FOR BIDDING

PROJECT MANUAL

MYSTIC HARBOUR WWTP BIOSOLIDS UPGRADE

WORCESTER COUNTY, MARYLAND

OCTOBER 2026

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MYSTIC HARBOUR WWTP BIOSOLIDS UPGRADE
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DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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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). See the Agreement for a list of the Contract 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.

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. Registered plan holders will receive Addenda issued by Owner.~~

2.04 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.05 ~~Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.~~

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~~ **[insert version number]** ~~or later~~. It is

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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 2.06.A 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.

C. **Deleted**

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 **Deleted.**

3.02 **Deleted.**

3.03 Bidder is to submit ~~the following information~~ **EJCDC C-451 "Qualifications Statement"** with its Bid to demonstrate Bidder's qualifications to perform the Work:

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.~~

3.04 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 3 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.

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4.03 **Deleted.**

4.04 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

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. *Geotechnical Baseline Report/Geotechnical Data Report:* The Bidding Documents contain a Geotechnical Baseline Report (GBR) and Geotechnical Data Report (GDR).~~

~~a. As set forth in the Supplementary Conditions, the GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during~~

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~~construction in specified locations ("Baseline Conditions"). The GBR is a Contract Document.~~

~~b. The Baseline Conditions in the GBR are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on the Baseline Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the GBR, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are baselined.~~

~~c. Nothing in the GBR is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.~~

~~d. As set forth in the Supplementary Conditions, the GDR is a Contract Document containing data prepared by or for the Owner in support of the GBR.~~

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. **[List of other Site-related documents]**.~~

~~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.~~

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B. A Site visit is scheduled following the pre-bid conference. ~~Maps to the Site will be available at the pre-Bid conference.~~

C. ~~A Site visit is scheduled for **[designate, date, time and location]**. Maps to the Site will be made available upon request.~~

D. Bidders visiting the Site are required to arrange their own transportation to the Site.

E. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the ~~following~~ Owner ~~or Engineer contact for visiting the Site: **[provide contact information]**~~. 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. **However, Bidder is responsible for making reasonable inspections of site conditions in accordance with Article 6.**

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

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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. **All Bidders shall acknowledge receipt of all Addenda on the Bid Form. Failure to do so may result in Bid rejection.**

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to the Owner's Procurement Officer in writing. ~~Contact information and submittal procedures for such questions are as follows:~~

A. ~~**[Insert contact information for submittal of questions to Engineer; describe any permissible or required special procedures, such as submittal via a Bidding Documents Website.]**~~

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. 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 **Five (5)** 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. The Bid Bond included in the Bidding Documents must be completed and submitted with the Bid. All Bids without the properly executed Bid Bond in the format as required herein may be rejected.**

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. **The next low Bidder in order of Bid price shall then be considered the lowest responsive Bidder and the Contract will be awarded to him. Should this Bidder default, the next low Bidder shall be considered and so on. In each case, a defaulting Bidder forfeits the Bid security.**

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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~~ **90** days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 **Deleted.**

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.

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 **Bidders must submit to the Owner a list of the subcontractors proposed for each type of work identified in the Bid Form. Subcontractors shall be duly licensed in the State of Maryland.** ~~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:~~

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A. ~~**[List key categories of the Work. Depending on the Project this might include electrical, fire protection, major equipment items]**~~.

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 **or typewritten** 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. **Failure to comply may be cause for rejection. No allowances, segregated Bids or assignments will be considered. State all amounts in numerical figures. A bidder shall make no additional stipulations on the Bid Form to qualify his Bid by attachments or any other matter. Stipulations or qualifications will be subject to Bid rejection.**

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.

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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 **evidence of** 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 *Lump Sum*

A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

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 may be applied in any combination as listed in the Bid Form.

13.03 **Deleted.**

13.04 **Deleted.**

13.05 *Unit Price*

A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

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B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

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

13.06 *Allowances*

A. For cash allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

13.07 **Deleted.**

ARTICLE 14—SUBMITTAL OF BID

14.01 ~~The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of~~ **Within each copy of the Bidding Documents,** 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~~ **sealed** in a plainly marked package with the Project title, **the Bid Opening date and time, the Bidder's name, address, and Maryland License Number. Each Bid shall be completed on the forms provided.** ~~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. **Oral, telegraphic, electronic, or telephonic Bids are invalid and will not receive consideration.**

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

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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 within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.~~ **Bids may not be withdrawn within 100 (100) days after the Bid Opening.**

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 ~~Bids will be opened privately.~~

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 **or minor defects.** ~~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 **for any combination of the bid options outlined within the Bid Form. This decision will be made at the Owner's discretion.**

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. **Deleted.**

C. **Deleted.**

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D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items as outlined in each of the bid options in the bid form.

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 **The Contractor shall be responsible for the payment of any state taxes, if any, assessed in relation to the work, including but not limited to gross receipt taxes.** ~~Owner is exempt from **[name of state]** state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption No. **[number]**). Said~~ Taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 22—CONTRACTS TO BE ASSIGNED

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DIVISION 00 - BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 31 32

GEOTECHNICAL DATA

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HILLIS-CARNES
ENGINEERING ASSOCIATES

Geotechnical Engineering Study
Mystic Harbor WWTP Biosolids Upgrade
Berlin, Maryland 21811
Project No. SAL260009A

John Hibschman E.I.T.
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February 13, 2026

February 13, 2026

John Hibschman E.I.T.
Graduate Engineer
George Miles Buhr
206 W Main St
Salisbury, MD 21801

Reference: **Geotechnical Engineering Report**
Mystic Harbor WWTP Biosolids Upgrade
9624 Stephen Decatur Hwy, Berlin, Maryland 21811
HCEA Project No. SAL260009A

Mr. Hibschman:

Hillis-Carnes Engineering Associates (HCEA) is pleased to submit this report summarizing the subsurface exploration and subsequent geotechnical evaluation for the proposed upgrades at the Mystic Harbor Wastewater Treatment Plant. These improvements include two sludge holding tanks, a sludge dewatering building, sludge drying beds, and a stormwater management facility north of the Mystic Harbor residential community in Berlin, Maryland.

Samples taken from the project site boring locations will be stored at the Delmar, Maryland office for a period of 30 days from the date of this letter. Please advise HCEA in writing prior to the end of the 30-day period if the samples should be stored for a longer period or be delivered elsewhere. Unless other arrangements are made, the samples will be discarded at the end of the 30-day storage period.

HCEA appreciates having had the opportunity to provide geotechnical consultation and we will remain available for further consultation during the various design stages. Should there be any questions concerning the contents of the report, or the requirement of additional consultation, design, inspection or testing services, please contact the Delmar HCEA office.

Best regards,

HILLIS-CARNES ENGINEERING ASSOCIATES



Evan M. Mansfield, E.I.T.	Jeremy M. Boehm	Andrew Hajec, P.E.
Staff Engineer	Principal Engineer	Regional Project Engineer

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GEOTECHNICAL ENGINEERING STUDY
MYSTIC HARBOR WWTP BIOSOLIDS UPGRADE
BERLIN, MARYLAND 21811
HCEA PROJECT NO. SAL260009A

1.0 PURPOSE AND SCOPE

The purpose of this study was to characterize the general subsurface conditions of the project site by analysis of the test boring and sounding locations and to evaluate those conditions with respect to the proposed upgrades for the Mystic Harbor Wastewater Treatment Plant in Berlin, Maryland. The proposed improvements will include two sludge holding tanks, a sludge dewatering building, sludge drying beds, and a stormwater management facility.

The evaluations and recommendations presented in this report were developed from an analysis of project characteristics and an interpretation of the general subsurface conditions at the site based on the boring and sounding information. The stratification lines indicated on the boring and sounding logs represent the approximate boundaries between soil types. In-situ, the transitions may be gradual. Such variations can best be evaluated during construction and any minor design changes can be made at that time. An evaluation of the site with respect to potential construction problems and recommendations for the earthwork are also included.

The *Appendix* contains a summary of the field and laboratory work on which this report is based.

2.0 PROJECT CHARACTERISTICS

The project site is the existing Mystic Harbor Wastewater Treatment Plant at 9624 Stephen Decatur Highway in Berlin, Maryland. The approximate location is shown on the Project Location Map (Figure 1) in the *Appendix*. Based on the information provided by George Miles Buhr (GMB), the proposed construction includes two sludge holding tanks, a sludge dewatering building, sludge drying beds with greenhouse superstructures, and a stormwater management facility. According to the topographic map provided by GMB, site elevations vary from 10 to 18 feet in the proposed structural areas and as low as 6 feet in the existing pond. The site is approximately 0.5 miles from the Assateague Bay, near the triple junction with the Isle of Wight Bay and the Atlantic Ocean. Based on available historical aerial photographs, the existing facility has been at the project site since May of 2015, and the site appears to have been developed since 1985. There is an existing backwash storage basin on the west side of the site, and the site is bound on the other three sides by residential properties. From historical imagery, it is understood that there used to be a larger pond on the west side of the property.

HCEA was not provided with anticipated structural loading conditions. HCEA has estimated maximum wall loads on the order of 3 kips per foot and maximum column loads of 50 kips for the dewatering building and sludge beds. The sludge tanks are to be approximately 21 feet in diameter and 16 feet in height, total loads are estimated to weigh 350 kips. Based on the provided sludge bed cross section, HCEA estimated a subgrade stress of approximately 600 psf from the sludge, asphalt, and drainage layer, exclusive of the foundation-supported superstructure.

Based on our experience with similar projects, HCEA has assumed that for new structures a total settlement of approximately 1 inch and ¾ inch differential settlement will be tolerable, and for additions to existing structures that ¾ inch differential settlements will be tolerable. It is assumed that the existing stormwater management facility will be expanded to accommodate the new construction.

If the structural loads or other conditions vary from those indicated above, HCEA should be contacted for additional recommendations.

3.0 FIELD EXPLORATION

HCEA performed the following borings to determine the general subsurface conditions:

- One (1) 30-ft Standard Penetration Test (SPT) soil boring (B-5) between the sludge holding tanks and the western addition to the sludge greenhouses,
- One (1) 20-ft SPT soil boring (B-3) within the footprint of the southern addition to the sludge greenhouses,
- One (1) 10-ft SPT soil boring (B-6) within the proposed stormwater management facility, and
- Two (2) 23-ft Cone Penetration Test (CPT) soundings, one located between the southern additions and the sludge tanks (B-4) and one located on the southern edge of the plan sludge dewatering building (B-2).
- Note: boring B-1 was cancelled because the site development plan was altered.

The boring locations were selected and staked by GMB and drilled by HCEA crews. The approximate boring locations are shown on the Testing Location Plan (Figure 2) in the *Appendix*. The elevations indicated on the boring logs were provided on a topographical survey map provided by GMB.

The SPT borings were advanced with hollow-stem augers. The subsurface soils were sampled at intervals of 2 feet for the initial 10 feet below existing grades and every 5 feet thereafter. Samples were taken by driving a 1-$^{3}/_{8}$-inch I.D. (2-inch O.D.) split-spoon sampler in accordance with ASTM D-1586 specifications. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler 12 inches after seating is designated as the "Penetration Resistance" or "N" value. The penetration resistance, when properly evaluated, can be used as an index for soil strength and compression characteristics.

Representative portions of each soil sample were placed in glass jars and transported to HCEA's laboratory. In the laboratory, the samples were visually examined by the geotechnical staff to verify the driller's field classifications. The samples were classified in accordance with the Unified Soil Classification System (USCS), and the field classifications were revised where necessary. The stormwater samples were additionally classified using the USDA Textural System. The USCS and USDA Symbols appear on the boring logs, and the system nomenclature is briefly described in the *Appendix*.

The CPT test method consists of pushing an instrumented cone tip first into the ground at a controlled rate (usually 2 centimeters/second). The resolution of the CPT in delineating stratigraphic layers is related to the size of the cone tip, with typical cone tips having a cross-sectional area of either 10 or 15 cm², corresponding to diameters of 3.6 and 4.4 cm. HCEA uses a 10 cm² cross-sectional area cone.

CPT cones also employ a pressure transducer with a filter to gather pore water pressure data. The filter is usually located on the cone tip (the U1 position), immediately behind the cone tip (the U2 position – HCEA cone) or behind the friction sleeve (U3 position). Pore pressure data aids in determining stratigraphy and is primarily used to correct tip friction values for those effects. CPT testing, which also gathers this 10 cm² piezometer data, is called CPTU testing. CPT and CPTU

testing equipment generally advances the cone using hydraulic rams mounted on either a heavily ballasted vehicle or using screwed-in anchors as a counter-force.

CPT for geotechnical applications was standardized in 1986 by ASTM and is currently covered by ASTM Standard D 3441. Later ASTM Standards have addressed the use of CPT for various environmental site characterization and groundwater monitoring activities.

4.0 Laboratory Testing

Laboratory testing was performed on representative samples, which consisted of Atterberg limits, sieve analysis, and moisture content tests. The results were used in general accordance with ASTM D-2487 to obtain the USCS classification of the soils tested. The results of the laboratory testing are presented in the Appendix and summarized below. The USCS and USDA classifications presented on the boring logs were reviewed based on the laboratory testing results in Table 1.

Table 1 – Laboratory Test Result

Test Boring / Sample Number	Depth (Feet)	USCS Classification	USCS Symbols	As Received Moisture Content (%)	Atterberg Limits		Grain Size		
					Liquid Limit	Plasticity Index	% Gravel	% Sand	% Fines
B-3 S-5	8.0 – 10.0	Fine to medium SAND, trace silt	SP-SM	15.9	Non-plastic	Non-plastic	0	93.5	6.5
B-5 S-3	4.0 – 6.0	Fine to medium SAND, some silt	SM	10.0	Non-plastic	Non-plastic	0	67.3	32.7
B-5 S-8	23.5 - 25.0	Fine to medium SAND, trace silt	SP-SM	19.9	Non-plastic	Non-plastic	0	95.4	4.6
B-6 S-4	6.0 – 8.0	Sandy lean CLAY	CL	11.9	23.1	14.7	-	-	59.9

5.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the site are shown on the boring logs in the *Appendix* of this report. Brief descriptions of the subsurface conditions and pertinent engineering characteristics of the soils are given in the following sections. Strata divisions shown on the boring logs have been estimated based on visual examinations of the recovered boring samples. In the field, strata changes could occur gradually and/or at slightly different levels than indicated. The groundwater conditions indicated on the boring logs are the conditions observed during the period of the subsurface exploration. Fluctuations in groundwater levels could occur seasonally and may also be influenced by changes in grading, runoff, infiltration rates, and other environmental factors.

Generalized subsurface conditions based on the results of the borings are discussed in the following sections.

5.1 Site Geology

According to the *Geologic Map of Worcester County* (1978) produced by the Maryland Geological Survey (MGS) the project site is part of the Sinepuxent Formation. The MGS describes the Sinepuxent Formation as follows:

"Underlies lowlands west of Chincoteague, Sinepuxent, and Assawoman Bays, but poorly exposed. Numerous holes were augured through the formation, particularly in areas between Berlin and Ocean City, and three lithofacies are recognized. The lowest and thickest lithofacies consist of dark-gray micaceous silty sand. Dark thin clay beds, locally fossiliferous, are present in the lower few meters of the lithofacies. The sand In all drill holes coarsens upward and is dark-gray medium sand in the upper part of this lithofacies. The dark-gray micaceous sands are overlain by a 1-1.5m bed of peaty sand to peaty clay. The peaty bed dips seaward, and beneath Assateague Island is about 9m below sea level.

The peats and, where absent, the dark-gray facies, are overlain by light-colored sands that form a lowland east of a prominent seaward facing scarp with a toe at about 6m above sea level. Most of these surface sands have no distinct morphology except south of Public Landing, where, near the scarp, a narrow band of ridge and swale topography is present. The surface sands are mostly light colored, fine to medium gained, and well sorted. Near and locally adjacent to the scarp, a narrow band of gravelly sand with surface elevations near 6.1m extends from the southern Berlin quadrangle through most of the Public Landing quadrangle. The gravelly sands, exposed in a few borrow pits, are cross stratified, with the troughs having an average amplitude of 0.3 to 0.7 m.

Gravel, with maximum size of clasts about 2.54cm is mostly scattered through sandy beds. A well-developed soil profile similar to that found on the Parsonsburg Sand is exposed in the borrow pits. The maximum thickness of formation penetrated was 22m at the coats. The formation dips eastward so the thickness of the formation seaward from the coast is not known.

The basal dark sand is mainly a micaceous, feldspathic (both microcline and plagioclase) quartz sand. The micas are chiefly muscovite (colorless) but large concentrations of chlorite (green) and biotite (black) are also present. The very micaceous nature of these beds is unique compared with all the other formations in the County. The non-opaque heavy-mineral assemblage in the Sinepuxent is similar to that in the Holocene barrier sand (e.g. high percentage of hornblende and relatively high concentrations of hypersthene). Ilmenite is the major opaque heavy mineral."

5.2 Surficial Materials

The surficial materials at the boring locations included two to twelve inches of organic bearing topsoil. Depths of existing topsoil could vary considerably across the site because of previous site development; therefore, these observations should not be used as the sole basis for topsoil volume calculations.

5.3 Suspected Fill Materials

Fill materials are those soils showing evidence of having been worked with or man-placed in the past. Based on project site existing grades, past usage, and observations of soil samples, it is suspected that soils from the existing ground surface to 4 feet below grade at boring locations B-3, B-5, and B-6 are fill materials.

5.4 Natural Materials

The natural soils encountered below the observed fill materials are generally consistent with the description of the upper facies of the Sinepuxent Formation in geology section of this report. Subsoil conditions generally consisted of materials classified under the USCS as clean with trace to little silt (SP-SM), some silt to silty SAND (SM), lean CLAY (CL), and combinations thereof. USDA classifications included sand, sandy loam, sandy clay.

Standard Penetration Test results generally indicated loose to dense relative densities for granular soils and medium stiff for fine-grained soils. The SPT results in natural soils ranged between 6 and 32 blows per foot (bpf).

"N_{60}" values from CPT correlations generally indicated very loose to very dense relative densities for the granular materials encountered and soft to stiff consistencies for the fine-grained materials. Blow count correlations show a range from 3 to 45 bpf. Please refer to the CPT logs in the *Appendix* for detailed information regarding the densities and consistencies of the soils along with each individual depth.

In general, the subsoils encountered on the project site can be characterized as fine to medium sands with varying silt contents. A clay layer was identified from 6 to 8 feet below existing grade at B-6 and multiple relatively thin layers of clayey soils were indicated in the B-4 sounding between 11 and 15 feet below existing grade.

The USDA Web Soil Survey maps the majority of the site as *Mullica-Berryland complex*, 0 to 2 percent slopes; with a small amount of *Urban land-udorthents complex*, 0 to 5 percent slopes in the southeast corner.

5.5 Groundwater

Groundwater levels were monitored in the open boreholes where applicable. During SPT drilling groundwater was estimated at depths between 8.5 and 9.0 feet below existing grade, corresponding to elevations between 1.1 and 8.8 feet. Groundwater was not encountered at boring B-6. Following removal of the augers, the borings caved in at depths of 5.2 to 8.0 feet below existing grades.

Groundwater was estimated from the “U2” pressure transducer readings during CPT testing to be 8.5 to 9.5 feet below existing grades at the time of soundings.

A more accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers which could be monitored over an extended period of time. The actual level of the hydrostatic water table and the amount and level of perched water should be anticipated to fluctuate throughout the year, depending on variations in precipitation, surface run-off, infiltration, site topography and drainage.

6.0 EVALUATIONS AND RECOMMENDATIONS

Our findings suggest that the site can be developed for the proposed construction utilizing conventional spread footings or ground-supported slab construction. Due to the previous development at the site, special attention should be given to removal of unsuitable materials and preparation of fill and structural subgrades.
It is particularly important to verify that topsoil and other deleterious surface materials are properly stripped in the grading process, that subgrades are verified for firmness prior to adding the first lift of

new fill and that all grading operations are continuously monitored for material quality, lift thickness, and compaction. Special consideration should be given to the proper monitoring of structural fill operations, footing excavations, and concrete placement in all structural areas of the project.

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, HCEA should be consulted so that the recommendations of this report can be reviewed and revised where necessary.

6.1 General Site Preparation

Where applicable, any existing structures (including all above and below-ground construction) within the areas to be developed should be removed prior to the initiation of new construction. We suggest that all available information regarding the existing utilities at the site be reviewed prior to construction.

