B. Detail drawings shall be submitted for approval and shall consist of a complete list of equipment and materials, including manufacturer’s descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Detail drawings shall be submitted for all materials and equipment specified. Drawings shall show applicable schematic diagrams, equipment layout and anchorage.

C. The label or listing of the Underwrites Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements. However, materials and equipment installed in hazardous locations must bear the UL label unless the Engineer specifically approves the data submitted from other testing agency in writing. For other than equipment and materials specified to conform to UL publications, a manufacturer’s statement indicating complete compliance with applicable Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers Association or other commercial standard, is acceptable.

1.4 QUALITY ASSURANCE

A. Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

B. The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated herein or shown.

1.5 WARRANTY

A. The manufacturer of the equipment shall warrant it to be of quality construction, free from defects in material and workmanship. The manufacturer's warranty period shall be a minimum of 6 years from the date of equipment delivery. Warranty shall provide 100% coverage for parts and labor. Components failing to perform as specified by the ENGINEER, or as represented by the manufacturer, or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the OWNER.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be the responsibility of the Contractor and at a minimum shall be conducted in accordance with the manufacturer's recommendations.

PART 2 - PRODUCT

2.1 VARIABLE SPEED DRIVES

A. General: Furnish variable frequency drives to provide powering of the equipment motors as indicated on the plans. Raw and finished water pump drives shall include Ethernet/IP communication for advanced monitoring by the SCADA system, in addition to the dedicated input and output control indicated. Drives shall have Nema 12 enclosure and RFI filters. Drives 5 HP and larger shall have lockable fused main disconnect switch. VFD's shall be user-selectable for either constant or variable torque loads. Drives shall be products of Danfoss or Allen Bradley. Drives shall be warranted by manufacturer to be free from defects in material and workmanship for 6 years from date of shipment. Warranty shall provide 100% coverage for parts and labor.

B. Converter: A converter stage shall change fixed voltage, fixed frequency, AC line power to a fixed DC voltage. The converter shall consist of six power diodes in a three phase, full wave bridge, configuration. The converter shall be insensitive to the phase rotation of the AC line and shall not cause displacement power factor of less than .95 lagging under any speed and load condition.

C. Inverter: An inverter stage shall change fixed DC voltage to variable frequency, variable voltage, AC for application to a standard NEMA design B squirrel cage motor. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform and shall output a waveform that closely approximates a sine wave. The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or derating.

D. Temperature Rating: The controller shall be rated to operate in an ambient temperature 0 degrees C to 40 degrees C continuously. Installation at altitudes less than 3,300 feet above sea level shall not require derating.

E. The controller shall be designed to operate from a 460V + 10 percent, - 5 percent three phase, 50/60 Hz supply and control a motor with a corresponding voltage rating. Acceleration and deceleration time shall be independently adjustable from 1 second to 360 seconds.

F. The VFD will be capable of running either variable or constant torque loads. In variable torque applications, the VFD shall provide a CT-start feature and be able to provide full torque at any speed up to the base speed of the motor. In either CT or VT mode, the VFD shall be able to provide its full rated output current continuously and 110% of rated current for 60 seconds.

G. Output Frequency: The controller shall be capable of producing an output frequency over the range of 3 Hz to 60 Hz (20 to 1 speed range), 3 Hz to 90 Hz (30 to 1 speed range) or 3 Hz to 120 Hz (40 to 1 speed

range) without low speed cogging. Over frequency protection shall be included such that a failure in the controller electronic circuitry shall not cause frequency to exceed 110 percent of the maximum controller output frequency selected (60, 90, or 120 Hz). Minimum and maximum output frequency shall be adjustable over the following ranges:

1. Minimum frequency 3 Hz to 50 percent of maximum selected frequency
2. Maximum frequency 40Hz to 60 Hz

H. The controller shall be capable of being restarted into a motor coasting in either the forward or reverse direction without tripping.

I. Switching of the input power to the VFD shall be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.

J. An Automatic Energy Optimization (AEO) selection feature shall be provided in the VFD to minimize energy consumption in variable torque applications. This feature shall optimize motor magnetization voltage and shall dynamically adjust output voltage in response to load, independent of speed. Output voltage adjustment based on frequency alone is not acceptable for single motor VT configurations.

K. An Automatic Motor Adaptation (AMA) function shall measure motor stator resistance and reactance to optimize performance and efficiency for all motor constructions. It shall not be necessary to spin the motor shaft or de-couple the motor from the load to accomplish this optimization. Additionally, the parameters for motor resistance and motor reactance shall be user-programmable.

L. The VFD selected must be able to source the motor's full load nameplate amperage (fundamental RMS) on a continuous basis, and be capable of running the motor at its nameplate RPM, voltage, current, and slip without having to utilize the service factor of the motor.

M. VFD shall automatically boost power factor at lower speeds.

N. The VFD shall have temperature controlled cooling fans for quiet operation, minimized internal losses, and greatly increased fan life.