Removal should also include surficial materials such as topsoil, unsuitable existing fill, and other deleterious materials from the proposed construction areas. Stripping operations should be performed in a manner consistent with good erosion and sediment control practices.

Please note that the majority of subsoils encountered are predominantly granular and prone to sloughing in trench excavations, especially if allowed to become saturated (i.e., after rain events). Trench excavations may require shoring to control sloughing and cave-ins. All trenching shall be in conformance with OSHA requirements.

Areas of the site to receive fill, pavements or slabs-on-grade should be proof-rolled. The proof-rolling operations should be performed using a 20-ton, fully-loaded tandem axle dump truck. The purpose of the proof-rolling will be to locate any near-surface pockets of soft or loose soils requiring stabilization. A geotechnical engineer or experienced soil technician should witness the proof-rolling operations and should determine which areas need stabilization. Areas not accessible to proof-rolling should be evaluated based on Dynamic Cone Penetrometer (DCP) tests performed under the supervision of a geotechnical engineer.

6.2 Fill Selection, Placement and Compaction

All material to be used as fill or backfill should be reviewed, tested, and approved by the geotechnical engineer, and should be free of deleterious materials, such as root fragments, stumps or other organic matter. In general, the on-site soils may be re used as general site fill. However, the portions of the natural soils consisting primarily of fine-grained silts and clays are considered moisture-sensitive and will lose strength and stability if disturbed in the presence of water. Additionally, these materials may be soft and unstable under construction equipment. Depending on the results of the subgrade evaluation at the time of construction, undercutting of the subgrade soils may be required prior to fill placement and foundation construction.

If fine-grained soils are exposed to rain events, it should be anticipated that some amount of aeration and drying will likely be necessary. Drying of the fine-grained surface soils will only be feasible during the warm, dry season of the year and may require extended time and aeration effort to achieve a moisture content that is acceptable for compaction.

If necessary, imported structural fill may be used which consists of granular materials meeting the USGS requirements of GW, GM, GW-GM, SW, SM or SW-SM materials and should be approved by the Geotechnical Engineer prior to use. Imported structural or load-bearing fill should meet the following criteria:

- free of organic matter, ash, cinders, trash, or other unsuitable materials;
- particle size distribution that is well-graded;
- plasticity index less than 10, liquid limit less than 30; and
- less than 15 percent by weight rock fragments larger than 3 inches with no particle size exceeding 6 inches, less than 30 percent by weight larger than ¾ inches and less than 30 percent smaller than the No. 200 sieve.

It should be noted that the tolerances with respect to plasticity, gradation, and fines content for imported structural fills are more stringent than the existing on-site soils being recommended for reuse. Structural fill brought to the site should be expected to possess properties that are conducive to being workable and compactable without requiring significant drying.

Imported materials meeting the classification of ML, MH, CL, or CH are less desirable, as fine-grained soils are more moisture-sensitive. These fine-grained soils should be reviewed by the geotechnical engineer prior to use.

Structural fill should be placed in horizontal lifts not exceeding 8 inches in loose thickness where heavy compaction equipment can be utilized and 4 inches in loose thickness where hand-operated equipment is necessary. Only hand-operated tampers and rollers should be used immediately behind below-grade walls and retaining walls during backfilling unless permission is granted by the structural engineer to utilize heavy compaction equipment. The optimum lift thickness and number of repetitive passes with compaction equipment necessary to achieve the required percentage compaction values should be determined in the field with test passes of the chosen compaction equipment. New structural fill should be placed at ± 2% of the optimum moisture content as determined in accordance with ASTM D1557 and compacted to the minimum percentages of the soil's maximum dry densities as indicated below.

Fill Location	**Percent of Max. Dry Density (ASTM D1557)**
Foundation Support & Backfill Areas	95%
Slab on Grade, Pavement Subgrade	95%
Utility Trenches	95%
Non-Structural and 'Green' Areas	90%

Structural fill for the building pad should extend a minimum of 10 feet beyond foundation lines where the structure is to be constructed on the fill. Fill slopes no steeper than 3(H):1(V) should be used. New fills should be properly benched into existing slopes.

Grading operations within structural areas, including pavement, utility trench, and wall backfill should be observed and tested on a full-time basis by a soil technician under the supervision of a geotechnical engineer. All efforts to compact fill materials should be verified by in-place density testing. HCEA recommends that final subgrades be proof-rolled immediately prior to placement of subbase stone, concrete slabs, or pavement to evaluate the stability of the subgrade, which may

have been impacted by exposure to wet weather and disturbance by construction traffic after mass grading. This procedure will allow for the identification and remediation of any soft or otherwise unstable areas prior to the placement of base courses, concrete, and/or asphalt pavement.

6.3 Building Foundations

Our findings indicate that the proposed sludge dewatering building and sludge drying bed greenhouses can be supported on shallow foundations bearing on firm natural soils, on approved engineered fill placed over natural soils or on a combination thereof. Foundations should not be placed on or over any man-placed fill materials that are not properly certified by a geotechnical engineer or experienced soil technician based on rigorous observations with a final approval by an HCEA geotechnical engineer during construction.

Based on the assumed maximum structural loads, the maximum allowable settlement, and the general soil conditions which were encountered, it is our recommendation that a net allowable bearing capacity of ***3,000 pounds per square foot (psf)*** will be available for foundation design. Our analysis shows less than ¾ inch estimated total settlement, with less than ¾ inch differential settlement between adjacent new and existing structures. Exterior foundation bottoms should be positioned at depths of approximately 2.5 feet below exterior grade to protect against frost heave.

To preclude punching shear failures, column footings should be at a minimum of 36 inches wide and wall footings a minimum of 24 inches wide. It is recommended that wall footings be provided with longitudinal reinforcement. Such reinforcement would provide the footings with greater bending capacity that should allow them to span across any localized weak zones that may go undetected during construction. Since a net soil pressure is specified, the weights of the footing concrete and backfill need not be added to the structural loads when proportioning the footings.

The footing excavations should be evaluated by a geotechnical engineer or experienced soil technician prior to the placement of concrete. The purpose of the evaluation would be to verify that the exposed materials will be capable of supporting the design bearing pressure. The evaluation should include bearing tests performed with attention to adequate spacing and hand augering to identify potential problem areas. As indicated in the test borings, relatively soft or loose soils were encountered near anticipated foundation bearing elevations. It should be anticipated that some remediation of the foundation bearing soils may be required prior to foundation construction.

If foundation bearing materials need to be over-excavated below the planned bearing level at frost depth, the excavation limits should be extended 9 inches horizontally for each foot of materials excavated below the planned bearing level. The over-excavation should be backfilled in accordance with Section 6.2 of this report or with lean concrete.

6.4 Adjacent Foundations

New foundations in areas adjacent to an existing structure will require special consideration. New foundations should be located in such a way that stresses imposed by the new foundations will not overstress the existing or planned adjacent foundations or soils under the existing or planned foundations. This can be done by locating new foundations in such a manner that the adjacent foundations are not located within a 1H:1V slope from the leading bottom edge of the new adjacent foundation. If any of these criteria cannot be met, HCEA should be consulted for further evaluation.

It should be anticipated that old fill materials will be encountered adjacent to currently existing foundations. New foundations should extend through any unsuitable old backfill and bear on firm, approved soils. Alternatively, these backfill materials can be excavated and replaced with structural fill or lean concrete (1,000 psi). Extreme caution should be exercised when excavating adjacent to any existing structure so as not to undermine the existing foundations.

6.5 Sludge Tank Foundations

Our findings indicate that the proposed sludge tanks can be supported on shallow foundations bearing on firm natural soils, on approved engineered fill placed over natural soils or on a combination thereof. Foundations should not be placed on or over any man-placed fill materials that are not properly certified by a geotechnical engineer or experienced soil technician based on rigorous observations with a final approval by an HCEA geotechnical engineer during construction.

Based on the assumed maximum structural loads, the maximum allowable settlement, and the general soil conditions which were encountered, it is our recommendation that a net allowable bearing capacity of ***3,000 pounds per square foot (psf)*** will be available for foundation design. Our analysis shows less than ¾ inch immediate settlement during construction, and up to 1 inch of cumulative immediate and long-term (creep) settlement over an assumed design life of 50 years.

The ring foundation or turned-down edge of a mat foundation should extend at least 2.5 feet below exterior grade to protect against frost heave. To preclude punching shear failures, ring footings should be at least 36 inches wide. It is recommended that ring footings or mat foundations be provided with circumferential and radial reinforcement. Such reinforcement would provide the footings with greater bending capacity that should allow them to span across any localized weak zones that may go undetected during construction. Since a net soil pressure is specified, the weights of the footing concrete and backfill need not be added to the structural loads when proportioning the footings.

Foundation subgrades for the sludge tanks should be prepared and evaluated in accordance with Sections 6.1, 6.2, and 6.3 of the report.

6.6 Ground-Supported Slabs

Floor slabs should be supported on approved, firm natural soils or on newly compacted fill. Due to the previous construction activities within the proposed addition area, particular attention should be

paid to the slab subgrade, which should be thoroughly proof-rolled to delineate any soft or loose areas requiring undercutting and/or stabilization.

HCEA recommends that the slabs be directly supported on a minimum 4-inch layer of clean granular materials such as washed sand, clean sand and gravel, or screened, crushed stone. A suitable moisture vapor barrier (polyethylene sheeting) should also be provided if intrusion of water vapor into the structure through the floor slab is to be avoided. These procedures will provide a moisture break that will help to prevent capillary rise, dampness of the floor slabs, and help to provide a good curing environment for the concrete. HCEA recommends that construction joints on the slab surface and isolation joints between the slab and structural walls be provided (such that the slab would "float" independently of the footings).

A composite modulus of subgrade reaction value "k_s" of 110 pci can be assumed for floor slabs founded on silty SAND (SM) soil approved for concrete placement by HCEA.

6.7 Groundwater and Drainage

Groundwater levels were monitored in the open boreholes where applicable. During SPT drilling groundwater was estimated at depths between 8.5 (B-3) and 9.0 (B-5) feet below existing grade, corresponding to elevations between 1.1 to 8.8 feet respectively. Groundwater was not encountered at boring B-6. Following removal of the augers, borings caved in at depths of 5.2 to 8.0 feet below existing grade.

Groundwater was estimated from the "U2" pressure transducer readings during CPT testing to be 8.5 to 9.5 feet below existing grades at the time of soundings.

Any water seepage resulting from a shallow interception of the groundwater table, precipitation, surface run-off, or perched water should be able to be controlled by means of sump pits and pumps, or by gravity ditching procedures. Such procedures are only to be used if it is necessary to lower the water by 2 feet or less. If it is necessary to lower the water by more than 2 feet, then a more extensive dewatering system may be required.

Adequate drainage should be provided at the site to minimize any increases in the moisture contents of the foundation soils. Surface water should not be allowed to reach excavations, prepared subgrade, or surrounding areas. All slab areas should be sloped to prevent the ponding of water.

6.8 Stormwater Management and Pond Considerations

Soil boring B-6 was drilled in the footprint of the proposed stormwater management facility. HCEA assumes that the existing stormwater management facility is to be expanded to accommodate the development of the site. The surface elevation at the boring location is approximately 15.2 feet. Groundwater was not encountered during drilling operations to a maximum explored depth of 10 feet at B-6. Based on the other borings and the topography, HCEA estimates a seasonal high groundwater elevation at approximately 8 feet.

Seasonal groundwater elevation changes of several feet are expected based on soil observations and historic well data. The soils that will form the sides and bottoms of the pond are highly permeable. If the pond has a bottom elevation similar to the existing pond (±6 feet), HCEA expects the pond to retain water during wet periods, but it could become dry during annual periods of low precipitation or

seasonal drops in the groundwater elevation. A liner be required to maintain stable pool elevations. HCEA suggests a 30-mil synthetic liner is appropriate for the stormwater management pond. The clay soils available on site were only encountered in thin layers and have high sand contents, making them unlikely to be suitable for liner construction. An imported clay liner would be technically feasible if an economical source of imported clay could be found. Suitable clay soil would have at least 30% passing the #200 sieve and a maximum permeability of $1x10^{-6}$ cm/s.

The non-organic soil from the proposed excavations for the pond may be suitable for use as controlled structural fill. Additional laboratory testing would need to be conducted to confirm gradation and density values for any borrow soils to be used as structural fill. If soil is extracted from below the seasonal high-water table, it could be too wet for any immediate use, and the earthwork contractor should plan to spread and dry the wet soils prior to use as controlled fill.

Due to the sandy granular nature of the soils at this site and the relatively high groundwater levels, cut slopes for the ponds should be no steeper than 3H:1V and should be properly vegetated to prevent erosion of the surface materials leading to rills and gullies that can concentrate overland flows of water.

HCEA should be contacted for additional recommendations if filled embankments are proposed for use at this site.

6.9 Seismic Site Classification

The Seismic Site Classification based on the recommendations found in the International Building Code 2021 in reference to standard ASCE 7-16 is D, stiff soil profile. This Seismic Site Class recommendation is based on a combination of HCEA's previous experience of the site geology and interpolated SPT values observed on-site.

7.0 RECOMMENDED ADDITIONAL SERVICES

Additional soil and foundation engineering, testing, and consulting services recommended for this project are summarized below:

Site Preparation and Proof-Rolling: A geotechnical engineer or experienced soil technician should evaluate the site prior to the start of final grading. The evaluator should determine if any undercutting or in-place densification is necessary to prepare a subgrade for fill placement or for slab support through a thorough proof rolling program as previously described in this report.

Fill Placement and Compaction: A geotechnical engineer or experienced soil technician should witness any required filling operations and should take sufficient in-place density tests to verify that the specified degree of fill compaction is achieved. The engineer or technician should observe and approve borrow materials used and should determine if their existing moisture contents are suitable.

Footing Excavation Inspections: A geotechnical engineer or an experienced soil technician should evaluate footing excavations prior to placement of reinforcing steel and concrete for the foundation. It is necessary to verify that the design bearing pressure criteria has been achieved and that no soft or loose pockets of previous fill exist beneath the bearing surfaces of the footing excavations. Based on the evaluation, the evaluator would either approve the bearing surfaces or recommend that loose or soft fill soils be undercut to expose satisfactory bearing materials.

8.0 REMARKS

This report has been prepared to aid in the evaluation of the site for the proposed construction. It is considered that adequate recommendations have been provided to serve as a basis for the design of plans and specifications. Additional recommendations can be provided as needed.

These analyses and recommendations are based on the information made available at the time of writing the report as relevant to on-site conditions including surface and subsurface existing at the time the exploratory borings were drilled. Further assumption has been made that the exploratory borings and soundings, limited in relation both to the area of the site and to depth, are representative of conditions across the site. The recommendations contained herein have been based on a series of widely spaced soil borings. Actual subsurface conditions encountered could vary from those outlined in this report.

If subsurface conditions are encountered that differ from those reported herein, this office should be notified immediately so that the analyses and recommendations can be reviewed and/or revised as necessary.

HCEA should be given the opportunity to review the final plans and specifications to comment on the interaction of the soil conditions as described herein and the design requirements.

A geotechnical engineer or experienced soil technician should be present at the site during the construction phase to verify installation according to the approved plans and specifications. The presence of an evaluator is particularly important during the excavation, placement, and compaction of fill materials or preparation of foundation or slab subgrades.

Please note that the successful completion of the project is dependent on compliance with all the recommendations provided in this report. While presented separately, the recommendations represent work that is intertwined. The successful completion of the project is specifically conditioned on your complying with all recommendations.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either implied or expressed. Hillis-Carnes Engineering Associates, Inc. assumes no responsibility for interpretations made by others based on work or recommendations made by HCEA.

APPENDIX

Important Information about This
Geotechnical-Engineering Report

Figure 1: Project Location Map

Figure 2: Testing Location Plan

SPT Boring Logs

Laboratory Test Results

HCEA Soil Description Sheet

USDA Soil Textural Triangle

CPT Sounding Logs

USDA Soil Map



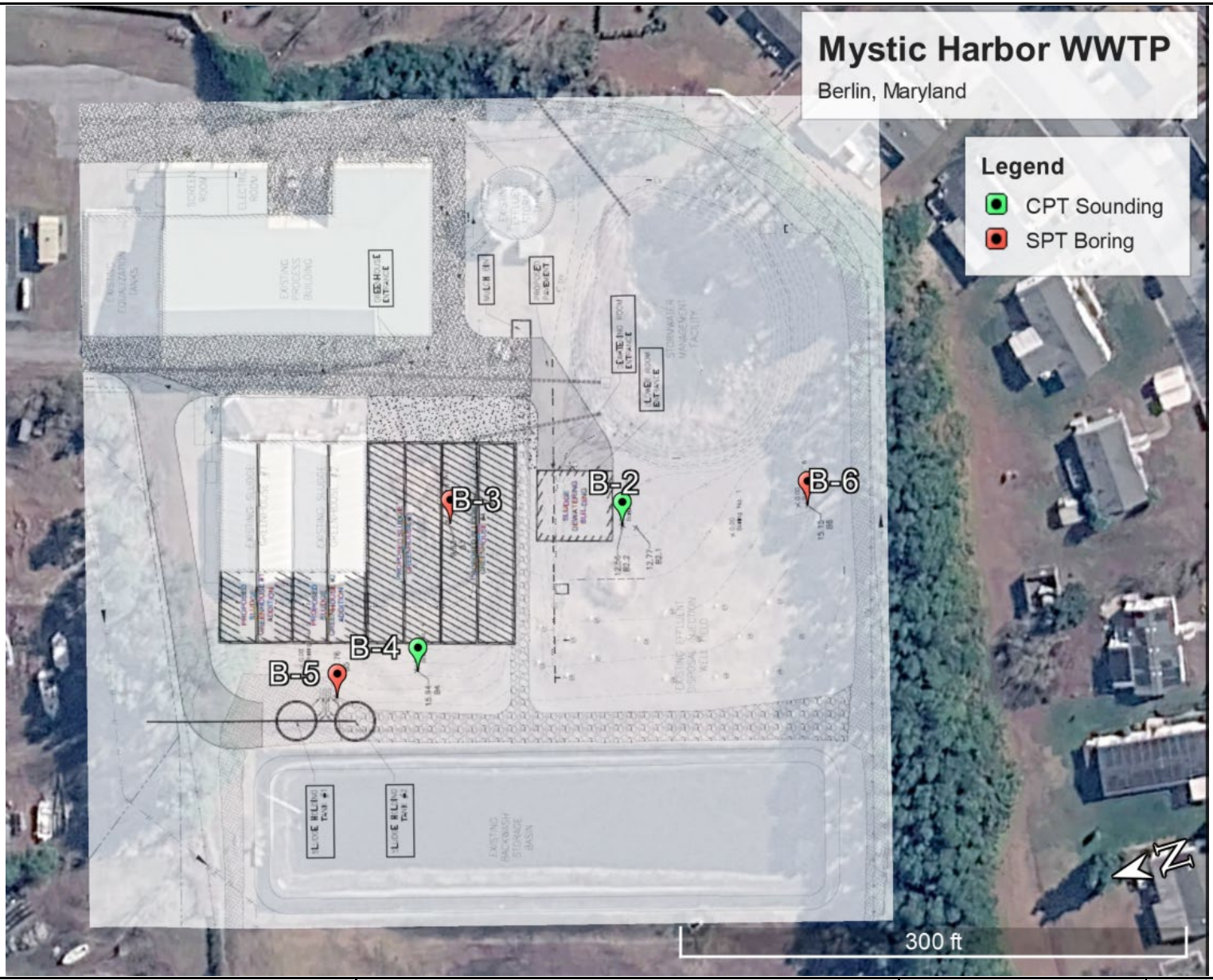
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PROJECT LOCATION MAP

FIGURE 1

Mystic Harbor WWTP Biosolids Upgrade
Berlin, Maryland

Project No:	SAL260009A	**Base Map:**	Google
Date:	2/1/2026	**Drawn By:**	EMM
Scale:	As Shown		



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TESTING LOCATION PLAN

FIGURE 2

Mystic Harbor WWTP Biosolids Upgrade
Berlin, Maryland

Project No:	SAL260009A	**Base Map:**	Google / GMB
Date:	1/30/2026	**Drawn By:**	EMM
Scale:	As Shown		

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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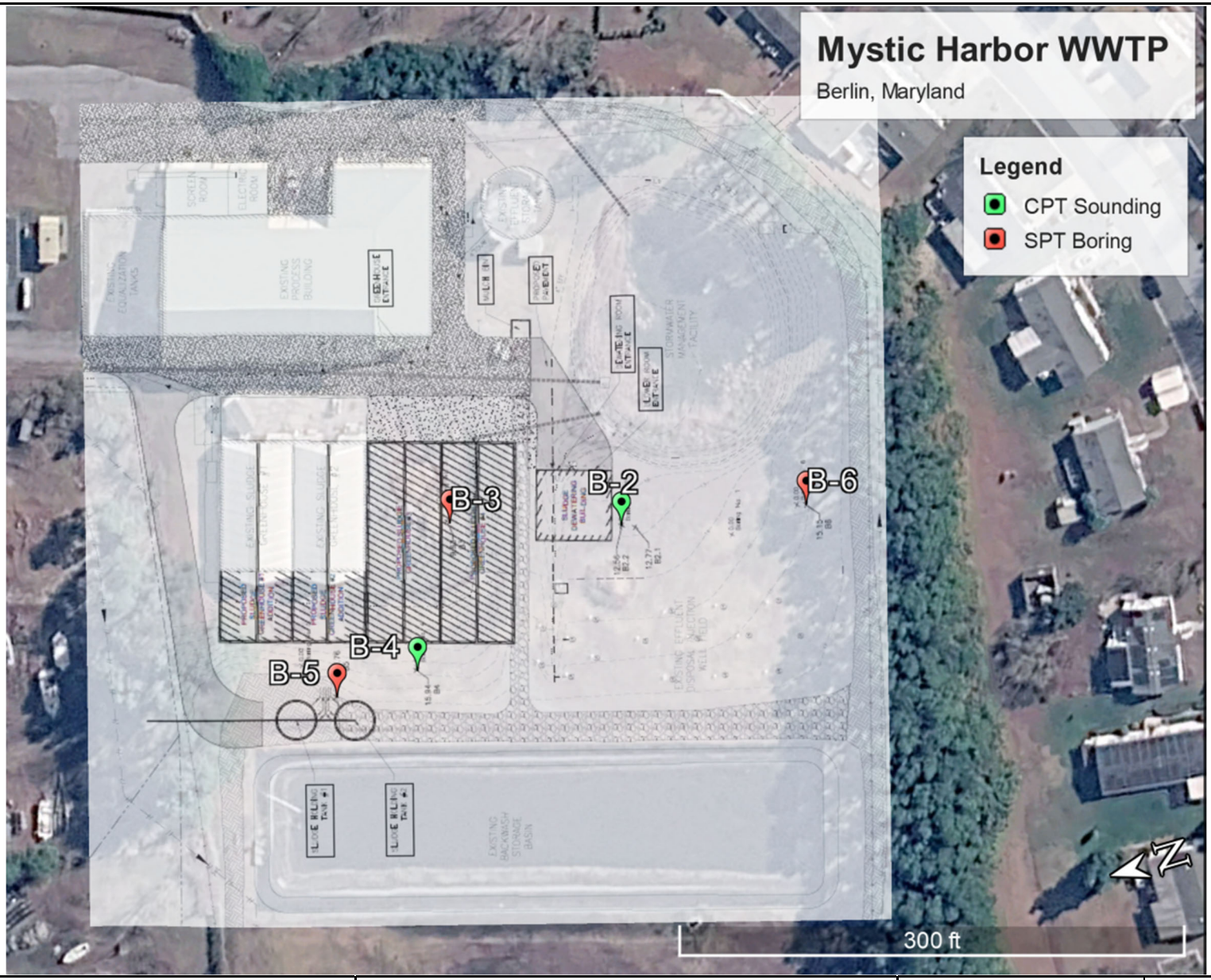
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PROJECT LOCATION MAP

FIGURE 1

Mystic Harbor WWTP Biosolids Upgrade
Berlin, Maryland

Project No:	SAL260009A	**Base Map:**	Google
Date:	2/1/2026	**Drawn By:**	EMM
Scale:	As Shown		



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TESTING LOCATION PLAN

FIGURE 2

Mystic Harbor WWTP Biosolids Upgrade
Berlin, Maryland

Project No:	SAL260009A	**Base Map:**	Google / GMB
Date:	1/30/2026	**Drawn By:**	EMM
Scale:	As Shown		

SPT Boring Logs

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RECORD OF SUBSURFACE EXPLORATION

Project Name: **Mystic Harbor WWTP Biosolids Upgrade** Boring No.: B-3

Location: Berlin, Maryland Job #: SAL260009A

SAMPLER

Datum: GMB Hammer Wt.: 140 lbs. Hole Diameter: 8 Foreman: Justin B.

Surf. Elev.: 9.6 Ft. Hammer Drop: 30 in. Rock Core Diameter: NA Classified By: Delany Midash

Date Started: 1-22-2026 Pipe Size: 2.0 in. Boring Method: HSA Date Completed: 1-22-2026

Elevation/ Depth	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Rec.	NM %	SPT Blows	SPT Blows/Foot N	Boring & Sampling Notes
0	I	Light brown, moist, medium dense, fine to medium SAND, some silt (SM)	19		2-7-11-10	18	Approximately 4" Topsoil Suspected Fill
8	I	Grayish brown, moist, medium dense, fine to medium SAND, some silt (SM)	22		7-8-8-9	16	Suspected Fill
4	D	Light brown, moist, medium dense, fine to medium SAND, some silt (SM)	22		4-9-11-11	20	
4	D	Light brown, wet, medium dense, fine to medium SAND, some silt (SM)	18		7-10-10-8	20	
8	D	Light brown, saturated, medium dense, fine to medium SAND, trace silt (SP-SM)	24	15.9	4-8-10-16	18	Passing No. 200 Sieve: 6.5% Groundwater estimated 8.5' below existing grade
0							
12	D	Brown and light brown, saturated, medium dense, fine to coarse SAND, trace silt (SP-SM)	18		3-6-8	14	
-4							
16	D	Grayish brown, saturated, medium dense, fine to medium SAND, trace silt (SP-SM)	16		4-7-12	19	
-8		Boring terminated at 20.0'					
20							
-12							
24							

Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	- ft.	8.0 ft.
AFTER 24 HRS.	ft.	ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

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RECORD OF SUBSURFACE EXPLORATION

Project Name: **Mystic Harbor WWTP Biosolids Upgrade** Boring No.: B-5

Location: Berlin, Maryland Job #: SAL260009A

SAMPLER

Datum: GMB Hammer Wt.: 140 lbs. Hole Diameter: 8 Foreman: Justin B.

Surf. Elev.: 17.8 Ft. Hammer Drop: 30 in. Rock Core Diameter: NA Classified By: Delany Midash

Date Started: 1-22-2026 Pipe Size: 2.0 in. Boring Method: HSA Date Completed: 1-22-2026

Elevation/ Depth	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Rec.	NM %	SPT Blows	SPT Blows/Foot N	Boring & Sampling Notes
0	I	Brown, moist, medium dense, fine to medium silty SAND (SM)	20		4-8-7-8	15	Approximately 2" Topsoil Suspected Fill
15	I	Light brown, moist, medium dense, fine to medium SAND, some silt (SM)	20		8-11-12-12	23	Suspected Fill
5	I	Orange and light brown, moist, medium dense, fine to medium SAND, some silt (SM)	20	10.0	3-5-8-8	13	Passing No. 200 Sieve: 32.7%
10	I	Light brown, moist, medium dense, fine to medium SAND, some silt (SM)	17		3-8-8-8	16	
10	I	Dark brown, wet, medium dense, fine to medium SAND, some silt (SM)	20		2-2-10-12	12	Groundwater estimated: 9'
5	I	Light gray, saturated, dense, fine to medium SAND, trace silt (SP-SM)	18		7-16-16	32	
15	D	Light gray, saturated, medium dense, fine to medium SAND, trace silt (SP-SM)	16		4-5-7	12	
0	I	Brown, saturated, medium dense, fine to medium SAND, trace silt (SP-SM)	18	19.9	5-8-9	17	Passing No. 200 Sieve: 4.6%
20	9	Grayish brown, saturated, medium dense, fine to medium SAND, some silt (SM)	18		5-8-11	19	
-5		Boring terminated at 30.0'					
25							
-10							
30							

Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	- ft.	5.3 ft.
AFTER 24 HRS.	ft.	ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

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RECORD OF SUBSURFACE EXPLORATION

Project Name: **Mystic Harbor WWTP Biosolids Upgrade** Boring No.: B-6

Location: Berlin, Maryland Job #: SAL260009A

SAMPLER

Datum: GMB Hammer Wt.: 140 lbs. Hole Diameter: 8 Foreman: Justin B.

Surf. Elev.: 15.2 Ft. Hammer Drop: 30 in. Rock Core Diameter: NA Classified By: Delany Midash

Date Started: 1-22-2026 Pipe Size: 2.0 in. Boring Method: HSA Date Completed: 1-22-2026

Elevation/ Depth	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Rec.	NM %	SPT Blows	SPT Blows/Foot N	Boring & Sampling Notes
15 / 0	I	Light brown, moist, medium dense, fine to medium SAND, trace silt (SP-SM, 10YR 7/3, sand)	21		2-5-6-5	11	Approximately 12" Topsoil Suspected Fill
12.5 / 2.5	I	Tan, moist, medium dense, fine to medium SAND, some silt (SM, 10YR 6/3, sandy loam)	18		4-7-7-9	14	Suspected Fill
10 / 5	I	Gray, moist, loose, fine to medium silty SAND (SM, 2.5Y 6/1, sandy loam)	22		5-5-3-4	8	
7.5 / 7.5	I	Brown, moist, medium stiff, sandy lean CLAY (CL, 2.5Y 6/3 and 6/1, sandy clay)	19	11.9	3-3-3-4	6	LL: 23.1% PI: 14.7% Passing No. 200 Sieve: 59.9%
5 / 10	I	Dark brown, moist, loose, fine to medium SAND, some silt, some organic debris (SM, 2.5Y 4/2, sandy loam)	23		3-4-5-7	9	
		Boring terminated at 10.0'					
2.5 / 12.5							
0 / 15							

Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	- ft.	5.2 ft.
AFTER 24 HRS.	ft.	ft.
AFTER ___ HRS.	ft.	ft.

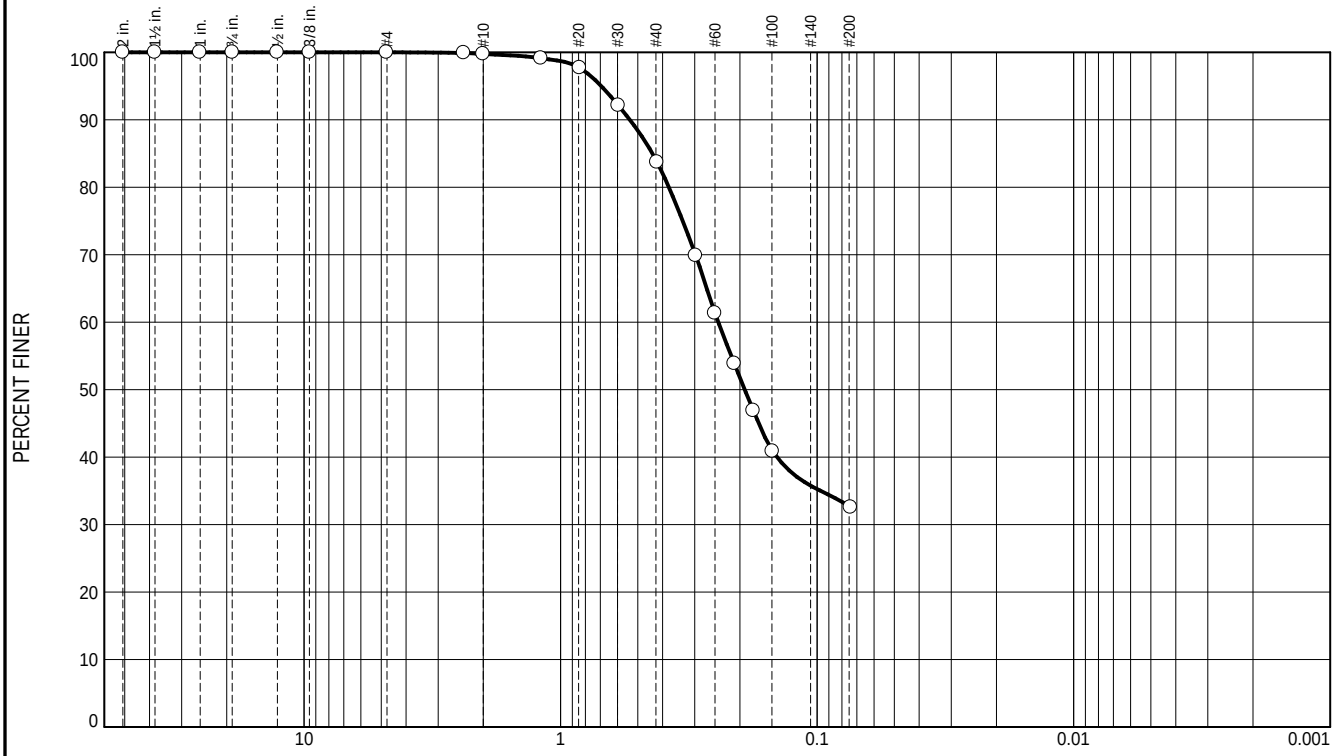
BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

Laboratory Test Results

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	0.0	0.2	15.7	51.4	32.7

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
2	100.0			
1.5	100.0			
1	100.0			
0.75	100.0			
0.5	100.0			
0.375	100.0			
#4	100.0			
#8	99.9			
#10	99.8			
#16	99.1			
#20	97.7			
#30	92.1			
#40	83.7			
#50	69.9			
#60	61.3			
#70	53.9			
#80	46.9			
#100	40.9			
#200	32.5			

* (no specification provided)

Material Description

Orange and light brown, moist, medium dense, fine to medium SAND, some silt (SM)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5368 D_{85}= 0.4381 D_{60}= 0.2427
D_{50}= 0.1915 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Test Remarks

Source of Sample: B-5 Depth: 4
Sample Number: 3 Sample Date: 2-3-2026

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SALISBURY, MD

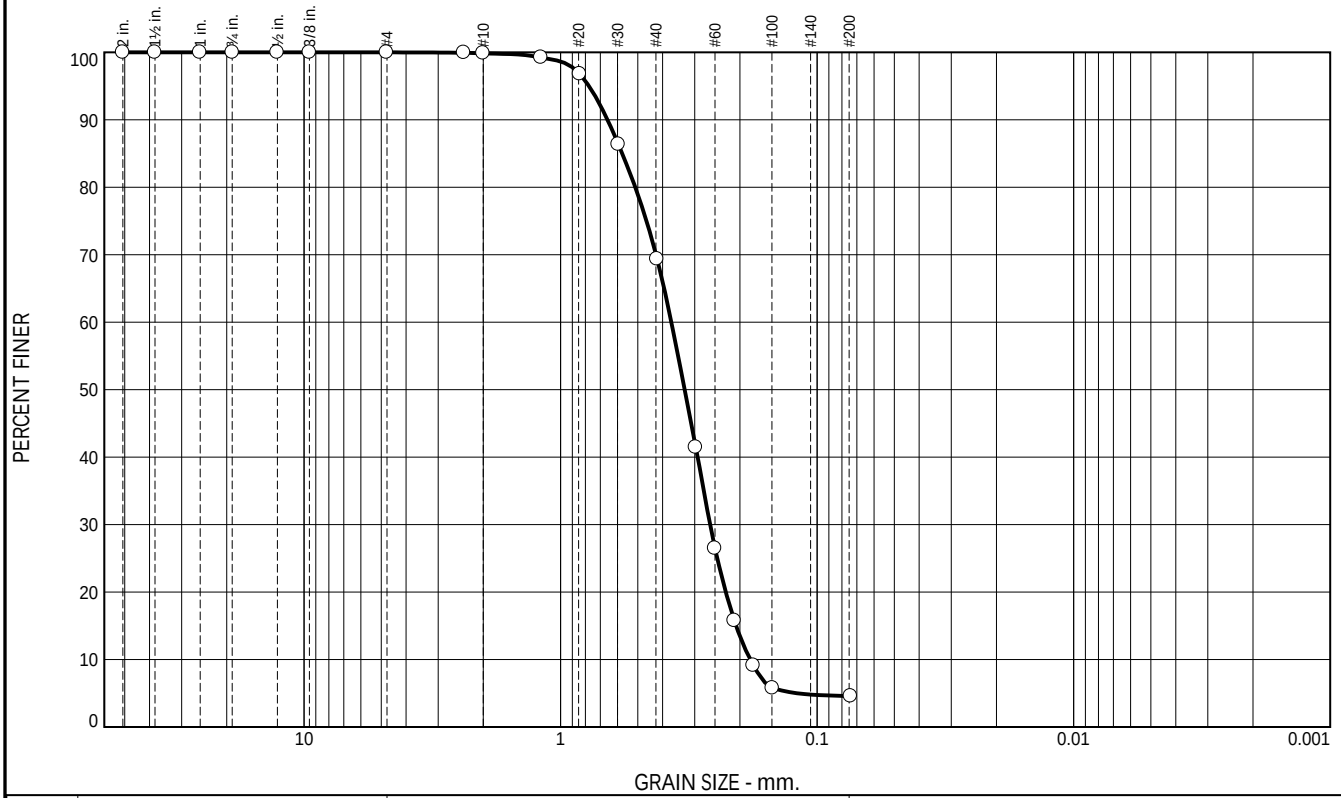
Client: George, Miles and Buhr, LLC
Project: Mystic Harbor WWTP Biosolids Upgrade

Project No: SAL260009A Figure

Tested By: Delany Midash Checked By: Evan Mansfield

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	0.0	0.1	29.8	65.5	4.6

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
2	100.0			
1.5	100.0			
1	100.0			
0.75	100.0			
0.5	100.0			
0.375	100.0			
#4	100.0			
#8	99.9			
#10	99.9			
#16	99.2			
#20	96.8			
#30	86.4			
#40	69.4			
#50	41.4			
#60	26.5			
#70	15.7			
#80	9.1			
#100	5.8			
#200	4.6			

* (no specification provided)

Material Description

Brown, saturated, medium dense, fine to medium SAND, trace silt (SP-SM)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6559 D_{85}= 0.5750 D_{60}= 0.3698
D_{50}= 0.3283 D_{30}= 0.2613 D_{15}= 0.2068
D_{10}= 0.1823 C_u= 2.03 C_c= 1.01