O. The VFD shall include an integral RFI filter conforming to the A2 standard as a minimum. VFD enclosures shall be made of metal to minimize RFI and provide additional immunity.

P. VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with PELV requirements and to protect PLC's and other connected equipment from power surges and spikes.

Q. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. DC Link reactor shall be installed so that power fluctuations to the DC Capacitors shall be reduced to increase Capacitor life. VFD's without a DC link reactor shall provide a 5% impedance line side reactor and provide spare capacitors.

R. Protection: Protection of power semiconductor components shall be accomplished without the use of fast acting semiconductor output fuses. Subjecting the controller to any of the following conditions shall not result in component failure or the need for fuse replacement:

1. Short circuit at controller output
2. Ground fault at controller output
3. Open circuit at controller output
4. Input undervoltage
5. Input overvoltage
6. Loss of input phase
7. AC line switching transients
8. Instantaneous overload

9. Sustained overload exceeding 115 percent of controller rated current

S. Overload Protection: Solid state motor overload protection shall be included such that current exceeding an adjustable threshold shall activate a 60 second timing circuit.

Should current remain above the threshold continuously for the timing period, the controller will automatically shut down. The timing circuit shall include a memory such that current exceeding the threshold for less than 60 seconds and dropping back below the threshold momentarily shall not cause the timer to reset to zero but shall cause the timing circuit to pick up at a point dependent upon the length of time the current was below the threshold.

T. Slip Compensation: A slip compensation circuit shall be included which will sense changing motor load conditions and adjust output frequency to provide speed regulation of NEMA B motors to within +-0.5 percent of maximum speed without the necessity of a tachometer generator.

U. Reversing: the controller shall include static reversing which shall change the output phase rotation by changing the order of firing signals to the inverter switching devices. All logic necessary to accept a direction select contract shall be included.

V. Display: The controller electronics shall contain light emitting diodes (LEDs) or a digital diagnostic display to monitor and indicate the following conditions:

1. Drive Lockout
2. Undervoltage
3. Overvoltage
4. Overtemperature
5. Instantaneous Overcurrent
6. Ground Fault
7. Shoot Through
8. Overload Threshold Exceeded
9. Overload Shutdown
10. Power Up Delay
11. +10V supply 0K112.10V Supply OK112.-10V Supply OK
12. Controller Enabled
13. Motor Regenerating
14. Current Limit Operating (Motor Mode)
15. Current Limit Operating (Regen. Mode)
16. Gate Driver Cards Operating (6)

W. Inputs and Outputs: The controller shall include the following input and output signal connections.

1. Digital Run Command Input
2. Digital Run Confirmation Output
3. Digital Fail Indication Output
4. Analog (4-20mA) Speed Command Input
5. Analog (4-20mA) Operating Speed Output

X. Motor Heater Power: Drives for vertical turbine pump and thickener tank mixers shall have 120 volt control power supply with sufficient capacity to power a 192 watt, 120 volt motor space heater in addition to standard control devices in the drive. The drive shall have a contact that will energize the space heater when the motor is not running, and de-energize the space heater when the motor is running.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment specified in this section shall be installed in accordance with the manufacturer's recommendations at the locations as shown on the plans.

3.2 START-UP SERVICES

A. The supplier of the drives shall provide the services of a trained, qualified representative for at least three trips and four (4) days of field service for the purpose of inspecting the installation to assure compliance with shop manufacturer and Owner requirements and initial startup of the equipment. The representative shall notify the Owner of anything in the installation which might render the manufacturer's guarantee null and void. The manufacturer's representative shall also instruct the operating personnel in the proper method of operation and maintenance of the equipment.

B. A 6-year on-site warranty shall be provided such that the owner is not responsible for any warranty costs including travel, labor, parts, or other costs for a full 6 years from the date of delivery of the drive. The warranty shall cover all drive failures including line anomalies.

C. Following the start-up of the equipment the supplier shall provide a written certification verifying that the units have been installed and started up property and are performing in accordance with the specifications and confirming that nothing has been done to negatively impact the equipment warranty.

D. A variable frequency drive technician shall checkout and reconfigure existing finished water pump drives for modified operation to accept new analog input speed reference signals from the SCADA system and provide analog speed feedback output function. Configuration of existing and new drives shall be checked to verify proper operation of all analog and digital input and output signals.

END OF SECTION

16900 – CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This section covers work necessary for the design, documentation, assembly, installation, field testing, startup, training, and final documentation for project controls and modifications to the Owner's Synchronous Control and Data Acquisition (SCADA) system, as described herein. Major components of this system shall include the specified software modifications, materials, equipment, and installation required to implement and integrate the equipment within the system, as well as any associated panel or field equipment modifications.

1.2 GENERAL REQUIREMENTS

A. Electrical: All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire color code and number shall be clearly shown on the drawings, with each wire's color and number indicated.

1.3 QUALITY ASSURANCE

A. General: The system provider (hereafter referred to as Contractor) shall be responsible for and shall provide for the design, supply, delivery, installation, certification, calibration and adjustment, software configuration, testing and startup, owner training, warranty and routine future field services, of a complete coordinated system which shall perform the specified functions.

B. Standard Products: In order to achieve standardization for appearance, operation, maintenance, spare parts and manufacturer's service, to the greatest extent practical, like items of equipment provided hereunder shall be the end products of the same manufacturer.

1.4 SUBMITTALS

A. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for their review copies of submittal documents. Submittals shall include full details, shop drawings, catalog cuts, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the Contractor shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on USB storage device.

2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.

3. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.

B. Software Configuration: Software programmer shall coordinate and attend meeting (in person or via remote video conference) with Owner and Engineer to develop conceptual layout of software and HMI screens and functionality. Digital copies of all HMI screens shall be submitted to Owner and Engineer and revised per comments as required for final approval.

C. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.

D. Scope of Engineer's Review: The Owner and the Engineer will review system technical information as submitted by the Contractor for software; operating system, database, control strategies and the graphical user interface, i.e. report and log formats, graphics, trends, alarming, etc. for compliance with these specifications. Review of the submittal does not relieve the Contractor from the responsibility of providing a fully functional telemetry and control system which complies with the project documents.

1.5 OPERATION AND MAINTENANCE MANUALS AND SOFTWARE

A. General: The Contractor shall provide a digital O&M manuals for the controls. In addition to "as-built" system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this section. Wiring diagrams shall be provided for all equipment panels and shall include colors and unique numbers for all panel wires.

The 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.

Operation and Maintenance manuals shall include copies of all PLC programs written to accomplish the monitoring and control functions specified. Programs shall be updated after startup is complete, with the fully commented program(s) licensed to and provided to the Owner on USB storage device. One (1) printed copy and one (1) digital copy of all manuals shall be provided.

All custom programing shall be licensed to Owner for their use on existing facilities and as a base for future expansion of system.

The contents of the O&M manuals shall include the following sections:

1. System Hardware/Installation
2. System Software
3. Operation
4. Maintenance and Troubleshooting

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling: Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer’s written instructions. Protect equipment and controls from dirt and damage.

B. Delivery: Schedule deliveries to minimize long-term storage at the Project site and to prevent overcrowding of construction spaces. Deliver products to Project site in an undamaged condition in Manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling,

storing, unpacking, protecting, and installing. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: The functions and features specified herewith are the minimum acceptable requirements for implementing the upgrades and additions to the Authority's SCADA system at the water treatment facilities. In some cases, the specifications may allow the accomplishing of certain functions by means of more than one hardware/firmware/software approach. Any approach that is proposed shall equal or exceed all functional, operational, convenience and maintenance aspects of the one described. Major equipment, component and software items are specified; however, the Contractor shall provide all appurtenant items necessary to achieve the required operation as hereinafter specified.

B. Overview: The SCADA system at the water treatment facility and remote sites was installed in 2008, when the facilities were originally constructed. The Main Building includes two Treatment Train Panels operating and monitoring equipment in that building and exterior basins. Three filter console control panels are located in the Filter Building operating and monitoring each Filter and shared components. All panels in the Main and Filter Buildings are networked via Ethernet. Two master SCADA computers are also located in the Control Room and primary Laboratory in the Main Building. One remote control panel is located at the Finished Water Station and networked via fiber optic loop. An additional control panel is located at the Raw Water Intake and networked via broadband internet. The SCADA system also includes broadband communication to other remote Authority operated facilities. The PLC hardware consists primarily of Allen Bradley components including CompactLogix processors in the Main and Filter Buildings and MicroLogix 1100 processors at the Finished Water Station and Raw Water Intake.

The SCADA software system was originally developed with FactoryTalk HMI software system; however, it has since been replaced with an Ignition system.

Existing automated SCADA control operations at the treatment plant include, but are not limited to, the following:

1. Sodium Permanganate Metering Pumps (Raw Water Intake): The lead sodium permanganate metering pump is started when either of the Raw Water Pumps is running and raw water flow is greater than 200 gpm. Feed rate is paced according to the reading from the raw water flow meter to maintain a constant desired dosage.

2. Polyaluminum Chloride (PAC) Metering Pumps - PAC Pumps #1 and #2 operate when flow in its respective treatment train is greater than 100 GPM. Feed rate is paced according to the reading from each respective treatment train flow meter to maintain a constant desired dosage. PAC Pump #3 can be used as a spare for either of the other two pumps, if the selector switch on the local pump panel is set to either "1" or "2". In either of those cases, the automatic operation of that pump will be identical to either Pump #1 or Pump #2.

3. Hypochlorite Metering Pumps – Hypochlorite Pumps #1 and #2 operate when flow in its respective treatment train is greater than 100 GPM. These pumps feed to the sedimentation basin and filter inlets respectively, and are not normally both enabled. Feed rate is paced according to the total reading from both treatment train flow meters to maintain a constant desired dosage. Pump #3 operates when either of the filter effluent valves is open and total filter effluent flow is greater than 50 GPM. Feed rate is paced according to the total reading from all filter effluent flow meters to maintain a constant desired dosage.