Classification

USCS= SP AASHTO=

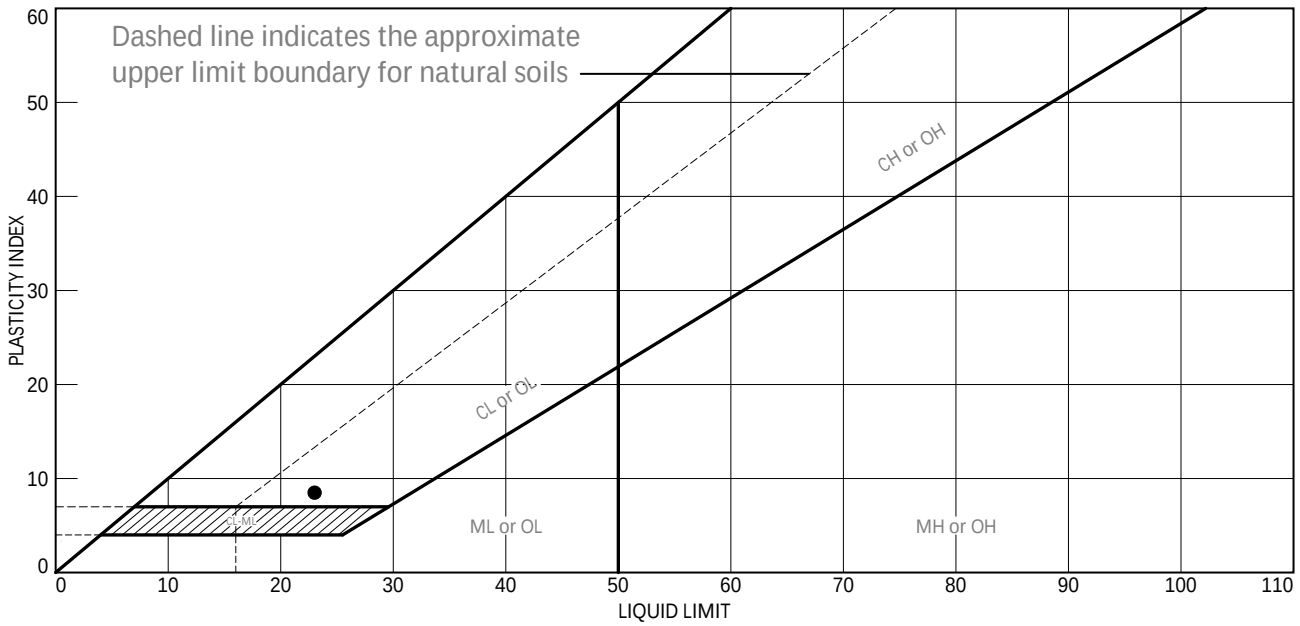
Test Remarks

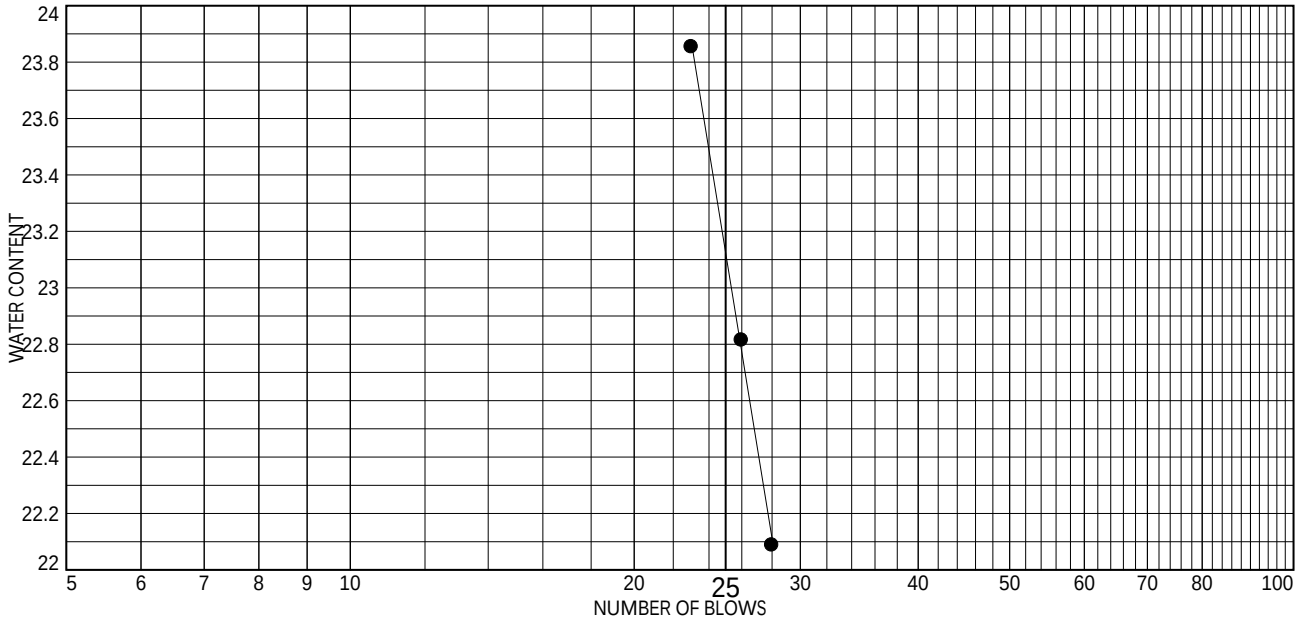
Source of Sample: B-5 Depth: 23.5
Sample Number: 8 Sample Date: 2-3-2026

HILLIS-CARNES ENGINEERING ASSOCIATES SALISBURY, MD	Client: George, Miles and Buhr, LLC Project: Mystic Harbor WWTP Biosolids Upgrade Project No: SAL260009A Figure

Tested By: Delany Midash Checked By: Evan Mansfield

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown, moist, medium stiff, sandy lean CLAY (CL, 2.5Y 6/3 and 6/1, sandy clay)	23.1	14.7	8.4		59.9	CL

Project No. SAL260009A Client: George, Miles and Buhr, LLC

Project: Mystic Harbor WWTP Biosolids Upgrade

Source of Sample: B-6 Depth: 6
Sample Number: 4

HILLIS-CARNES ENGINEERING ASSOCIATES

SALISBURY, MD

Remarks:

Figure

Tested By: Kelsey Carr Checked By: Delany Midash

HILLIS-CARNES
ENGINEERING ASSOCIATES

SOIL DESCRIPTION SHEET

DESCRIPTION OF SOILS - PER ASTM D2487

MAJOR COMPONENT	COMPONENT TYPE	COMPONENT DESCRIPTION	SYMBOL	GROUP NAME
Coarse-Grained Soils, More than 50% is retained on the No. 200 sieve	**Gravels** – More than 50% of the coarse fraction is retained on the No. 4 sieve. Coarse = 1" to 3" Medium = ½" to 1" Fine = ¼" to ½"	Clean Gravels <5% Passing No. 200 sieve	GW	Well Graded Gravel
			GP	Poorly Graded Gravel
		Gravels with fines, >12% Passing the No. 200 sieve	GM	Silty Gravel
			GC	Clayey Gravel
	Sands – More than 50% of the coarse fraction passes the No. 4 sieve. Coarse = No.10 to No.4 Medium = No. 10 to No. 40 Fine = No. 40 to No. 200	Clean Sands <5% Passing No. 200 sieve	SW	Well Graded Sand
			SP	Poorly Graded Sand
		Sands with fines, >12% Passing the No. 200 sieve	SM	Silty Sand
			SC	Clayey Sand
Fine Grained Soils, More than 50% passes the No. 200 sieve	Silts and Clays Liquid Limit is less than 50 Low to medium plasticity	Inorganic	ML	Silt
			CL	Lean Clay
		Organic	OL	Organic Silt
				Organic Clay
	Silts and Clays Liquid Limit of 50 or greater Medium to high plasticity	Inorganic	MH	Elastic Silt
			CH	Fat Clay
		Organic	OH	Organic Silt
				Organic Clay
Highly Organic Soils	Primarily Organic matter, dark color, organic odor		PT	Peat

PROPORTIONS OF SOIL COMPONENTS

COMPONENT FORM	DESCRIPTION	APPROXIMATE PERCENT BY WEIGHT
Noun	Sand, Gravel, Silt, Clay, etc.	50% or more
Adjective	Sandy, silty, clayey, etc.	35% to 49%
Some	Some sand, some silt, etc.	12% to 34%
Trace	Trace sand, trace mica, etc.	1% to 11%
With	With sand, with mica, etc.	Presence only

PARTICLE SIZE IDENTIFICATION

PARTICLE SIZE	PARTICLE DIMENSION
Boulder	12" diameter or more
Cobble	3" to 12" diameter
Gravel	¼" to 3" diameter
Sand	0.005" to ¼" diameter
Silt/Clay (fines)	Cannot see particle

COHESIVE SOILS

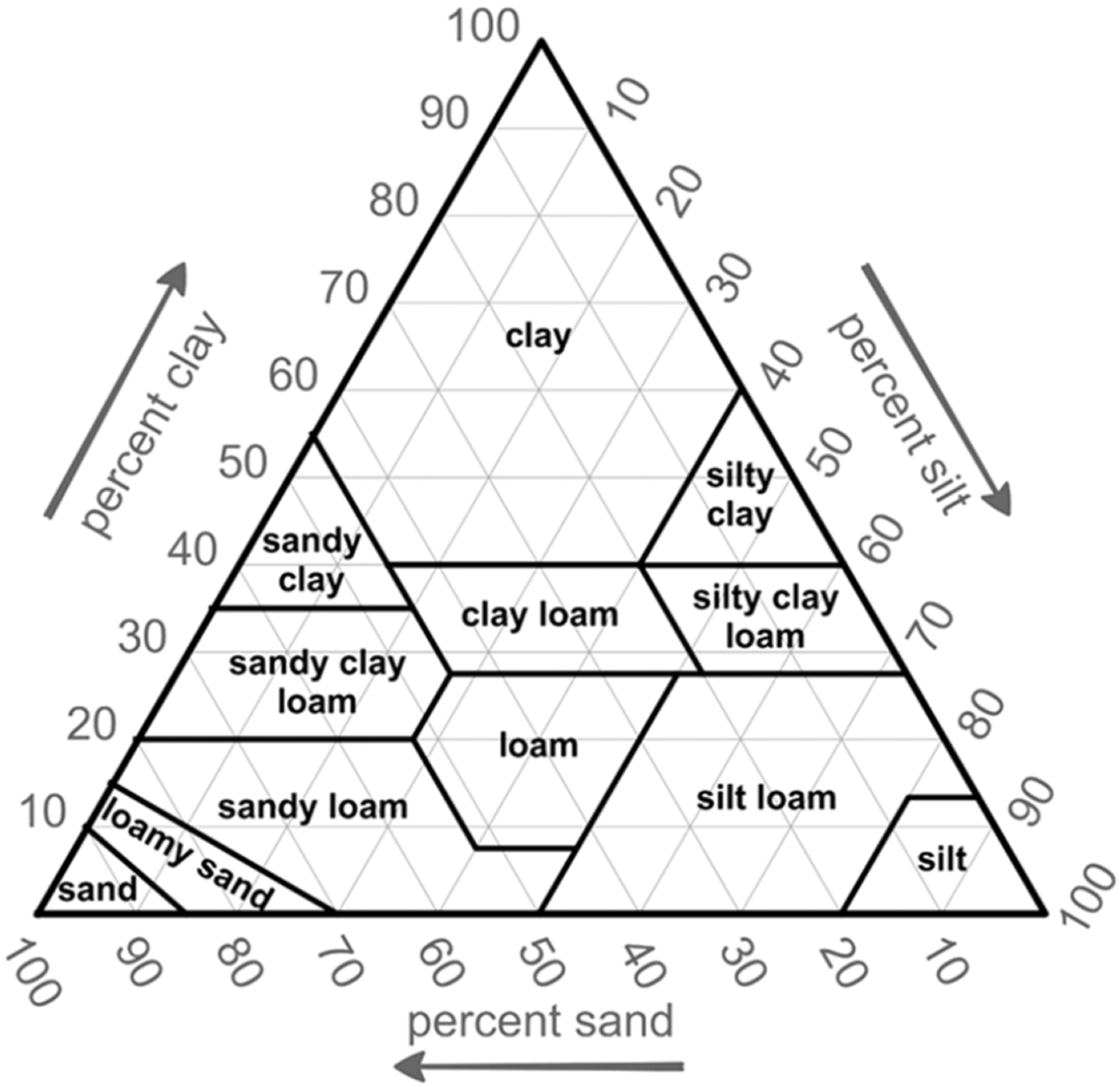
FIELD DESCRIPTION	NO. OF SPT BLOWS/FT	CONSISTENCY
Easily Molded in Hands	Less than 2	Very Soft
Easily Penetrated several inches by thumb	2 - 4	Soft
Penetrated by thumb with moderate effort	5 - 8	Medium Stiff
Penetrated by thumb with great effort	9 - 15	Stiff
Indented by thumb only with moderate effort	16 - 30	Very Stiff
Indented by thumb only with great effort	Greater than 30	Hard

GRANULAR SOILS

NO. OF SPT BLOWS/FT.	RELATIVE DENSITY
Less than 5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
Greater than 50	Very Dense

OTHER DEFINITIONS:

- **Fill:** Encountered soils that were placed by man. Fill soils may be controlled (engineered structural fill) or uncontrolled fills that may contain rubble and/or debris.
- **Disintegrated Rock:** Residual soil material with rock-like properties, very dense, N > 60 blows/ft.
- **Karst:** Descriptive term which denotes the potential for solutioning of the limestone rock and the development of sinkholes.
- **Alluvium:** Recently deposited soils placed by water action, typically stream or river floodplain soils.
- **Groundwater Level:** Depth within borehole where water is encountered either during drilling, or after a set period of time to allow groundwater conditions to reach equilibrium.
- **Caved Depth:** Depth at which borehole collapsed after removal of augers/casing. Indicative of loose soils and/or groundwater conditions.



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			DATE:	1/18/2026	DRAWN BY: AEK
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PHONE: (410) 749-0940	FAX: (410) 896-3478		PAGE:	1	CHECKED BY: AEK

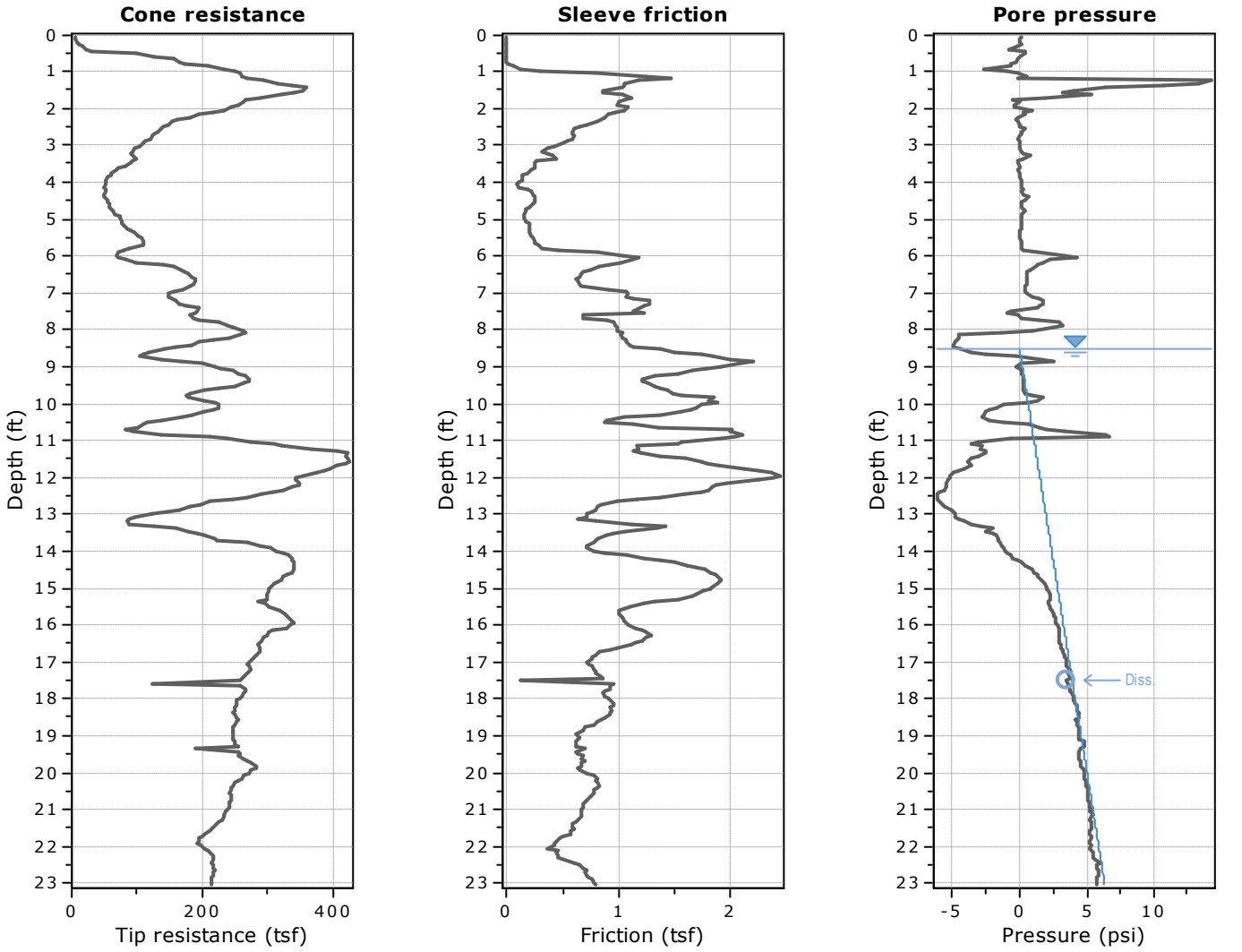
CPT Sounding Logs

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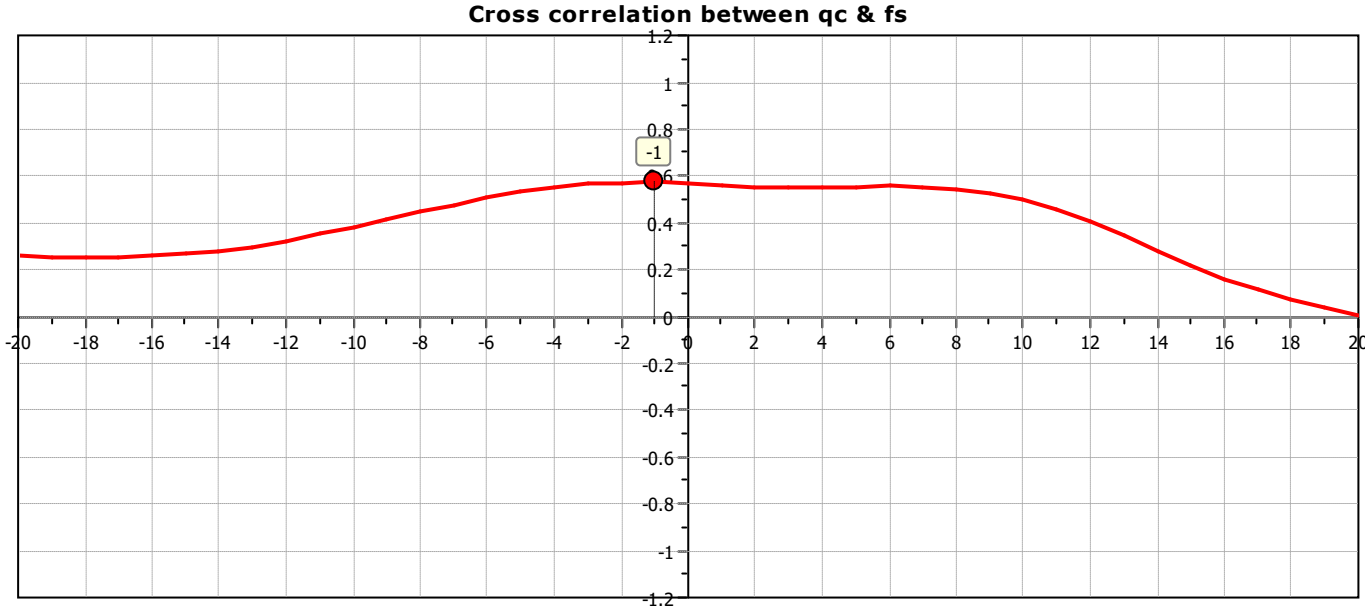
CPT: B-2