4. Soda Ash Metering Pumps – Soda Ash Pumps #1 and #2 operate when flow in its respective treatment train is greater than 100 GPM. Feed rate is paced according to the reading from each

respective treatment train flow meter to maintain a constant desired dosage. Pump #3 operates when either of the filter effluent valves is open and total filter effluent flow is greater than 50 GPM. Feed rate is paced according to the total reading from all filter effluent flow meters.

5. Carbon Metering Pumps – Carbon Pumps #1 and #2 operate when either of the raw water pumps is running and flow in its respective treatment train is greater than 50 GPM. Feed rate is paced according to the reading from each respective treatment train flow meter to maintain a constant desired dosage. Pump #3 operates when either of the filter effluent valves is open and total filter effluent flow is greater than 50 GPM. Feed rate is paced according to the total reading from all filter effluent flow meters.

6. Hydrofluosilicic Acid Metering Pumps – Hydrofluosilicic Acid Pumps #1 and #2 operate when either of the raw water pumps is running and flow in its respective treatment train is greater than 50 GPM. Feed rate is paced according to the reading from each respective treatment train flow meter to maintain a constant desired dosage. Pump #3 operates when either of the filter effluent valves is open and total filter effluent flow is greater than 100 GPM. Feed rate is paced according to the total reading from all filter effluent flow meters to maintain a constant desired dosage.

7. Hydrofluosilicic Acid Chemical Usage – SCADA PLC shall network interface with tank scale indicator to indicate current scale weight and indicate and record daily chemical usage. Communication cards or protocol translation units shall be added to existing treatment train control panel as required to interface with scale indicator.

8. Treatment Train Flow Rate Control – Operators select a desired target flow setpoint for each of the two treatment trains. The controls operate a PID loop to try and maintain the respective target by adjusting the electrically actuated 12” butterfly upstream of the static mixer according to the respective mag meter reading.

9. Flocculators – The six (6) flocculators operate when flow in its respective treatment train is greater than 100 GPM. Each of the two treatment trains is associated with three (3) flocculators.

10. Sampling Pumps & Solenoid Valves – The influent raw water sampling pump operates when either of the raw water pumps is operating. The post chemical feed water sampling solenoid valve and settled water sampling pumps operate when either of the raw water pumps is operating and flow in the respective treatment train is greater than 50 GPM. Each filter sampling pump operates when the respective filter effluent valve is open and flow is greater than 50 GPM. The finished water solenoid valve operates when either of the finished water pumps is operating and flow is greater than 200 GPM. All sampling pumps include automatically activated solenoid valves on the sample lines to prevent water from draining by gravity while the pump respective sampling pump is not operating.

11. Finished Water Pumps – The finished water pumps are normally operated by HMI Hand selection, with a low clearwell and chlorine contact tank cutout level setpoint. When the pumps are in Auto mode, they are operated according to a demand call from “On” and “Off” level controls in the downstream system Raper Ridge tank. Pumps include variable frequency drives; however, speeds are not typically adjusted currently and are only adjustable from the local drives.

12. Backwash Pumps – The backwash pumps operate when any filter backwash valve is opened and pump run initiated by an operator through the control system.

13. Filter Air Scour Blower – The filter blower operates when any filter air scour valve is opened and blower run initiated by an operator through the control system.

2.2 RAW WATER INTAKE

A. General: Contractor shall replace the existing MicroLogix 1100 PLC at the intake control panel with a new AB MicroLogix 1400, Micro 800, or CompactLogix controller. PLC may be replaced within the existing panel, or a new panel may be provided. The controller shall include inputs and outputs to reconnect all existing I/O which will remain in service as well as new I/O as shown on the plans.

B. Input and Output Modifications: The two existing raw water pump soft starters will be replaced with variable frequency drives for the two new pumps. The PLC shall provide digital output run commands, analog output speed reference signals, digital input run status, analog input speed feedback, and digital input fault indication for each drive. The PLC shall also provide I/O to the three new screen intake electric valve actuators including digital output open command, digital output close command, digital input open and closed limit switch feedbacks, and digital input fault indication. Refer to instrumentation plan sheets for full list of inputs and outputs.

C. Control Modifications: The PLC shall provide manual control and monitoring of all new devices through the local HMI and remote SCADA software. Automatic control shall also be provided to flow pace the new raw water pumps according to an operator flow target setpoint and the actual flow rate measured by the local mag meter. This raw water pump speed flow rate control shall replace the existing main treatment building throttling valve flow rate control.

The local HMI and remote SCADA system controls shall include Open, Close, Auto control of the intake screen valve actuators. In Auto mode, the valves shall normally remain open unless an air backwash of the associated intake screen is initiated by the SCADA system. The SCADA system shall be updated to include a daily air backwash of each screen at a time of day setpoint configurable for each of the three intake screens.

2.3 TREATMENT TRAIN CONTROL PANELS

A. The existing PLCs in the treatment train control panels shall remain. Inputs and outputs and control programming shall be updated as required for new and modified connected equipment.

B. Input and Output Modifications: The Treatment Train Control Panels shall be modified to control and monitor all new chemical feed pumps and scale and flushing solenoid valves. Input and outputs to existing pumps shall be reused for new pumps wherever possible. The PLC shall provide connecting I/O to all peristaltic pumps including digital output run commands, analog output speed reference signals, digital input run status, analog input speed feedback, digital input fault indication, and tube leak detection. The PLC shall add digital outputs to open the three new soda ash flushing solenoids. Refer to instrumentation plan sheets for full list of reworked and additional inputs and outputs.

C. Control Modifications: The PLC shall provide remote manual control for all sodium hypochlorite, PAC, hydrofluosilicic acid, and soda ash pumps and the soda ash flushing solenoid valves. The following updated and new control functionality shall also be provided:

1. Maste Online and Automated Startup/Shutdown Control – The PLC and SCADA interfaces shall be modified to include a Master WTP online or offline selection. When the Online selection is activated, the control system shall display selectable Startup and Shutdown button selections. The Startup selection shall initiate a remote start of one raw water pump, alternating between Auto mode enabled pumps each cycle. Chemical Feed systems and flocculators shall be activated operating all units which are Auto mode enabled once measured flow in the respective treatment train is above the minimum 100 gpm threshold. All filters shall be switched to online In Service mode. The Shutdown sequence shall reverse this series of operations. The Online and Offline treatment plant selection will be used as an additional permissive check for chemical feed pump system operation.

2. Polyaluminum Chloride (PAC) Metering Pumps - PAC Pumps #1 and #2 shall operate when the treatment plant is in the Online condition and flow in its respective treatment train is greater than 100 GPM. Feed rate shall continue to be flow paced according to the reading from each respective treatment train flow meter to maintain a constant desired setpoint chemical dosage. PAC Pump #3 shall feed to the common raw water line prior to the split to individual treatment trains and shall be flow paced according to the combined flow reading of both treatment train meters.

3. Hypochlorite Metering Pumps – Hypochlorite Pumps #1 through #4 shall operate as dedicated feeds to each respective filter influent. In auto control mode, each pump shall be activated whenever the

respective filter influent valve is open and either the filter effluent or rewash valves are full or partially open. Feed rate shall be flow paced according to the filter target effluent setpoint and calculations to provide the desired setpoint chemical dosage. Feed pump #5 shall be selectable between treatment train 1 raw feed, treatment train 2 raw feed, filtrate feed, or idle mode. In raw water or filtrate feed mode, the control shall operate when the treatment plant is in the Online condition and flow in its respective treatment train is greater than 100 GPM. Pumps shall be flow paced according to the respective flow meter reading using the existing dosage and feed calculation controls.

4. Soda Ash Metering Pumps – Soda Ash Pumps #1 and #2 will operate when the treatment plant is in the Online condition and flow in its respective treatment train is greater than 100 GPM. Feed rate shall continue to be paced according to the reading from each respective treatment train flow meter to maintain a constant desired dosage. Pump #3 shall operate when the treatment plant is in the Online condition, at least one filter effluent valve is open with filtrate flow above 50 gpm. Pumps shall be flow paced according to their respective flow meter readings using the existing dosage and feed calculation controls..

5. Hydrofluosilicic Acid Metering Pumps – Hydrofluosilicic Acid Pumps #1 and #2 shall operate when the treatment plant is in Online condition and flow in its respective treatment train is greater than 100 GPM. Feed rate is paced according to the reading from each respective treatment train flow meter to maintain a constant desired dosage. Pump #3 shall operate when either of the filter effluent valves is open and total filter effluent flow is greater than 100 GPM. Feed rate shall be paced according to the total reading from all filter effluent flow meters to maintain a constant desired dosage using existing dosage and feed rate control calculations.

6. Soda Ash Solution Line Flushing Solenoid Valves – Each valve shall be selectable between Auto or Off control mode. In Auto mode, the valve shall be opened whenever the respective metering pump is stopped by its auto control mode. The solenoid valve shall remain open for a operator setpoint defined period adjustable between 0 and 99 seconds. Each valve shall also have a Test feature in the control system which will activate the open cycle when selected.

7. Treatment Train Flow Rate Adjustment – The existing treatment train 1 and 2 flow rate setpoint control will be discontinued, since flow rate loop control is being provided at the intake through that local mag meter reading and the new pump VFDs. The treatment train control programming shall be adjusted so that operators can enter a fully open valve position for each of the two treatment trains to balance flow between the lines.

8. Fluoride Scale – The new fluoride scale interface shall be interfaced to the SCADA system via Ethernet communication through one treatment train switch. The SCADA system shall read and record data from the indicator including current scale weight and current day and previous daily chemical weights fed.