Project: **Mystic Harbor WWTP Biosolids Upgrade**
Location: **Berlin, Maryland**

Total depth: 23.03 ft
Surface Elevation: 12.77 ft, Est. GWL: 8.50 ft



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

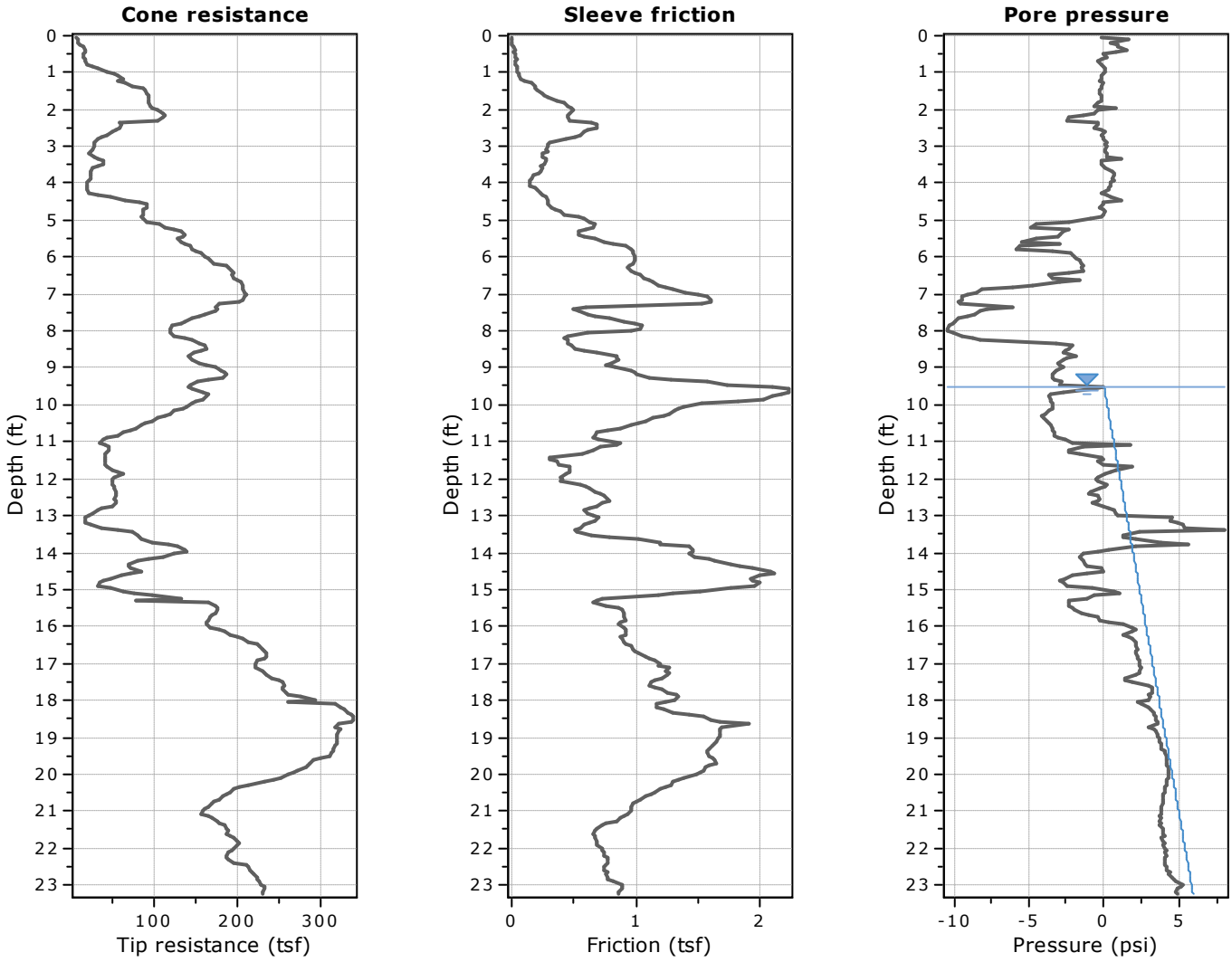


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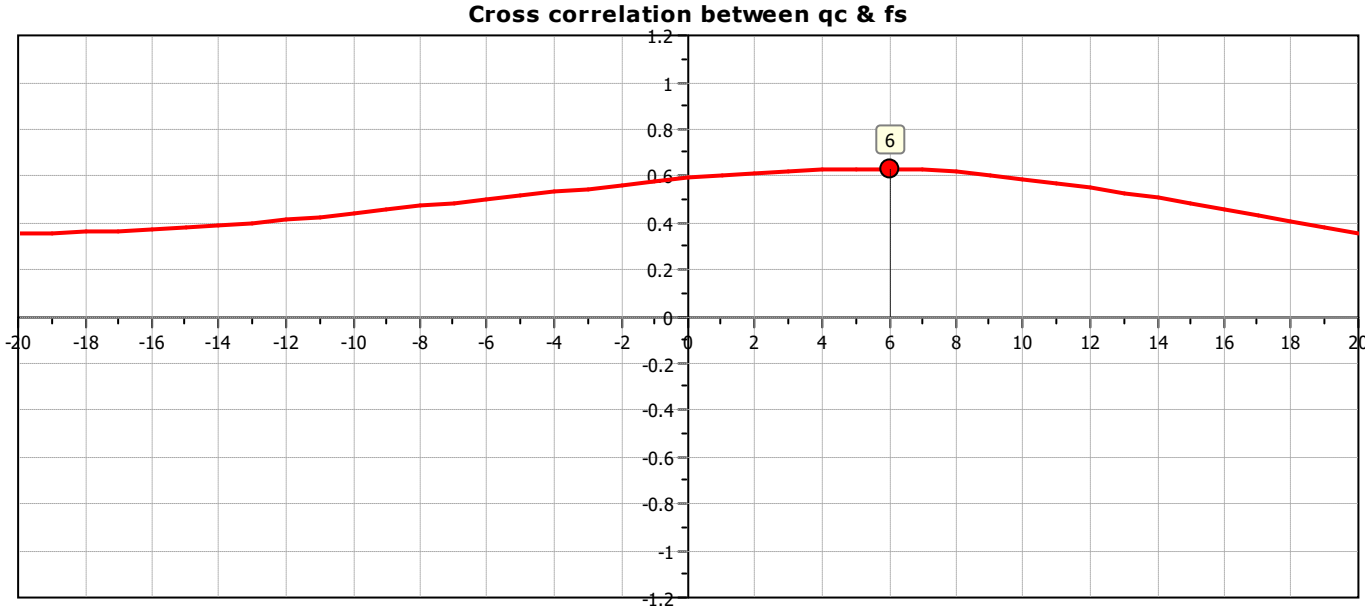
CPT: B-4

Project: **Mystic Harbor WWTP Biosolids Upgrade**
Location: **Berlin, Maryland**

Total depth: 23.23 ft
Surface Elevation: 15.94 ft, Est. GWL: 9.50 ft

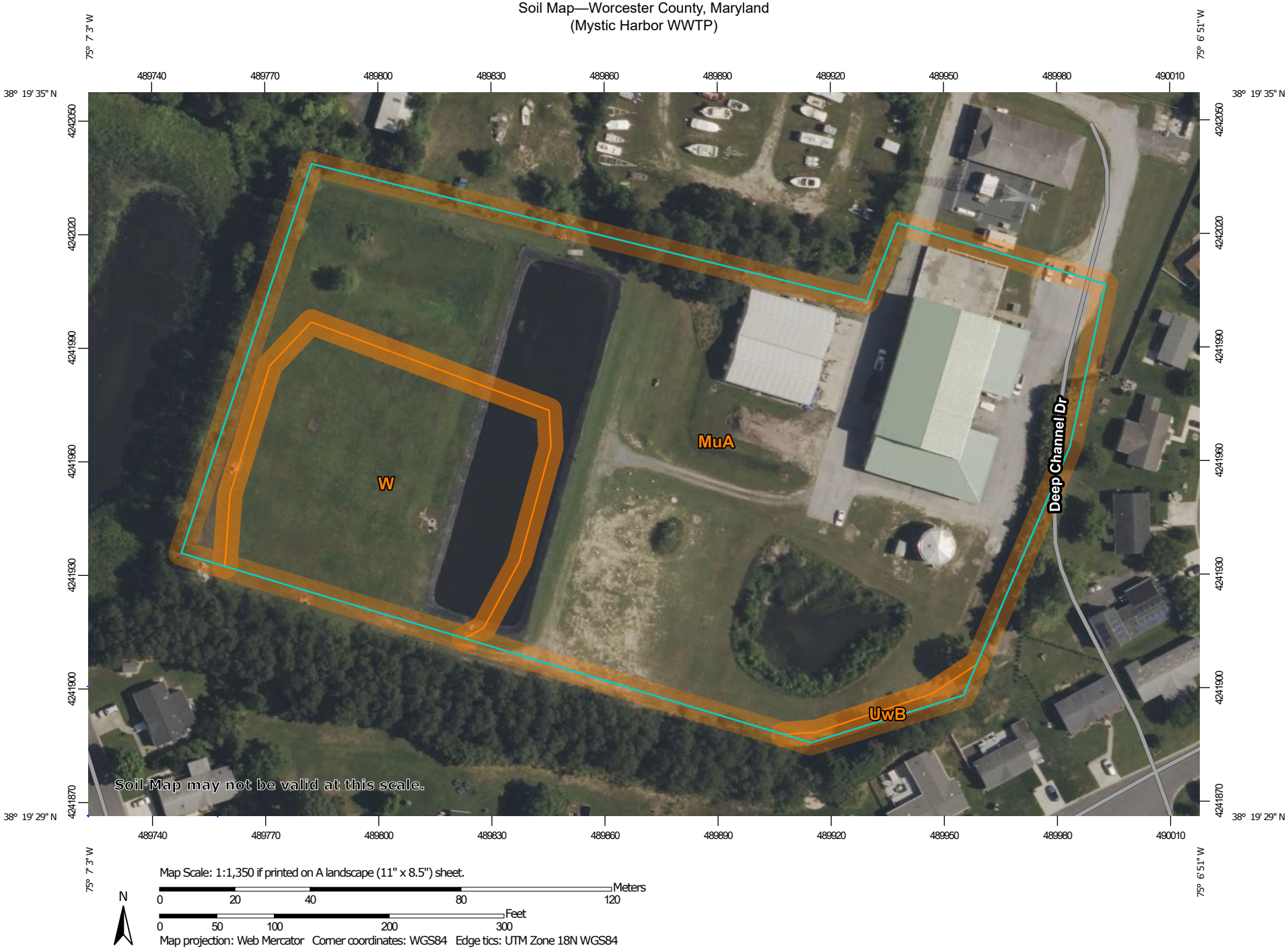


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



USDA Soil Survey Map

Soil Map—Worcester County, Maryland
(Mystic Harbor WWTP)



250196

00 31 32 - 40

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Maryland
Survey Area Data: Version 23, Sep 9, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 30, 2022—Jul 4, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MuA	Mullica-Berryland complex, 0 to 2 percent slopes	4.9	79.2%
UwB	Urban land-Udorthents complex, 0 to 5 percent slopes	0.0	0.6%
W	Water	1.2	20.2%
Totals for Area of Interest		**6.2**	**100.0%**

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 31 46

PERMITS

(Permits to be added once obtained)

- MDE Water/Sewerage Construction Permit
- Office of The State Fire Marshal – Approval
- Worcester County Stormwater Management Waiver
- Worcester County Soil Conservation District - Approval

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GOVERNMENT CENTER
ONE WEST MARKET STREET, ROOM 1302
SNOW HILL, MARYLAND 21863-1294
TEL: 410-632-5666
FAD: 410-632-5664

TRANSMITTAL OF PLANS REVIEW FOR FIRE CODE

TYPE: **XX** CONSTRUCTION ___ SPRINKLER ___ FIRE ALARM

PROJECT: **Mystic Harbour WWTP Renovations**
REVIEW #: **20260362** BUILDING PERMIT NUMBER: **FMO**
LOCATION: **9428 Stephen Decatur Highway Ocean City, MD 21842**
CONTACT: **John Hibschman** **CONTACT PHONE: 410.742.3115**
EMAIL: **jhibschman@gmbnet.com** REVIEW BY: **Hunter Mauk**
DATE REVIEWED: **08/27/2026** **Deputy Fire Marshal**

As you requested, this office has reviewed plans for the above project. Construction shall be in accordance with applicable Worcester County and State of Maryland fire codes. This review is based upon information contained in the submitted plans only, and does not cover unsatisfactory conditions resulting from errors, omissions or failure to clearly indicate conditions. Unless otherwise noted, all references are from the *Life Safety Code, NFPA 101,* 2024 Edition. The following comments are noted from a fire protection standpoint.

___ Resubmit Plans Due to Incomplete Information
XX Submit Letter of Commitment Addressing Items Listed Below
XX Plans are Released for Construction

REFERENCED STANDARDS

___ NFPA 13 ___ NFPA 13R ___ NFPA 72 ___ NFPA 30

---

1) The applicable building code for this plan review is the International Building Code, 2021 Edition (IBC 2021).

2) The applicable fire code for this plan review is the National Fire Protection Association - Life Safety Code, 2024 Edition. (NFPA-101).

3) HVAC equipment shall comply with NFPA 90B, *The Standard for the Installation of Warm Air Heating and Air Conditioning Systems*. (38.5.2)

4) Portable fire extinguishers shall be provided in accordance with NFPA 10*, The Standard for Portable Fire Extinguishers*. Provide ten lbs. ABC fire extinguishers within 75' travel distance from any location in the building. The fire extinguishers shall be permanently mounted, remain unobstructed and be inspected annually. (36.3.5)

5) Install illuminated battery backup exit signs as indicated in plans as well as install signage to properly direct occupants from rear of structure to nearest exit. (36.2.10)

6) Install or maintain existing emergency lighting units as indicated in plans as well as install lighting units to illuminate egress path from rear of business to nearest exit. (36.2.9)

7) Electrical wiring and equipment shall comply with NFPA 70, *National Electric Code*. (38.5.1)

8) Interior wall and ceiling finish shall be Class A, Class B or Class C. (38.3.3)

9) All changes to the existing fire alarm and sprinkler systems shall be submitted to our office for approval prior to installation. A final inspection shall be conducted by this office.

10) Contact Fire Marshal Hunter Mauk for all required inspections for this project.

GOVERNMENT CENTER
ONE WEST MARKET STREET, ROOM 1302
SNOW HILL, MARYLAND 21863-1294
TEL: 410-632-5666
FAD: 410-632-5664

TYPE: **XX** CONSTRUCTION ___ SPRINKLER ___ FIRE ALARM

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REVIEW #: **20260362** BUILDING PERMIT NUMBER: **FMO**
LOCATION: **9428 Stephen Decatur Highway Ocean City, MD 21842**
CONTACT: **John Hibschman** **CONTACT PHONE: 410.742.3115**
EMAIL: **jhibschman@gmbnet.com** REVIEW BY: **Hunter Mauk**
DATE REVIEWED: **08/27/2026** **Deputy Fire Marshal**

I, Chris Derbyshire, P.E., have read and understand the above referenced requirements. I agree with and understand these items must be incorporated within the scope of this project. My signature below serves as my acceptance of these requirements.

_____ 8-27-2026

(Authorizing Signature) (Date)

Please return a signed copy of this plan review by emailing an electronic copy to hmauk@worcestermd.gov or by faxing it to 410-632-5664.

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Map 27 Lot 13
Parcel 727 LOD 1.16 Bond_____

DEPARTMENT OF ENVIRONMENTAL PROGRAMS

Worcester County

GOVERNMENT CENTER
ONE WEST MARKET STREET, ROOM 1306
SNOW HILL, MARYLAND 21863
TEL:410.632.1220 / FAX: 410.632.2012

LAND PRESERVATION PROGRAM
STORMWATER MANAGEMENT
SEDIMENT AND EROSION CONTROL
SHORELINE CONSTRUCTION
AGRICULTURAL PRESERVATION
ADVISORY BOARD

WELL & SEPTIC
WATER & SEWER PLANNING
PLUMBING & GAS
CRITICAL AREAS
FORESTRY CONSERVATION
COMMUNITY HYGIENE

STORMWATER MANAGEMENT
SINGLE-FAMILY WAIVER REQUEST

WAIVER REQUIREMENTS

The Department may grant a waiver of stormwater management requirements for individual developments, provided that a written request is submitted to the reviewing agent by the applicant containing descriptions, drawings and any other information that is necessary to evaluate the proposed development. A separate written waiver request shall be required if there are subsequent additions, extensions or modifications to a development receiving a waiver.

(1) Stormwater management quality and quantitative control waivers may be granted to projects:

A. That have direct discharges to tidally influenced receiving waters;

B. That do not increase the post-development peak discharge for the 2 year storm event by more than 10 percent; or

C. When the approving agency determines that circumstances exist that prevent the reasonable implementation of quantity control practices.

(2) Stormwater management qualitative control waivers apply only to:

A. In-fill development projects where environmental site design has been implemented to the maximum extent practicable and it has been demonstrated that other best management practices are not feasible;

B. Sites where the approving agency determines that circumstances exist that prevent the reasonable implementation of environmental site design to the maximum extent practicable; or

C. Redevelopment projects if the requirements of § NR 1-105 hereof are met.

Stormwater Management Waiver Request

(3) Waivers granted must:

A. Be on a case-by-case basis;

B. Consider the cumulative effects of the County waiver policy; and

C. Reasonably ensure the development will not adversely impact stream quality.

Owner: I hereby request a waiver from the requirements to provide stormwater management on my property known as Tax Map 27, Parcel 727, Section _____, Lot 13, Block _____, Address: MYSTIC HARBOUR WWTP- UPGRADE for the following activity: _____

_____

_____.

I attest that I qualify for a waiver as outlined above and understand that the receipt of a waiver does not relieve me from correcting any future problems as a result of my development activity or violations of any applicable law or regulation.

_____
Owner's Signature

Signatures:

1. Plan Reviewer Recommendation: _____
Approve Disapprove

2. David M. Bradford, Deputy Director _____
Approve Disapprove

3. Robert J. Mitchell, Director _____
Approve Disapprove

Fee for Waiver: $200.00 for Stormwater Management Review
$100.00 for Worcester County Environmental Programs

If a project is not granted a waiver, a stormwater management plan will be required. The following information must be provided on the plan in addition to the information on the stormwater management check-off list.

1. Water Quality Volume - WQV
2. Recharge Volume
3. Overbank Flood Protection Volume
4. Extreme Flood Volume

DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 41 00 – BID FORM FOR CONSTRUCTION CONTRACT

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

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

Worcester County, Maryland
Attn: Edward Welch
Procurement Department
1 West Market Street, Room 103
Snow Hill, MD 21863

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. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. 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;

E. 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;

F. Required Bidder Qualification Statement with supporting data; and

G. Assurances for Compliance with Federal Laws and Regulations (00 73 10 – 9)

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), together with any Unit Prices indicated in Paragraph 3.02:

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SCHEDULE A – LUMP SUM PRICES BID

ITEM NO.	DESCRIPTION	UNIT	EST QTY	BID PRICE
A1	Mobilization/General Conditions (not exceeding 5% of Item No. A2)	Lump Sum	1	$
A2	Treatment Plant Work and All Appurtenances	Lump Sum	1	$
Subtotal Schedule A				$

3.02 *Unit Price Bids*

A. Bidder will perform the following Work at the indicated unit prices:

SCHEDULE B – UNIT PRICE CONTINGENT BID

ITEM NO.	DESCRIPTION	SIZE	UNIT	EST QTY	BID UNIT PRICE	ESTIMATED BID PRICE
B1	Excavation Below Subgrade	--	CY	200	$	$
B2	Furnish and Place Gravel Bedding	--	CY	200	$	$
B3	Furnish and Place Special Backfill	--	CY	200	$	$
B4	Miscellaneous Excavation and Refill	--	CY	50	$	$
B5	Furnish and Place Miscellaneous 4,000 PSI Concrete	--	CY	50	$	$
B6	Concrete Spalling Repairs	--	EA	20	$	$
B7	Miscellaneous Existing Reinforcing Prep and Anti-Corrosion Coating	--	LF	50	$	$
B8	Secure Modified Proctor Tests, AASHTO T-180, Method A	--	EA	5	$	$
B9	Secure Field Density Tests, AASHTO T-191	--	EA	25	$	$
B10	Secure Field Density Tests for Bearing Capacity	--	EA	5	$	$
Subtotal Schedule B						$

B. Bidder acknowledges that:

1. Each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. Estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

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3.03 *Total Bid Price (Lump Sum and Unit Prices)*

Total Bid Price (Total of Schedule A + B)	$

Dollars $(_____)

3.04 The acceptance or rejection of "Substitute Equipment" will not be considered when determining the low bidder.

The Bidder shall circle the manufacturers named below for the equipment upon which the Bid is based.

SCHEDULE C: EQUIPMENT

Item Description	Manufacturer No. 1
Bolted Stainless Steel Tank (43 41 11)	Liquid Tech Tank Systems, Inc
Rotary Drum Screens (46 21 33)	Parkson Corporation
Screening Washing and Compacting Equipment (46 21 73)	Parkson Corporation
Rotary Lobe Pumps (43 23 58)	Boerger, LLC
Belt Filter Press (46 76 21)	BDP Industries, Inc

"SUBSTITUTE EQUIPMENT"

The Contractor hereby wishes to offer the following pieces of equipment as a substitute for the piece of equipment listed above. The Bidder understands that after a contract is awarded, the Owner may, at his sole discretion, select items of any manufacturer listed in the following substitute tabulation. If awarded the Contract, the Bidder agrees to furnish and install any substitutions listed for the price indicated. The Contract Price will then be adjusted accordingly, by change order, by the amount shown below.