2.4 FILTERS

A. General: A new filter console with PLC, HMI, ethernet interface port, and associated hardware shall be provided for Filter #4, which is being developed as part of this project. The filter console and control hardware shall generally match those of the existing consoles, unless otherwise noted. Refer to instrumentation plan sheets for full list of inputs and outputs.

B. PLC Control and HMI: The new filter console shall provide control of all filter functions, identical to the control provided for the existing filters. In order to maintain uniformity, the PLC and HMI programming shall be copied from one of the existing filter consoles to the new console and updated to address the Filter #4 instruments and components.

C. An additional minimum 5 port DIN rail mounted ethernet switch shall be added to existing Filter Console #3 to extend communication to Filter #4 console. Alternately, the existing switch may be replaced with a new minimum 8 port switch.

D. Filter HMI and PLC programming shall be modified to display the water level above media in units of #.## feet for each filter. The reading shall be based on the upstream pressure transducer already used to compute the filter Loss of Head, with adjustment to account for the elevation difference between the transducer and top of media.

E. Sludge Collector Interface: The new Filter #4 console ethernet switch shall be networked to the new Sludge Collector Control Panel (provide by the Sludge Collector manufacturer) in order to integrate monitoring and control of that equipment to the SCADA system.

2.5 FINISHED WATER STATION

A. General: Contractor shall replace the existing MicroLogix 1100 PLC at the finished water station control panel with a new AB MicroLogix 1400, Micro 800, or CompactLogix controller. PLC may be replaced within the existing panel, or a new panel may be provided. The controller shall include inputs and outputs to reconnect all existing I/O which will remain in service as well as new I/O as shown on the plans.

B. Input and Output Modifications: The PLC shall include additional I/O to provide analog output speed reference and analog input speed feedback from each of the two existing finished water pump VFDs. The PLC shall also provide digital output run command, analog output speed reference signal, digital input run status, analog input speed feedback, and digital input fault indication for the new finished water pump VFD. Refer to instrumentation plan sheets for full list of inputs and outputs.

C. Control Modifications: The PLC shall provide manual control and monitoring of the new finished water pump through the local HMI and remote SCADA software. Automatic control shall also be provided to flow pace the finished water pumps according to an operator flow target setpoint and the actual flow rate measured by the local mag meter or in alternate level control mode to maintain a constant selectable target level in the respective chlorine contact or clearwell tanks. The function shall be selectable where operators can choose flow setpoint target, level target (for each tank), or manual speed mode, where speed can be set through the SCADA HMI. The programming shall allow operators to select whether one or two pumps will operate at a time. When dual pumps are operating, the same speed reference signal shall be output to both operating pumps.

2.6 SLUDGE DEWATERING BUILDING CONTROL PANEL

A. General: The new control panel in the Sludge Dewatering shall provide control and monitoring of the sludge pump station equipment, thickener tank equipment, and new dechlorination feed pumps. The panel shall include PLC, HMI, ethernet and fiber switches, ethernet interface port, and associated hardware. It shall also provide monitoring of the centrifuge and conveyor system. The controller shall be networked to the SCADA system via looped fiber extended from the Finished Water Station. Refer to instrumentation plan sheets for full list of inputs and outputs.

B. Sludge Pump Station Control: The PLC shall monitor wetwell level via wetwell level transducer and alarm float switches. Pumps shall be selectable between Hand, Off, and Auto control modes. In Auto mode, start and stop pump control shall be provided as indicated on the plans according to the sensed wetwell levels. The pump shall be operated by VFDs. Analog I/O shall be provided for speed control and feedback capability; however, speed will only be set manually at the drives initially. Flow rate shall be monitored by the mag meter located within the building. Pump protection relay modules shall be obtained from pump supplier (or per pump suppliers recommendations) for monitoring of pump motor overtemperature and seal failure warning.

C. Thickener Tank Mixers: The PLC shall operate the thickener tank mixers, which are powered by VFDs in the Dewatering Building. Control Mode shall be selectable between On, Off, and Auto Timer. In Auto

Timer mode, the mixers shall operate on repeat cycle timer according to On and Idle duration setpoints. Mixer speed shall also be adjustable via operator setpoints.

D. Dechlorination Pump Control: The PLC shall operate the new dechlorination pumps in the Dewatering Building providing digital output run commands, analog output speed reference signals, digital input run status, analog input speed feedback, digital input fault indication, and tube leak detection. Each pump shall be selectable between On, Off, and Auto mode. In Auto mode one pump shall operate whenever any filter waste valve is open waste flow meter reading is above 100 gpm. Pumps shall alternate every cycle and be paced to maintain a constant feed dosage according to the following equation, with selectable dosage and configuration setpoints for all pump and chemical properties"

$$\text{Pump Speed} = \frac{\text{Dosage(mg/L)} * \text{Water Flow(gpm)}}{\text{Pump Capacity (gph)} * \text{Density (lb/gal)} * \text{Solution Strength} * 1997} * 100\%$$

E. Centrifuge and Conveyor System: The Dewatering Control Panel shall network interface with the centrifuge/conveyor PLC to provide monitoring of that equipment to the Master SCADA system.

2.7 SCADA PC

A. The SCADA PCs shall be update to display status and operator control of all new equipment and control functions. An additional chemical feed screen shall be added to provide detailed monitoring and control of all chemical feed equipment along with popup configuration screens for setting chemical and pump capacity information setpoints used in existing flow control. Additional screens shall be generated to provide more detailed information view of individual processes. These shall include additional screens for the following:

1. Chemical Feed: Status display and control of all chemical feed pumps, solution feed systems, and scale weight. Screen shall display control mode and dosage selection, sun status, and daily chemical volumes and weights.
2. Flocculation & Sedimentation: Display of all flocculator drive status, control selections, and speeds. Include additional display and control of new sludge collector units including remote activation.
3. Filters: Display of all filter status values and control interfaces.
4. Finished Water: Display of chlorine contact tank and clearwell levels, pump status and controls, and finished water flow and chlorine residual.
5. Solids Handling: Display and control of all tank levels, mixer and pump control and status, and centrifuge and conveyor control and status.

2.8 SCADA COMPONENT SPECIFICATIONS

A. Control Panels: Control panel enclosures shall be NEMA Type 4X, fabricated from stainless steel. Units shall include a single gasketted front door. Full height hinges, locking hasp and quick release door clamping hardware shall be included. All enclosures shall be UL listed. Filter console enclosure shall be Hoffman CFC383616SS, to match existing consoles.

Unless otherwise indicated, controls shall operate from a source of 120 volts, 1 phase, 60 Hz and shall include a main breaker. All controls shall be protected from lightning or other transient voltages by a power arrestor. All power supplies required for operation shall be provided. Power supplies shall be sized to have a minimum of 40% spare capacity providing increased reliability and allowing for the addition of future

equipment. Isolators shall be provided on all analog inputs for surge suppression. Enclosure shall have a heater for condensation protection.

B. Power Supply: Equipment shall operate from an input source of 120 volts, 1 phase, and 60 Hz and shall include a 24 VDC power supply for internal control hardware. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" at 120 Volts and shall carry the SWD marking.

C. Battery Back Up System: Included with the control panel, shall be an intelligent AC battery backup system Battery system shall provide full on-line protection, power conditioning, and a seamless switchover to battery upon detection of main power supply failure. Once main power is restored, the unit shall provide seamless switchback to normal power source and recharge the battery. Battery health logic module shall individually monitor main power supply, battery and converter voltages for low voltage conditions, and provide low voltage cutoff to protect battery from an unrecoverable depletion. An on board LED, or local Operator Interface (OI) if provided shall locally indicate detection of an alarm condition. The unit shall be capable of providing two hours of battery backed operation.

D. PLC Control: Operations of the control panels shall be controlled through a programmable logic controller (PLC) consisting of a power supply, CPU, discrete input and output modules and analog input and output modules. The processor unit shall include two (2) serial ports with DF1/DH485/Modbus RTU/DNP3/ASCII protocol support and a built-in Ethernet port, which supports EtherNet/IP, Modbus TCP/IP and DNP3. The Filter #4 and Dewatering Building Panel PLC processors shall be Allen-Bradley CompactLogix controller, or approved alternate Allen-Bradley model. The replacement PLCs in the Raw Water Intake and Finished Water Station Panels shall be Allen-Bradley CompactLogix, MicroLogix 1400, or Micro 800 series controller.

E. Local Inputs and Outputs: The PLC panels shall be capable of accepting and producing all analog inputs (AI), digital inputs (DI), analog outputs (AO), and digital outputs (DO) as indicated on the plans.

F. Condensation Protection: Enclosure shall have a heater and thermostat to prevent condensation build-up.

G. Wiring: All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire color code and number shall be clearly shown on the drawings, with each wire's color and number indicated. Short circuit rating of control enclosure shall be 5 kA RMS symmetrical @ 120VAC maximum. All control panel single conductor wire shall be 16 AWG multi-strand machine tool wire (MTW) minimum, with PVC insulation. Wire colors shall be as follows:

120 VAC control power:	Red
Neutral:	White
Ground:	Green
AC Power from remote source:	Yellow
Neutral from remote source:	White with Yellow Stripe
24 VDC (+):	Blue
24 VDC (-):	White with Blue Stripe
VDC (+) from remote source:	Orange
VDC (-) from remote source:	White with Orange Stripe
Intrinsically Safe:	Light Blue

1. All wires shall be clearly marked with an identification number consistent with the wiring schematic drawing. Wire markers shall be a thermal transfer printable type. The material shall be a self-laminating vinyl. Labels shall be Brady THT-9-427-10 or approved equal.

2. Wiring inside the control panel shall be run in PVC wiring duct rated for continuous temperatures up to 122° F (50°C). Devices mounted in the enclosure door shall have wires run in spiral wrap to avoid pinch points when opening and closing the door.
3. Control components mounted internal and external to the enclosure shall be mounted with stainless steel hardware and clearly labeled with a plastic identification nametag. The tag shall be white with black lettering.