Spec. Section	Item	Substitute Manufacturer	Women's Business Or Minority Business Enterprise (Yes or No)	Add or Deduct

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ARTICLE 4—BID ALTERNATES

4.01 The following Alternate bid items may or may not be part of the contract. The Owner may decide at their sole discretion to select an Item. Prices bid by Contractor are deemed to be full compensation for all required, labor, products, tools, equipment, transportation, testing, inspection, services, incidentals, administrative procedures, applicable taxes, permit fees, overhead, profit, and other miscellaneous expenses specified or referenced in the Contract Documents. The Owner reserves the right to add or deduct items it deems to be in its own best interest. **The Low Bidder will be determined based on the Total Base Bid (Schedule A + Schedule B), minus the aggregate deductions for the items selected by the Owner from Schedule D. The Owner reserves the right to select any combination of deductive items listed in Schedule D.**

4.02 Alternates

SCHEDULE D – BID DEDUCT SLUDGE CONVEYOR(S) INSTALLATION, PRIMARY SCREENS REPLACEMENT, & STORAGE BUILDING REHABILITATION

ITEM NO.	DESCRIPTION	UNIT	EST QTY	BID AMOUNT
D1	Furnish and Install Sludge Conveyors SLC-C-115 & SLC-C-116	LS	1	$
D2	Furnish and Install Primary Screens, Compactors, and All Appurtenances	LS	1	$
D3	Furnish and Install One (1) Liquid Sludge Storage tank	LS	1	$
D4	Storage Building Rehabilitation	LS	1	$
Subtotal Schedule D				$

~~ARTICLE 5—PRICE PLUS TIME BID~~ 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.

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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 100 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:

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

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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.

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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) _____

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 43 13 – 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: **Worcester County, Maryland** Address *(principal place of business)*: **1 West Market Street** **Snow Hill, Maryland 21863**	**Bid** Project *(name and location)*: **Mystic Harbour WWTP Biosolids Upgrade** **Snow Hill, Maryland** 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.	

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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.

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SECTION 00 45 13 – 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:			

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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		

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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)		

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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):	

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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.

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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.

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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: _____

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Schedule A—Current Projects

Name of Organization					
Project Owner		Project Name			
General Description of Project					
Project Cost		Date Project			
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			
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			
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					

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Schedule B—Previous Experience with Similar Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
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		
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		
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					

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Schedule B—Previous Experience with Similar Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
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		
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		
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					

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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	

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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	

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 51 00 - NOTICE OF AWARD

Date of Issuance:			
Owner:	**Worcester County, Maryland**	Owner's Project No.:	
Engineer:	**George, Miles & Buhr, LLC**	Engineer's Project No.:	**250196**
Project:	**Mystic Harbour WWTP Biosolids Upgrade**		
Contract Name:	**Mystic Harbour WWTP Biosolids Upgrade**		
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.

[Number of copies sent] 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 **[number of copies sent]** 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:	**[Full formal name of Owner]**
By *(signature)*:	_____
Name *(printed)*:	_____
Title:	_____

Copy: Engineer

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DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS
SECTION 00 52 00
AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **Worcester County** ("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:

The Mystic Harbour WWTP Biosolids Upgrade Project generally consists of, but is not limited to, the construction and installation of Primary Screening improvements including replacement of the existing Primary Screens and Compactors; installation of two (2) new Sludge Holding Tanks; a Mechanical Dewatering System; Sludge Transfer Pumps; Sludge Mixing Blowers; and a new CMU Dewatering Building to house the associated equipment. The Work also includes rehabilitation and extension of the existing Sludge Drying Beds and Greenhouses; construction of two (2) new Sludge Drying Beds and Greenhouses; site work; yard piping; associated demolition; miscellaneous structures; and installation, integration, and programming of new equipment and systems into the existing SCADA system. The Work also includes the rehabilitation/modification of an existing building into a Storage Building.

The work also includes all requirements to provide fully finished and operable facilities including miscellaneous items and operations as shall be indicated, shown, specified or required to complete the work in strict conformity with the Contract Documents. The work also includes all specified, indicated and shown mechanical and electrical equipment, appliances, appurtenances, furnishings, instrumentation and controls, accessories, tests and sundry parts and material as shall be necessary and required for a completely operable installation satisfactory to the Engineer. The Contractor shall provide all plant, labor, equipment, tools, appliances, materials and incidentals and shall perform all operations required to finish all of the work in the manner approved by the Engineer.

THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Mystic Harbour WWTP Biosolids Upgrade**

ARTICLE 2—ENGINEER

3.01 The Owner has retained **George, Miles & Buhr, 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.

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3.02 The part of the Project that pertains to the Work has been designed by **George, Miles & Buhr, LLC.**

ARTICLE 3—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 *Contract Times: Days*

A. The Work will be substantially complete within **420** 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 **450** days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above 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 **$1,500.00** 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 **$1,000.00** for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Milestones, 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.

ARTICLE 4—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, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

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ARTICLE 5—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 **15th** 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. **90** percent of the value of the Work completed (with the balance being retainage).

B. Upon Substantial Completion, 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 **3.0%** percent per annum.

ARTICLE 6—CONTRACT DOCUMENTS

7.01 *Contents*

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

1. This Agreement.

2. Bonds:

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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: **Mystic Harbour WWTP Biosolids Upgrade & Building Rehabilitation**.

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

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

a. **[list exhibits]**

9. 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 7—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.

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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,

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(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.

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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:	Contractor:
Worcester County *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(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)*	Attest: _____ *(individual's signature)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices: 1 West Street Snow Hill, MD 21836	Address for giving notices:
Designated Representative:	Designated Representative:
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address:	Address:
Phone:	Phone:
Email:	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.)*	License No.: _____ *(where applicable)* State:

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 55 00 - NOTICE TO PROCEED

Owner:	**Worcester County, Maryland**	Owner's Project No.:	
Engineer:	**George, Miles & Buhr, LLC**	Engineer's Project No.:	**250196**
Contractor:		Contractor's Project No.:	
Project:	**Mystic Harbour WWTP Biosolids Upgrade**		
Contract Name:	**Mystic Harbour WWTP Biosolids Upgrade**		
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 date by which Substantial Completion must be achieved is **[date for Substantial Completion, from Agreement]**, and the date by which readiness for final payment must be achieved is **[date for readiness, from Agreement]**.

[or]

The number of days to achieve 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:	**[Full formal name of Owner]**
By *(signature)*:	
Name *(printed)*:	
Title:	
Date Issued:	

Copy: Engineer

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 61 13.13 - 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: **Worcester County, Maryland** Mailing address *(principal place of business)*: **1 West Market Street** **Snow Hill, Maryland 21863**	**Contract** Description *(name and location)*: **Mystic Harbour WWTP Biosolids Upgrade** **Snow Hill, Maryland** 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.

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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:

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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

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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"]**

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 61 13.16 - PAYMENT BOND

Contractor	**Surety**
Name: **[Full formal name of Contractor]** Address *(principal place of business)*: **[Address of Contractor'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	**Contract**
Name: **Worcester County, Maryland** Mailing address *(principal place of business)*: **1 West Market Street** **Snow Hill, Maryland 21863**	Description *(name and location)*: **Mystic Harbour WWTP Biosolids Upgrade** **Snow Hill, Maryland** 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 Payment Bond, do each cause this Payment 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.

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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.

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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;

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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"]**

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Contractor's Application for Payment

Owner:	Worcester County	**Owner's Project No.:**	
Engineer:	George, Miles & Buhr, LLC	**Engineer's Project No.:**	250196
Contractor:		**Contractor's Project No.:**	
Project:	Mystic Harbour WWTP Biosolids Upgrade		
Contract:	Mystic Harbour WWTP Biosolids Upgrade		
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:**	

EJCDC C-620 Contractor's Application for Payment
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Progress Estimate - Lump Sum Work **Contractor's Application for Payment**

Owner:	Worcester County	**Owner's Project No.:**	
Engineer:	George, Miles & Buhr, LLC	**Engineer's Project No.:**	250196
Contractor:		**Contractor's Project No.:**	
Project:	Mystic Harbour WWTP Biosolids Upgrade		
Contract:	Mystic Harbour WWTP Biosolids Upgrade		

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	$ -	$ -	$ -	$ -	$ -		$ -

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

Owner:	Worcester County	**Owner's Project No.:**	
Engineer:	George, Miles & Buhr, LLC	**Engineer's Project No.:**	250196
Contractor:		**Contractor's Project No.:**	
Project:	Mystic Harbour WWTP Biosolids Upgrade		
Contract:	Mystic Harbour WWTP Biosolids Upgrade		

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) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
Change Orders								
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
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						-		-
Change Order Totals		$ -	$ -	$ -	$ -	$ -		$ -
Original Contract and Change Orders								
Project Totals		$ -	$ -	$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work **Contractor's Application for Payment**

Owner:	Worcester County	**Owner's Project No.:**	
Engineer:	George, Miles & Buhr, LLC	**Engineer's Project No.:**	250196
Contractor:		**Contractor's Project No.:**	
Project:	Mystic Harbour WWTP Biosolids Upgrade		
Contract:	Mystic Harbour WWTP Biosolids Upgrade		

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

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Original Contract											
					-		-		-		-
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					-		-		-		-
				Original Contract Totals	$ -		$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work **Contractor's Application for Payment**

Owner:	Worcester County	**Owner's Project No.:**	
Engineer:	George, Miles & Buhr, LLC	**Engineer's Project No.:**	250196
Contractor:		**Contractor's Project No.:**	
Project:	Mystic Harbour WWTP Biosolids Upgrade		
Contract:	Mystic Harbour WWTP Biosolids Upgrade		

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

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Change Orders											
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					-		-		-		-
				Change Order Totals	$ -		$ -	$ -	$ -		$ -
Original Contract and Change Orders											
				Project Totals	$ -		$ -	$ -	$ -		$ -

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

Owner:	Worcester County	**Owner's Project No.:**	
Engineer:	George, Miles & Buhr, LLC	**Engineer's Project No.:**	250196
Contractor:		**Contractor's Project No.:**	
Project:	Mystic Harbour WWTP Biosolids Upgrade		
Contract:	Mystic Harbour WWTP Biosolids Upgrade		

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	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 65 16 - CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: **Worcester County, Maryland**
Engineer: **George, Miles & Buhr, LLC**
Contractor:
Project: **Mystic Harbour WWTP Biosolids Upgrade**
Contract Name: **Mystic Harbour WWTP Biosolids Upgrade**

Owner's Project No.:
Engineer's Project No.: **250196**
Contractor's Project No.:

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

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

Date of Substantial Completion:

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the 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:

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

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

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

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DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 65 19.23 - NOTICE OF ACCEPTABILITY OF WORK

Owner:	**Worcester County, Maryland**	Owner's Project No.:	
Engineer:	**George, Miles & Buhr, LLC**	Engineer's Project No.:	**250196**
Contractor:		Contractor's Project No.:	
Project:	**Mystic Harbour WWTP Biosolids Upgrade**		
Contract Name:	**Mystic Harbour WWTP Biosolids Upgrade**		
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.
7. Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

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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

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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

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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.

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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.

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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.

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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.

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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

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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.

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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

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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.

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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

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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.

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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.

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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

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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.

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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

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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;

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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

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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

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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

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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

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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

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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.

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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);

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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

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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.

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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.

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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;

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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

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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.

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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

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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:

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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.

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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

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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

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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

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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

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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.

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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

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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

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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.

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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,

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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,

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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

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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.

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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;

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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

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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

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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.

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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,

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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.

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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,

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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

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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.

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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.

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DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

Section 00 73 00 - Supplementary Conditions

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EJCDC® C-800, Supplementary Conditions of the Construction Contract.
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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

1.01 *Defined Terms*

SC-1.01.A.8 Insert the following language in the definition of "Change Order" after "signed by Contractor and Owner":

, and approved by Funding Agency,

SC-1.01.A.10 Delete the definition of "Claim" and replace with the following definition:

Claim – (a) A demand or assertion by Owner directly to Contract in accordance with the provisions set forth herein; or (b) a demand or assertion by Contractor directly to Owner in accordance with the provisions set forth herein. A demand for money or services by a third party is not a Claim.

SC-1.01.A.23 Insert the following language in the definition of "Field Order" after "Engineer":

And approved or ratified by Owner.

SC-1.01.A.50 Add the following language at the end of the last sentence of Paragraph 1.01.A.50:

Work Change Directive cannot change Contract Price or Contract Times without a subsequent Change Order.

SC-1.01.A.51 – Add the following new paragraph:

"Or-equal" – Or approved equal.

SC-1.01.A.52 Add the following new paragraph:

***Abnormal Weather Conditions* – Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal weather Conditions.**

SC-1.01.A.53 Add the following new paragraph:

Geotechnical Baseline Report (GBR)—The interpretive report prepared by or for Owner regarding subsurface conditions at the Site, and containing specific baseline geotechnical conditions that may be anticipated or relied upon for bidding and contract administration purposes, subject to the controlling provisions of the Contract, including the GBR's own terms. The GBR is a Contract Document.

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SC-1.01.A.54 Add the following new paragraph:

Geotechnical Data Report (GDR)—The factual report that collects and presents data regarding actual subsurface conditions at or adjacent to the Site, including Technical Data and other geotechnical data, prepared by or for Owner in support of the Geotechnical Baseline Report. The GDR's content may include logs of borings, trenches, and other site investigations, recorded measurements of subsurface water levels, the results of field and laboratory testing, and descriptions of the investigative and testing programs. The GDR does not include an interpretation of the data. If opinions, or interpretive or speculative non-factual comments or statements appear in a document that is labeled a GDR, such opinions, comments, or statements are not operative parts of the GDR and do not have contractual standing. Subject to that exception, the GDR is a Contract Document.

ARTICLE 2—PRELIMINARY MATTERS

2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.

1. *Basic Requirements*

a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.

b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.

c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.

d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.

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f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

   a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.

      1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is **10** MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.

      2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.

   b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

   c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.

   d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

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e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.

f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.

g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

h. The ~~Owner~~ **Engineer** will operate a Project information management system (also referred to in this EDP as "Project Website") for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:

1) The Project Website will be available for reliance by all parties **throughout the entirety of the project and for three (3) months following completion of the project**;

2) **Reference Exhibit A as included at the end of this specification for details on Electronic Documents Protocol.**

C. *Software Requirements for Electronic Document Exchange; Limitations*

1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.

a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.

2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.

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3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.03 *Reporting and Resolving Discrepancies*

SC-3.03.A.2 **Delete "by Engineer" in the last sentence and replace it with "by Owner".**

3.04 *Requirements of the Contract Documents*

SC-3.04.A **Remove the words "and Owner" from the first sentence of 3.04.A. Delete the last sentence and replace with:**

"Unless such matter is subject to the exceptions listed in subsection (c) below, Engineer shall review and submit to Owner a recommendation regarding any matters in question regarding the requirements of the Contract Documents. Within ten days of receipt of Engineer's recommendation, Owner shall issue a final decision regarding said matter, unless Owner gives notice of an extension of the deadline for said recommendation."

SC-3.04.C **Replace the words "a decision or interpretation" with "recommendation" in the first sentence. Delete the last sentence and replace with:**

"If Contractor is dissatisfied with Owner's decision, Contractor may pursue resolution as provided in Article 12."

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement and Progress of the Work*

SC-4.01 **Delete in its entirety and replace with:**

The Contract Times will commence to run on the day indicated in the Notice to Proceed.

4.02 *Starting the Work*

SC-4.02 **At the end of the first sentence add:**

"in accordance with the Notice to Proceed."

SC-4.05 **Amend Paragraph 4.05.C by adding the following subparagraphs:**

5. *Weather-Related Delays*

a. If "abnormal weather conditions" as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract Times, such request must be documented by data substantiating each of the following: 1) that weather conditions were abnormal for the period of time in which the delay occurred, 2) that such weather conditions could not have been reasonably anticipated, and 3) that such weather conditions had an adverse effect on the Work as scheduled. **Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered abnormal weather conditions. Requests for time extensions due to abnormal weather conditions**

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will be submitted to the Engineer within five days of the end of the abnormal weather condition event. It is the responsibility of the Contractor to provide the information listed in SC 4.05.C.5.b.

b. The existence of abnormal weather conditions will be determined on a month-by-month basis in accordance with the definition "Abnormal Weather Conditions" in SC-1.01.A.52.

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

5.01 *Availability of Lands*

SC-5.01.B Delete in its entirety.

SC-5.01 **Add the following new paragraphs immediately after paragraph 5.01-C:**

D. All permanent construction will be within lands of the Owner, public rights-of-way, or within easements through private property acquired by the Owner. The Contractor shall confine his operation strictly within the limits of the rights-of-way and construction areas. In the event the Contractor allows construction to occur outside the lands of the Owner, public rights-of-way, or within easements through private property, Contractor shall be responsible for correcting said error through relocating construction, obtaining corrective deeds or easements, or through other appropriate measures as may be agreed upon by the Owner. The Contractor shall replace in-kind and repair all damages within the prescribed areas equal to or superior to original conditions. Work will be permitted outside of the prescribed easement area if written permission to occupy additional ground is provided by the owner of the affected property. The Contractor shall be responsible for replacement of any property damaged outside of the prescribed area. Trees and other natural obstructions shall not be removed without written permission from the owner of the property. Such additional agreements shall be promptly sent to Engineer, in advance of construction, for filing.

5.03 *Subsurface and Physical Conditions*

SC-5.03 Delete Paragraph 5.03 in its entirety and replace with the following:

5.03 *Subsurface and Physical Conditions*

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

1. those reports of explorations and tests of subsurface conditions at or adjacent to the Site (other than any Geotechnical Data Report or Geotechnical Baseline Report) that contain Technical Data. Such reports are as follows: **NONE**

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. Such drawings are as follows: **NONE**

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

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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; or

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

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.

E. *Geotechnical Baseline Report*

1. This Contract contains a Geotechnical Baseline Report ("GBR"), identified as follows: **Hillis-Carnes Engineering Associates Geotechnical Engineering Study – Mystic Harbor WWTP Biosolids Upgrade, Berlin, Maryland dated February 13, 2026.** This Contract **does not** contain a Geotechnical Data Report (GDR).

2. The GBR and GDR are incorporated as Contract Documents. The GBR and GDR are to be used in conjunction with other Contract Documents, including the Drawings and Specifications. If there is a conflict between the terms of the GBR and the GDR, the GBR's terms prevail.

3. The GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations (referred to here in the Supplementary Conditions as "Baseline Conditions"). These may include ground, geological, groundwater, and other subsurface geotechnical conditions, and baselines of anticipated Underground Facilities or subsurface structures.

4. The Baseline Conditions will be used to assist in the administration of the Contract's differing site conditions clause at locations where subsurface conditions have been baselined. If a condition is baselined in the GBR, then only the pertinent Baseline Conditions will be used to determine whether there is a differing site condition; and no other indication of that condition in the Contract Documents or Technical Data, or of a condition that describes, quantifies, or measures a similar characteristic of the subsurface, will be used for the differing site condition determination.

5. The Baseline Conditions will not be used to make differing site conditions determinations at locations that have not been baselined in the GBR, or at any location with respect to subsurface conditions that the Baseline Conditions do not address. If Underground Facilities or Hazardous Environmental Conditions are expressly addressed in the Baseline Conditions, then comparison to such Baseline Conditions will be the

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primary means of determining (a) whether an Underground Facility was shown or indicated with reasonable accuracy, as provided in Paragraph 5.05 of the General Conditions, or (b) whether a Hazardous Environmental Condition was shown or indicated in the Contract Documents as indicated in Paragraph 5.06.H of the General Conditions. As indicated in Paragraph SC-5.04 below, the GDR will be the primary resource for differing site conditions determinations in cases in which the GBR is inapplicable.

6. The descriptions of subsurface conditions provided in the GBR are based on geotechnical investigations, laboratory tests, interpretation, interpolation, extrapolation, and analyses. Neither Owner, Engineer, nor any geotechnical or other consultant warrants or guarantees that actual subsurface conditions will be as described in the GBR, nor is the GBR intended to warrant or guarantee the use of specific means or methods of construction.

7. The behavior of the ground during construction depends substantially upon the Contractor's selected means, methods, techniques, sequences, and procedures of construction. If ground behavior conditions are baselined in the GBR, they are based on stated assumptions regarding construction means and methods.

8. The GBR will not reduce or relieve Contractor of its responsibility for the planning, selection, and implementation of safety precautions and programs incident to Contractor's means, methods, techniques, sequences, and procedures of construction, or to the Work.

5.04 *Differing Subsurface or Physical Conditions*

SC-5.04 Delete Paragraph 5.04 in its entirety and replace with the following:

5.04 *Differing Subsurface or Physical Conditions*

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

1. differs materially from conditions shown or indicated in the GBR; or

2. differs materially from conditions shown or indicated in the GDR, to the extent the GBR is inapplicable; or

3. differs materially from conditions shown or indicated in Contract Documents other than the GBR or GDR, to the extent the GBR and GDR are inapplicable; or

4. to the extent the GBR and GDR are inapplicable, 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; or

5. to the extent the GBR and GDR are inapplicable, is of such a nature as to require a change in the Drawings or Specifications; or

6. to the extent the GBR and GDR are inapplicable, 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 conditions or performing any Work in connection therewith (except in an

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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 the necessity of Owner's obtaining 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 SC-5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption or continuation 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 or continuation 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 Owner 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 Owner 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 SC-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 of the General Conditions; 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

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submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

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 as required by Paragraph SC-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 must 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.

5.05 *Underground Facilities*

SC-5.05.A.5 Insert the following into Paragraph 5 after the first sentence:

If Contractor damages any utilities, he or she shall immediately take such measures as are required to prevent further damage and to protect life and property. The Contractor shall also immediately notify the affected utility company and make permanent repair of the damage. The Contractor shall pay for all damages incurred, as well as for the full repair and restoration thereto at the sole expense of Contractor with no expense being incurred by Owner.

5.06 *Hazardous Environmental Conditions at the Site*

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. Unless provided in the Appendix of the specifications, no reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Deleted.

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).

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6.02 *Insurance—General Provisions*

SC-6.02.A **Remove "Owner and" from the sentence.**

SC-6.02.B **Delete in its entirety and replace with the following:**

All insurance required by the Contract to be purchased and maintained by Contractor shall be obtained from insurers that are allowed to do business in Maryland, with a Best's Financial Strength Rating of "A-" or better, and a Financial Size Category of "Class VII" or better in the latest evaluation of the A.M. Best Company, unless otherwise approved by Owner.

SC-6.02.E **Delete in its entirety.**

SC-6.02-F **Replace "Owner or Contractor" with "Owner" in both instances of this paragraph.**

Replace "the other party's" with "Contractor's".

SC-6.02.H.1. **Delete SC-6.02.H.1. in its entirety and replace with:**

Contractor shall require all Subcontractors to obtain and maintain workers' compensation, employers' liability, commercial general liability, business auto liability, and contractors' pollution liability, contractors' professional liability (optional) to the same extent required of Contractor, including additional insured status for persons required under Contractor's commercial general liability. Prior to the start of Work under this Contract, Contractor will furnish Subcontractors' certificates of insurance and required endorsements to Owner.

SC-6.02.I **Replace "either party" and "such party" with "Contractor" and "other party" with "Owner".**

SC-6.02.K **Delete Paragraph 6.02.K in its entirety and replace with the following:**

Without prejudice to any other right or remedy, if Contractor has failed to obtain required insurance, Owner may elect to obtain equivalent insurance, to protect Owner's interests at the expense of Contractor, and the Contract Price shall be adjusted accordingly.

SC 6.02.L **Add the following sentence to the end of paragraph 6.02.L:**

Nothing in this subsection shall be construed to allow insurance coverage, as required by the Contract Documents, to lapse during this Contract, unless and until specific, written authorization for alternative coverage is issued by Owner.

SC-6.02.N **Add the following paragraphs immediately after 6.02.N:**

O. No acceptance and/or approval of any insurance by Owner shall be construed as relieving or excusing Contractor, or its surety, or its bonds from any liability or obligation imposed upon them by the provisions of the Contract.

P. Any deductibles or retentions of $5,000 or greater ($10,000 for umbrella excess liability) shall be disclosed by Contractor and are subject to Owner's written approval. Such approval will not be unreasonably withheld. Any deductible or retention amounts elected by Contractor or its Subcontractors or imposed by Contractor's or Subcontractor's insurer(s) shall be the sole responsibility of Contractor or its Subcontractors and are not chargeable as expenses.

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Q. For any "claims-made" liability insurance purchased by Contractor or Subcontractors, the purchaser must comply with the following additional conditions. The limits of liability and the extensions to be included remain the same.

1. The retroactive date (if any) of such “claims-made” coverage can be no later than the earlier of the Effective Date of the Contract or the commencement of the Work under the Contract and either 2 or 3 below;

2. The Contractor or Subcontractor shall provide certificates of insurance evidencing the claims-made insurance for a period of three (3) years after Substantial Completion; or

3. The Contractor or Subcontractor shall purchase a three (3) year extended reporting period endorsement for each such “claims-made” policy in force as of the date the Contract terminates or expires, whichever is earlier and evidence the purchase of the extended reporting period endorsement by means of a certificate of insurance and a copy of the endorsement itself.

R. If Owner is damaged by the failure or neglect of Contractor to obtain and maintain insurance as described and required herein, without so notifying Owner, then Contractor shall bear all reasonable costs properly attributable thereto.

6.03 *Contractor’s Insurance*

SC-6.03.C.1. **Replace 6.03.C.1. with the following:**

1. include and list as additional insureds Owner and Engineer, and their respective elected and appointed officials, officers, directors, members, partners, employees, and agents.

SC-6.03 **Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:**

D. *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
Jones Act (if applicable)	
Bodily injury by accident—each accident	$
Bodily injury by disease—aggregate	$
Employer’s Liability	
Each accident	$ 1,000,000
Each employee	$ 1,000,000
Policy limit	$ 1,000,000

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Workers' Compensation and Related Policies	Policy limits of not less than:
Stop-gap Liability Coverage	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	$

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:

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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.

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Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$ 1,000,000
General Aggregate	$ 1,000,000

L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of $**1,000,000.00** after accounting for partial attribution of its limits to underlying policies, as allowed above.

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 **Delete Paragraph 6.04.B, 6.04.C, 6.04.D and 6.04.E of the General Conditions and substitute the following in its place:**

For all property owned by Contractor and used in or a part of the Work under this Contract, Contractor may purchase all-risk (Special Form) property insurance for such property and any consequential loss of income and extra expense resulting from loss of or damage to Contractor's property, in amounts sufficient to protect Contractor's interests. To the extent permitted by law, Contractor waives all right of recovery from the Owner and its elected and appointed officials, agents, and employees for loss of or damage to Contractor's property and any consequential loss of income and extra expense. If Contractor elects to purchase insurance, such insurance will permit this waiver by endorsement or otherwise. If any property is to be transferred to the Owner as part of the Scope of Work, the risk of loss shall remain with Contractor until the property has been accepted by the Owner, including property in storage or in transit.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 *Labor; Working Hours*

SC 7.03.C **Delete paragraph 7.03.C in its entirety and insert the following:**

C. Except as otherwise required for the safety and protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during working hours as defined below. Total normal hours per week should be forty (40) hours.

Work Hours:

Work will not be permitted on Saturday, Sunday, or holidays observed by Owner unless approval is given in response to a written request a minimum of 48 hours in advance of commencing work. Emergency repairs or actions are an obvious exception.

Normal working hours shall consist of a nine-hour work day performed between the hours of 7:00 a.m. and 5:00 p.m. Any requests by Owner to limit the Work on certain areas of the Site to certain hours of the day will be accommodated by Contractor. Extensions to the

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Contract Time will not be permitted, as these limited work hours have been accommodated in the Contract Time as set forth herein.

Overtime:

Overtime hours will be tracked for any work beyond the first 40 hours of the week. Subcontractors must work the same work hours as the Contractor. All overtime work beyond the normal 40 hours per week for the entire projects' duration must be paid by the Contractor. For purposes of administering the foregoing requirement, additional overtime costs are defined as: $165 per hour for RPR.

Observed Holidays:

New Year's Day	Martin Luther King Jr.'s Birthday
Good Friday	Memorial Day
Juneteenth Independence Day	Independence Day
Labor Day	Elections Day
Veterans Day	Thanksgiving Day
Day after Thanksgiving	Christmas Eve
Christmas Day	

7.04 *Services, Material and Equipment*

SC-7.04.D **Add the following new paragraph immediately after Paragraph 7.04.C:**

E. For projects utilizing a De Minimis waiver, Contractor shall maintain an itemized list of non-domestically produced iron or steel incidental components and ensure that the cost is less than 5% of total materials cost for project.

7.05 *"Or Equals"*

SC-7.05.A **Amend the third sentence of paragraph by striking out the following words:**

Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted,

SC-7.05.A.1.a.4 **Delete paragraph in its entirety and insert "Deleted."**

SC-7.05.B **Add the following at the end of paragraph:**

Contractor shall include a Manufacturer's Certification letter for compliance with Build America Buy America requirements in support data, if applicable. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

7.06 *Substitutes*

SC-7.06.A.3.a.4 **Add the following new paragraph immediately after Paragraph 7.06.A.3.a.3:**

4. Comply with Build America Buy America by providing Manufacturer's Certification letter of Build America Buy America compliance, if applicable. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

SC 7.06.B **Substitute the third sentence of 7.06.B with the following:**

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Engineer will make a recommendation to Owner regarding acceptability of "or equal" item.

In sentence four of 7.06.B, insert "subject to Owner's approval" after …and Engineer determines.

7.01 *Concerning Subcontractors and Suppliers*

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-7.07.F **Delete paragraph in its entirety and replace with the following:**

If the Owner or the Engineer refuses to accept any subcontractor, person, or organization or such list, the Contractor will submit an acceptable substitute, and the Contract price shall remain unchanged or shall be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate change order, if necessary, shall be issued.

SC-7.07.G **Delete paragraph in its entirety.**

SC-7.07.K **Delete paragraph and replace with the following:**

K. All work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Document for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 6.05, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

7.08 Patent Fees and Royalties

SC-7.08.B **Delete paragraph in its entirety.**

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7.12 *Record Documents*

SC-7.12.A **Amend paragraph by adding the following after "written interpretations and clarifications,":**

Manufacturers' Certifications,

Insert "and Owner" to the end of the last sentence of the paragraph.

SC-7.12.B **The following paragraphs are added after SC-7.12.A as follows:**

B. All work shall be measured, by the Contractor, during installation and before covering and backfilling. All measurements shall be referenced to project vertical datum and stationing shown on the drawings. All measurements will be recorded and kept current until completion of the Work. Such measurement records shall be transmitted to the Engineer to check Applications for Payment. The Contractor shall field survey inverts for installed gravity sewer pipelines and submit the results along with the Application for Payment for that particular section of sewer. All field measurements for all forcemain record documents shall be updated each month and shall also be submitted with the Application for Payment for that particular section of forcemain. The surveys shall indicate the pipeline in question has been installed in accordance with the Contract Documents.

C. Contractor shall be responsible for recording, keeping, and monitoring Record Drawings of work constructed in the field. Record Drawings will be kept on hand in the Contractor's field office for inspection by the Engineer. Two sets of initial draft Record Drawings shall be issued to the Engineer no later than 14 days from the date of substantial completion.

7.13 *Safety and Protection*

SC-7.13 Insert the following after the second sentence of Paragraph 7.13.J:

K. Access during construction:

1. The Contractor shall schedule Work to minimize the time period during which vehicular access to each building or dwelling along the work route is prevented. The Contractor shall provide, at all times, safe pedestrian access to all building or dwellings, whether residential, commercial, or other.

2. Construction shall be scheduled to interfere as little as possible with traffic. Necessary barricades, suitable and sufficient danger signals, and signs in accordance with the Maryland Traffic Control Manual shall be provided for the protection of existing property and safety of the Public.

L. Protection of Property and Utilities:

1. The location of utilities, facilities, or structures that may be shown on the plans or encountered in the work are not guaranteed. Any inaccuracy or omission in such

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information shall not relieve the Contractor of his responsibility to protect such existing features from damage or unscheduled interruption of service.

2. The Contractor shall contact "Miss Utility" at (800) 257-7777 at least 48 hours prior to digging in the vicinity of existing underground utilities to have them located and marked.

3. The Contractor shall pay all charges levied by utility companies for work to locate, inspect, protect, relocate, replace, or repair overhead or underground utilities necessary for the construction of the project. The Owner assumes no responsibility for damages or downtime for the Contractor or their subcontractors resulting from the inadequate or negligent performance by utility locators.

4. The Contractor shall, at his own expense, locate, protect, and repair damages to all overhead and underground utilities whether shown by the drawings or not. The Contractor shall cooperate with the utility service, or governing agency to prevent the unscheduled interruption of utility services and facilities during repair or replacement.

5. The Contractor shall comply with the Utility Damage Prevention and Safety Act for the State of Maryland, Title 12, Maryland Code, Chapter 117.

M. Safety Plan:

1. The Contractor shall follow all nationally recognized Safety, Health and Environmental standards in fulfilment of this Contract.

2. The Contractor shall erect and maintain, as required by the existing conditions and performance of this Contract reasonable safeguards for safety and protection of the Site, during all hours for the durations of the project. Reasonable safeguards, include but are not limited to posting danger signs, erecting fences, adding spill containment, or constructing other physical barriers that will protect workers, bystanders, and the general public from hazards.

3. Contractor shall submit to the Owner for review a project specific safety plan addressing his intended program for maintaining safety in accordance with the above referenced requirements.

SC-7.15.A **Replace "Engineer" with "Owner" in the last sentence.**

7.16 *Submittals*

SC-7.16.A.1.c **Amend paragraph by deleting the last period and adding:**

, including Manufacturer's Certification letter for any item in the submittal subject to Build America Buy America requirements and include the Certificate in the submittal. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

SC-7.16.A.1.d **Add new paragraph immediately after Paragraph 7.16.A.1.c:**

F. Survey and Stake-out Submittals

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1. All surveying and stake-out and rim elevation work shall be done by persons licensed by the State of Maryland to perform such work.

2. Work done by the Contractor without having first established proper lines and grade, or work done by him to incorrect line and grade, may be ordered removed and replaced at no increase in contract price.

3. Any bench marks destroyed through or as a direct result of the Contractor's construction operations shall be replaced and/or restored at his expense with no additional cost to the Owner.

SC-7.16.C.9 **Add new paragraph immediately after Paragraph 7.16.C.8:**

9. Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturers' Certifications in order to document compliance with Build America Buy America requirements, as applicable.

7.17 Contractor's General Warranty and Guarantee

SC-7.17.F **Add new paragraphs immediately after Paragraph 7.17.E:**

F. The Contractor hereby guarantees all of the work performed under this Contract for a period of one year, unless otherwise noted. The guarantee period begins on the date of the completion of the Conditional Acceptance period. The guarantee shall be as follows:

1. Against all faulty or imperfect materials and against all imperfect, careless and/or unskilled workmanship, as evidenced by excessive pipe settlement, cracked pavement, failure of structures, and/or equipment, etc.

2. That the entire equipment and each and every part thereof, shall operate with proper care and attention in a satisfactory manner, and in accordance with the requirements of these Contract Documents.

3. That the entire structure in the vicinity of work done shall be watertight and leak-proof, at every point and in every particular.

4. The Contractor agrees to replace with proper workmanship and materials, and to execute, correct or repair, without cost to the Owner, any Work which may be found to be improper or imperfect.

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

6. No use or acceptance by the Owner of the Work or any part thereof, nor any failure to use the same, nor any repairs, adjustments, replacements, or corrections made by the Owner due to the Contractor's failure to comply with any of the obligations under the Contract Documents, shall impair in any way

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the guarantee obligations assumed by the Contractor under these Contract Documents.

7.18 *Indemnification*

SC-7.18.A **Deleted and replaced with the following:**

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, defend and hold harmless Owner and Engineer, and the elected and appointed officials, officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused in whole or in part 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. Contractor shall be liable, regardless of whether or not such claims, damages, losses, injuries, or expenses are caused in part by a party indemnified hereunder.

Owner shall cooperate and assist the indemnifying party in the defense of the claim. The indemnifying party shall bear the cost of and have the right to control the defense and shall have the right to select counsel after consulting with the indemnified party. Contractor shall not settle or compromise any claim without the written consent of Owner.

SC- 7.18.B Deleted and replaced with the following:

B. In any and all claims against Owner, Engineer, Engineer's Consultants, and the elected and appointed officials, officers, directors, partners, employees, agents and other consultants and subcontractors of each by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, and 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, Contractor agrees to expressly waive its immunity, if any, as a complying employer under the Workers' Compensation law or statue, but only to the extent that such immunity would bar or affect recovery under or enforcement of any indemnification obligation contained herein. This waiver applies to the Maryland Workers' Compensation Act, or any other applicable state Workers' Compensation law or statute.

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7.19 *Delegation of Professional Design Services*

SC-7.19 Delete this Section in its entirety.

7.20 *No Limitation of Liability*

SC-7.20 Paragraph 7.20 is added to the Standard General Conditions as follows:

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

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

SC-8.01.B Delete paragraph in its entirety.

8.02 *Coordination*

SC-8.02.A Replace first sentence with the following:

A. Owner will make reasonable efforts to provide advance notice of any other work being performed or to be performed at or adjacent to the Site. Owner's failure to provide such notice will not be construed as a default of the Contract Documents. In such notice, Owner shall include the following:

8.03 *Legal Relationship*

SC-8.03.A Delete paragraph 8.03.A and replace with the following:

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, or any other contractor working for Owner, causes damage to the Work of 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 Times. Contractor must submit any Change Proposal seeking an equitable adjustment in 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 shall 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. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

SC-8.03.B Delete this paragraph in its entirety.

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ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

SC-9.01.A Delete Paragraph in its entirety.

9.02 *Replacement of Engineer*

SC-9.02.A Delete Paragraph and insert the following language in lieu thereof:

Owner may at its discretion appoint an engineer to replace Engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.06 *Insurance*

SC-9.06.A Delete Paragraph in its entirety.

9.11 *Evidence of Financial Arrangements*

SC-9.11.A Delete Paragraph in its entirety.

9.12 Safety Programs

SC-9.12.A Insert "in writing" to the end of the Paragraph.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site, **will act as directed by and under the supervision of the Engineer, and will confer with Engineer regarding RPR's actions**. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

3. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.

4. *Liaison*

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a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

5. *Review of Work; Defective Work*

a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

b. Observe whether any Work in place appears to be defective.

c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

6. *Interpretation of Contract Documents*: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by or approved by Owner.

7. *Shop Drawings and Samples:*

a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

8. *Modifications*: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by or approved by Owner.

9. *Review of Work and Rejection of Defective Work:*

a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

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10. *Inspections, Tests, and System Start-ups:*

    a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

    b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

11. *Records:*

    a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

    b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

    c. Maintain records for use in preparing Project documentation.

12. *Reports:*

    a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

    b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

    c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

13. *Payment Requests*: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

14. *Certificates, Operation and Maintenance Manuals*: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

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15. *Completion:*

    a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

    b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

    c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

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

SC-10.06 Rename Section "Engineer Recommendations".

SC-10.06.A Delete Paragraph in its entirety and replace with:

Engineer will render recommendations as noted throughout the Contract Documents.

10.07 Limitations on Engineer's Authority and Responsibilities

SC-10.07.A Add the following sentence to the end of paragraph:

This provision shall apply to Engineer's authority or responsibility to Contractor, and such authority and responsibilities and decisions impacting Owner shall not be affected by this Paragraph 10.07.

SC-10.07.B Add the following sentence to the end of paragraph:

Engineer shall be responsible for reporting to Owner any failures of Contractor with respect to the Contract Documents of which Engineer becomes or should have become aware through reasonably diligent observation or inspection.

SC-10.07.D Remove the words "only" and "generally" from the first sentence.

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SC-10.07.D Add the following sentence to the end of the paragraph:

To the extent that Engineer is able to or should be able to discern any error or omission in the exercise of its professional standard of care, Engineer will be responsible for any failure to fulfill this obligation to Owner.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

SC-11.01.A Restate the sentence to read:

The Contract Documents may be amended or supplemented by a Change Order.

SC-11.01.B Delete paragraph in its entirety.

SC-11.01.C Delete paragraph in its entirety.

11.02 *Change Orders*

SC-11.02.A Delete sentence and replace with following:

Owner, Contractor and Funding Agency, may execute appropriate Change Orders covering:

SC-11.02.C Add new paragraph immediately after Paragraph 11.02.B:

C. The Engineer or Owner shall contact the Funding Agency for concurrence on each Change Order prior to issuance. All Contract Change Orders must be concurred on (signed) by Funding Agency before they are effective.

11.03 Work Change Directives

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 Funding 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 Funding Agency.