H. Relays: Relays within PLC and I/O panels shall be solid state, plug in units, similar to Phoenix Contact PLC-INTERFACE series.

I. Fuses: Properly rated fuses and fuse holders shall be provided for protection of individual control devices (discrete and analog signals) mounted outside of the enclosure. Each fuse shall be housed in a hinged type fuse block to protect against contact with the fuse. Fuses shall be rated up to 250 VAC and be Littelfuse or approved equal. Fuse holders for discrete devices shall be rated to 600 VAC and 30 Amps. Fuse holders for analog devices shall be rated to 300 VAC and 15 Amps. Fuse holders shall be Allen Bradley 1492 or approved equal.

1. Circuit Breaker: All branch or supplementary control circuits shall be protected with a single-pole, C-Curve rated circuit breaker. Circuit breakers shall be rated for 240 VAC maximum, 50/60 Hz and UL 489 listed. Supplementary and branch protection circuit breakers shall be Merlin Gerin Multi 9 or approved equal.

J. Surge Protection: Surge protection shall be installed to protect electrical components in accordance with minimum International Society of Automation (ISA) standards.

1. All field analog instruments shall be protected by surge suppression on the instrument.
2. Level velocity meter analog signal to control panel shall be protected with surge suppression in panel via analog isolator/repeater.
3. All digital input/output signals and instrumentation shall be protected by inline fuses.
4. Transient voltage surge suppression (TVSS) shall be installed at the filter control panel.
5. Insulation and grounding of suppressors shall be in conformance with manufacturers recommendations.

K. Fiber Cable: Fiber cable shall be loose tube, all-dielectric type. Unless otherwise indicated by control system supplier, fiber shall be multi-mode for all locations. Fiber count and type shall be 24 multimode 62.5 micron/125 micron cable. The cable shall be listed and accepted by the USDA RUS as compliant with 7 CFR 1755.900, “Specification for Filled Fiber Optic Cable.” Multimode fibers shall comply with ANSI/EIA/TIA-492-AAAA. If control system supplier determines that single-mode switches are required for any communications, they shall notify the owner in writing and indicate requirements for fiber cable material and installation.

L. Ethernet and Fiber Switches: Ethernet and fiber switches shall be industrial grade DIN rail managed switches as manufactured by Moxa or approved equal. Fiber switches shall include self-healing Turbo Ring technology. All switches shall include alarm contacts for port status and/or power supply failure. Ethernet switches shall Gigabit type providing communication between various devices at 1000 Mbps in each direction. System provider shall be responsible for communications throughout network including verification that multi-mode fiber is adequate for all fiber communications. If control system supplier determines that single-mode units are required for any links, they shall notify the owner in writing and indicate requirements for fiber cable material and installation.

M. Operator Interface Terminal: A graphical operator Human Machine Interface (HMI) unit shall be provided on front face of each new control panel and filter console. HMI shall be touchscreen type with a minimum diagonal display length of 12 inches and display resolution of 1280 x 800 WVGA 18-bit color graphics. Interface shall be an Allen-Bradley PanelView Plus 7 Standard Terminal, or approved equal.

N. Interface Port: The control panel shall be furnished with an interface port including GFCI receptacle and Ethernet port for connection of programming computers. The interface port shall include transparent sealed cover with quick release latch. Unit shall be Saginaw P-R2-K2RF3-U450 or equal

2.9 INSTRUMENTATION

A. Submersible Level Transducer: Sludge thickener tanks and sludge pump station wetwell shall be measured by a submersible level transducer with a minimum bottom diaphragm of 2-5/8" providing a 4-20mA instrumentation signal. The transducer shall have a 0-15 psi range and maximum 0.25% accuracy. The transducer housing shall be fabricated of type 316 stainless steel. A hydraulic fill liquid behind the diaphragm shall transmit the sensed pressure to a solid-state variable capacitance transducer element to convert the sensed pressure to a corresponding electrical value. The transducer shall be of the solid state head pressure sensing type mounted using a removable cable suspension mounting kit utilizing all stainless steel hardware and cable attached to a stainless steel cable system. The transducer shall be non-fouling design with stainless steel guard protecting sensing diaphragm.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Equipment specified in this section shall be installed in accordance with the manufacturer's recommendations and all applicable codes.

B. Field Service: The Contractor shall provide experienced personnel to for installation, adjustment, testing, and startup of the system. All elements of the system shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents. The Contractor shall provide all special testing materials and equipment required. The Contractor shall coordinate and schedule all testing and startup work with the Owner. As a minimum, the testing shall include both a factory test and a field test.

C. Training: The training program shall educate operators, maintenance, engineering, and management personnel with the required levels of system familiarity to provide a common working knowledge concerning all significant aspects of the system being supplied. The training program shall include a minimum of two trips with a minimum of 14 hours on-site instruction. The supplier shall provide all instructional course material, equipment and manuals to conduct the training program.

END OF SECTION