11.05 Owner-Authorized Changes in the Work

SC-11.05.B Add the following at the end of this paragraph:

For Owner-authorized changes in the Work, the Contractor will provide the Manufacturer's Certification(s) for materials subject to Build America Buy America requirements.

11.07 *Change of Contract Price*

SC-11.07.A Delete Paragraph in its entirety and insert the following language in lieu thereof:

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A. The Contract Price may only be changed by Change Order. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to Engineer promptly (but in no event later than twenty (20) days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. If such claim is made in connection with an extension of the Contract Time, such notice shall be in addition to the notice required under Paragraph 12.01. On or before the fifth day of the month succeeding that in which he has provided such notice, Contractor shall provide Owner and Engineer with an itemized statement of the details and amount of such claim and a written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the claimant is entitled as a result of the occurrence of said event. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 12.01.A.

SC-11.07.B.2 Delete paragraph in its entirety and replace with:

2. Where the Work is not covered by unit prices contained in the Contract Bid, the cost of the Work shall be determined on a time and material basis, plus a Contractor's fee for overhead and profit. Said Contractor's fee shall be determined as follows:

   a. For Work performed by the General Contractor, the Contractor's overhead and profit fee shall be 10%.

   b. For Work performed by a subcontractor, the subcontractor's overhead and profit fee shall be 10% and the General Contractor's fee shall be 5%.

SC-11.07.B.3 Delete section in its entirety.

SC-11.07.C Delete section in its entirety.

11.09 *Change Proposals*

SC-11.09.C Replace this section in its entirety with the following:

Owner will consider Engineer's recommendation in its decision, but Owner shall make the final decision with respect to any Change Proposal. Owner's decision will be final and binding unless the Contractor appeals the decision by filing a Claim under Article 12.

11.10 *Notification to Surety*

SC-11.10.A Add the following to the end of the paragraph:

If Contractor does not give this notice, Contractor will be solely responsible for any damages or losses to Owner resulting from said failure to give notice. Owner may apply a set-off against any funds owed to Contractor to collect such damages or losses and shall be permitted to bring suit if Contractor fails to reimburse Owner for any amounts owed.

ARTICLE 12—CLAIMS

12.01 *Claims*

SC 12.01.A.1 Delete the sentence and replace with:

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Appeals by Contractor of Owner's decisions regarding Change Proposals;

SC 12.01.A.3 Delete sentence in its entirety.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

13.01 *Cost of the Work*

SC 13.01.B.1 Insert "in writing" to the end of the last sentence in the paragraph.

SC 13.01B.4 Add to the end of the sentence "and previously authorized to be retained in writing by Owner in writing".

13.02 *Allowances*

SC-13.02.C Delete paragraph in its entirety.

13.03 *Unit Price Work*

SC 13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

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 extended price of a particular item of Unit Price Work amounts to 20 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent 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

14.03 *Defective Work*

SC-14.03.B Delete the existing sentence with the following:

The Engineer has the authority to make recommendations to Owner whether Work is defective, and Owner may then reject defective Work.

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14.04 *Acceptance of Defective Work*

SC-14.04.A Add the following sentence to the end of the paragraph:

In addition, Owner may require Contractor to provide a bond or other security in a form acceptable to Owner prior to acceptance of any defective Work.

14.05 *Uncovering Work*

SC-14.05.A In the first sentence, remove "has the authority" and replace with "may recommend to Owner".

SC-14.05.C Insert "and Owner concurs with Engineer's recommendation," after "or tested by others" in the first sentence.

14.08 *Punch List Work*

SC-14.08.A Add the following paragraph to New Section 14.08:

In addition to Corrective Work or repair of Defective Work, the Owner shall exercise the rights and remedies described in Paragraphs 14.07 for Punch-List Work items that are not completed within the time period stipulated in the Punch-List.

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.6 Add new paragraph immediately after Paragraph 15.01.B.5:

6. By submitting an Application for Payment based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials are compliant with Build America Buy America requirements. Manufacturer's Certification letter for materials satisfy this requirement. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

SC 15.01.C.2 Delete the phrase "to the best of Engineer's knowledge, information, and belief" from the first sentence.

SC-15.01.C.3.b- After the phrase "between the parties", insert "unrelated to the portion of the Work under review".

SC-15.01.C.4 Delete the first sentence and replace with the following:

Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of or Owner's payment of any payment, including final payment, will impose responsibility on Engineer or Owner.

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

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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. In the event the 30th day is a weekend or City holiday; payment can be expected on the previous workday. Upon receipt of the check, Owner will notify the Contractor by telephone that the check is ready for pickup or delivery.

SC-15.01.E.2 Delete the word "immediate" from the first sentence.

SC-15.02.A Amend paragraph by striking out the following text: "7 days after" and insert "no later than the subsequent Application for Payment submission."

15.03 *Substantial Completion*

SC-15.03.A Modify by adding the following after the last sentence:

Contractor shall also submit the General (Prime) Contractor's Certification of Compliance certifying that to the best of the Contractor's knowledge and belief all substitutes, equals, and all Iron and Steel products proposed in the Shop Drawings, Change Orders, and Partial Payment Estimates, and those installed for the Project, are either Produced in the United States or are the subject of an approved waiver under Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.

SC-15.03.B 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.

15.06 *Final Payment*

SC 15.06.A.2 Add new subsection f.:

f. Satisfactory evidence that all subcontractors have been paid, except for any payment subject to dispute, in which case Owner may withhold 150% of amount withheld by Contractor in its dispute with subcontractor.

SC 15.06.D Insert "and Owner's agreement to final payment" after "Engineer's written recommendation".

SC 15.06.E Insert "to the extent Owner agrees with said amount" after "the amount recommended by Engineer,".

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.04 *Contractor May Stop Work or Terminate*

SC-16.04.A Delete item 2 within the paragraph.

SC-16.04.A Change "30 days" to "60 days" in item A.3.

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ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

17.01 *Methods and Procedures*

SC-17.01 Add the following new section after 17.01.B:

C. If the parties cannot reach an agreement in response to a dispute, the parties may pursue any remedy available under law or equity. No additional action or notice shall be required by this Contract.

ARTICLE 18—MISCELLANEOUS

18.08 *Assignment of Contract*

ARTICLE 19—SC-19 ADD ARTICLE 19 TITLED "FEDERAL REQUIREMENTS"

SC-19.01 Add the following language as Paragraph 19.01 with the title "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.

SC19.02 Add the following sections after 19.01 with the title "Contract Approval":

A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Attachment GC-A) before Owner submits the executed Contract Documents to Agencies for approval.

B. Concurrence by Agency in the award of the Contract is required before the Contract is effective

SC-19.03 Add the following language after Article 19.02B with the title "Conflict of Interest":

A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans 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 in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

SC-19.04 Add the following language after Article 19.03.A with the title "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

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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.

SC-19.05 Add the following language after Article 19.04.B with the title "Audit and Access to Records."

A. Owner, Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Engineer which are pertinent to the Agreement, for the purpose of making audits, examinations, excerpts, and transcriptions. Engineer shall maintain all required records for three years after final payment is made and all other pending matters are closed.

SC-19.06 Add the following language after Article 19.05.A with the title "Small, Minority and Women's Businesses."

A. If Contractor intends to let any subcontracts for a portion of the work, 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. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

SC-19.07 Add the following after Article 19.06.A with the title "Anti-Kickback."

A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) 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

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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.

SC-19.08 Add the following after Article 19.07.A with the title "Clean Air and Pollution Control Acts."

A. If this Contract exceeds $100,000, Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h) and 42 USC 7401et. seq.), section 508 of the Clean Water Act (33 U.S.C. 1368) and Federal Water Pollution Control Act (33 USC 1251 et seq.), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15) is required. Contractor will report violations to the Agency and the Regional Office of the EPA.

SC-19.09 Add the following after Article 19.08 with the title "State Energy Policy."

A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

SC-19.10 Add the following after Article 19.09 with the title "Equal Opportunity Requirements."

A. If this Contract exceeds $10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and 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 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.

C. 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; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

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SC-19.11 Add the following after Article 19.10.C with the title "Restrictions on Lobbying."

A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed $100,000 at any tier under a Federal loan that exceeds $150,000 or a Federal grant that exceeds $100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. 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, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

SC-19.12 Add the following after Article 19.11.A with the title "Environmental Requirements."

When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:

A. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.

B. 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 delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.

C. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported 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 State Historic Preservation Officer (SHPO).

D. 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.

E. Mitigation Measures – If the project had an Environmental Report, Environmental Assessment, or Environmental Impact Statement to meet the requirements of the National Environmental Policy Act, compliance with the mitigation measures, if any, in that document are hereby included as a condition of this contract.

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SC-19.13 Add the following after Article 19.12.E with the title "Davis-Bacon Act and Related Acts." 40 U.S.C. 3141-3148; 29 C.F.R. Part 3 & 5

By accepting this contract, the contractor acknowledges and agrees to the terms provided in the DBRA Requirements for Contractors and Subcontractors Under EPA Grants: (https://www.epa.gov/grants/contract-provisions-davis-bacon-and-related-acts).

Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $2,000awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and3146-3148) as supplemented by Department of Labor regulations (29 C.F.R. Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 C.F.R. Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States").The Act provides that each contractor or sub-contractors must 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 he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

- **EPA's Davis-Bacon and Related Acts website is available here.**
- **EPA grant recipients, subrecipients, prime contractors, and subcontractors must include the link to the Contract Provisions for Davis-Bacon and Related Acts in all contracts that are subject to DBRA requirements. In addition, EPA recipients and subrecipients must include the link to DBRA Requirements for EPA Subrecipients in all EPA subawards that are subject to DBRA requirements.**
- **More information about when Davis-Bacon applies to CDS grants is available in the Community Grants implementation guidance and programmatic T&Cs. Determining whether Davis-Bacon requirements are triggered can be complex, so consult ORC/OGC as appropriate.**

SC-19.14 Add the following after Article 19.13 with the title "Discrimination (Rehab Act of 73)." P.L. 93-112, STAT 355; REHABILITATION ACT OF 1973 AND AGE DISCRIMINATION ACT OF 1975

The contractor and any subcontractors shall not on the grounds of race, color, national origin, or sex, exclude from participation in, deny the benefits of, or subject to discrimination any person under any program or activity funded in whole or in part with Federal funds. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975, or with respect to an otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1073 shall also apply to any such program or activity. The contractor shall carry out applicable requirements of 40 C.F.R. Part33 in the award and administration of contracts awarded under EPA financial assistance agreements.

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Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

SC-19.15 Add the following after Article 19.14 with the title "Drug-free Workplace Act."
41 U.S.C.81

For every contract over $10,000 the contractor must maintain a drug-free workplace. During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontractor purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor in accordance with this chapter, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

SC-19.16 Add the following after Article 19.15 with the title "Federal Cross-Cutting Requirements."
40 C.F.R. Part 35.3145 & 35.3575

Contractor must comply with federal cross-cutting requirements as well as other applicable federal laws as provided in EPA's Community Grants Program Final Implementation Guidance.

SC-19.17 Add the following after Article 19.16 with the title "Inventions."
37 C.F.R. Part 401

If the Federal award meets the definition of "funding agreement" under 37C.F.R. Part §401.2 (a) and the contractor or sub-contractor wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the contractor must comply with the requirements of 37 C.F.R. Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

SC-19.18 Add the following after Article 19.17 with the title "Nonsegregated Facilities."
41 C.F.R. Part 60-1.8

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

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SC-19.19 Add the following after Article 19.18 with the title "Signage."

(If the recipient has decided to pick the physical sign option of the grant's Signage Term and Condition)The Contractor is required to place a physical sign displaying the EPA logo at the construction site for this project in an easily visible location that can be directly linked to the work taking place. The sign must be maintained in good condition throughout the construction period. In cases where the construction site covers a large area (e.g., lead service line replacement or septic tank repair/replacement projects), a sign should be placed in an easily visible location near where the work is being performed(e.g., entrance to the neighborhood, along a main road through town, etc.). Signage costs are considered an allowable grant expense, provided the costs associated with the signage are reasonable. Additionally, to increase public awareness of projects serving communities where English is not the predominant language, assistance contractors are encouraged to translate the language on signs (excluding the EPA logo or seal) into the appropriate non-English language(s).The costs of such translation are allowable grant expenses, provided the costs are reasonable.

Procuring Signs: Consistent with Section 6002 of RCRA, 42 U.S.C. 6962, and 2 C.F.R. 200.323, contractors are encouraged to use recycled or recovered materials when procuring signs.

EPA Logo: The contractor will ensure that signage displays the EPA logo. The EPA logo must not be displayed in a manner that implies that EPA itself is conducting the project. Instead, the EPA logo must be accompanied with a statement indicating that the contractor received financial assistance from EPA for the project.

The contractor will ensure compliance with the sign specifications provided by the EPA Office of Public Affairs (OPA) available at: https://www.epa.gov/grants/epa-logo-seal-specifications-signage-produced-epa-assistance-agreement-recipients. As provided in the sign specifications from OPA, the EPA logo is the preferred identifier for assistance agreement projects and use of the EPA seal requires prior approval from the EPA. To obtain the appropriate EPA logo or seal graphic file, the contractor should send a request directly to Londa Scott-Forte (scott-forte.londa@epa.gov) (202-564-1504) and Jini Ryan (ryan.jini@epa.gov) (202-564-1075).Please explain in the message that the EPA logo is to be used on signage at a construction site funded with EPA assistance and copy the EPA Project Officer on the message.

SC-19.20 Add the following after Article 19.19 with the title "Small Unmanned Aircraft Systems."
14 C.F.R. Part 107; a.k.a., DRONES, PURCHASES AND OPERATION COSTS

1. **If needed, contractors may use small, unmanned aircraft systems (UAS) as defined at 14 C.F.R. Part 107.3. Contractors must have prior approval of costs and tasks before purchasing, leasing, or otherwise using UAS on the project.**
2. **The Contractor agrees to abide by all the Federal Aviation Administration (FAA) regulatory requirements of 14 C.F.R. Part 107 including registration, certification, and training of small UAS. This includes but is not limited to contractor complete small UAS operator training at a FAA approved Airman Knowledge Testing Center, complete remote pilot certification (FAA Airman Certificate and/or Rating Application Form 8710-13), and complete FAA UAS registration. The Contractor must provide copies of registration, certification, and training certificates to the Owner prior to operating UAS to ensure compliance with Federal funding agreements.**

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SC-19.21 Add the following after Article 19.20 with the title "American Iron and Steel (AIA)."
P. L. 113-76, STAT 436

Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in Section 436 that requires Owner to use iron and steel products that are produced in the United States (US) for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. Additional details and a description of AIS requirements are available on EPA's website at:

https://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement

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

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EXHIBIT A—SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	

Notes	
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.

Key	
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version **[number]** or later
DWG	Autodesk® AutoCAD .dwg format Version **[number]**
DOC	Microsoft® Word .docx format Version **[number]**
EXC	Microsoft® Excel .xls or .xml format Version **[number]**
DB	Microsoft® Access .mdb format Version **[number]**

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DIVISION 00 - BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 73 10

SUPPLEMENTARY FUNDING AGENCY CONDITIONS

- **WATER QUALITY STATE REVOLVING FUND**
- **BUILD AMERICAN BUY AMERICAN (BABA) REQUIREMENTS**

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REQUIREMENTS AND CONTRACT PROVISIONS FOR THE TREATMENT WORKS PROJECTS

FINANCED THROUGH THE MARYLAND WATER QUALITY REVOLVING LOAN FUND

AND THE MARYLAND DRINKING WATER REVOLVING LOAN FUND

DEPARTMENT OF THE ENVIRONMENT

STATE OF MARYLAND

The project or segment thereof to be constructed in accordance with these contract documents is subject to the following requirements. In the event of conflict with other requirements of the contract documents, the following requirements control unless the requirement is a minimum requirement. Nothing in this document shall be construed to prohibit the owner from requiring additional assurances, guarantees, indemnities, or other contractual requirements from any other party to this agreement.

I. ASSURANCES FOR COMPLIANCE WITH THE FOLLOWING FEDERAL AND STATE LAWS AND REGULATIONS:

1. NON-DISCRIMINATION IN EMPLOYMENT

2. DEBARMENT

3. ANTI-KICKBACK

4. CONTRACT WORK HOURS AND SAFETY STANDARDS.

5. COMPLIANCE WITH CFR 40 247– 254 (RCRA - SECTION 6002)

6. COMPLIANCE WITH PREVAILING FEDERAL WAGE RATES UNDER THE DAVIS-BACON AND RELATED ACTS IN ACCORDANCE TO SECTION VI OF THIS DOCUMENT

7. MARYLAND ANTIDEGRADATION IMPLEMENTATION PROCEDURES

8. COMPLIANCE WITH BUILD AMERICA, BUY AMERICA (BABA) ACT

9. PROHIBITION ON CERTAIN TELECOMMUNICATION AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT (2 CFR 200.216)

II. DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION

- **GUIDANCE DOCUMENTS AND FORMS**
  (Performance of the good faith steps <u>are</u> required, regardless of goal achievement. All information is to be submitted to the owner, <u>prior</u> to the owner's <u>award</u> of the contract, <u>UNLESS OTHERWISE DIRECTED BY THE OWNER).</u>

III. PRESIDENTIAL DOCUMENTS

- **ATTACHMENT II**

  EXECUTIVE ORDER 13202 of February 17, 2001

  EXECUTIVE ORDER 13208 of April 8, 2001

IV. SEVERABILITY

V. PROJECT SIGNS

VI. FEDERAL WAGE RATE REQUIREMENTS UNDER THE DAVIS-BACON AND RELATED ACTS

I. ASSURANCES

The contractor is required to comply with the Federal laws and regulations in regard to non-discrimination in employment, debarment, anti-kickback, contract work hours and safety standards, and prevailing Federal wage rates under the Davis-Bacon and related acts as delineated below.

1. Non-discrimination in Employment:

The contractor is required to comply with Executive Order 11246 of September 24, 1965 entitled "Equal Employment Opportunity" as amended by Executive Order 11375 of October 13, 1967.

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

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

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

The contractor must be prepared to comply in all respects with the Contract Provisions regarding non-discrimination, as stipulated under the Labor Standards.

2. Debarment:

Under Executive Order 12549, an individual or organization debarred from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a sub-agreement thereunder for $25,000 or more.

Therefore, the bidder as an individual or as an organization, presently debarred, suspended, proposed for debarment, will be declared ineligible to participate in bidding the proposed contract as a prospective recipient of financial assistance from the Maryland Department of the Environment.

The contractor shall not enter into any sub-contract with any individual, firm or organization debarred from Government contracts pursuant to Executive Order 11246.

3. Anti-kickback:

The contractor and/or its sub-contractors shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874). Any evident illicit kickback practice in any shapes or forms will cause termination of the contract.

4. Contract Work Hours and Safety Standards:

The contractor and/or its sub-contractors shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330).

5. Compliance with 40 CFR: 247– 254 (RCRA - Section 6002):

The contractor shall comply with the guidelines contained in 40 CFR 247– 254 (Section 6002 of the Resource Conservation and Recovery Act).

State and local recipients and sub-recipients of grants, loans, cooperative agreements or other instruments funded by appropriated Federal funds shall give preference in procurement programs to the purchase of recycled products pursuant to the EPA guidelines.

6. Compliance with Prevailing Federal Wage Rates under the Davis-Bacon and Related Acts in accordance to Section VI of this document.

All laborers and mechanics employed by contractors and sub-contractors on projects funded directly by or assisted in whole or in part by and through the Federal Government programs including the State Revolving Loan fund shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code. With respect to the labor standards

specified in this section, the Secretary of Labor shall have the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (64 Stat. 1267; 5 U.S.C.App.) and section 3145 of title 40, United States Code. Most recent Federal prevailing wages can be obtained from: https://sam.gov/content/wage-determinations

The prevailing wage determination category that should be used for this project is Heavy Construction (including water and sewer). This determination is based on the Federal Department of Labor Wage and Hour Division classification.

7. Maryland Antidegradation Implementation Procedures:

The Clean Water Act requires three components to water quality standards that set goals for and protect each States' waters. The three components are: (1) designated uses that set goals for each water body (e.g., recreational use), (2) criteria that set the minimum conditions to support the use (e.g., bacterial concentrations below certain concentrations) and (3) an antidegradation policy that maintains high quality waters so they are not allowed to degrade to meet only the minimum standards. The designated uses and criteria set the minimum standards for Tier I.

Maryland's antidegradation policy has been promulgated in three regulations: COMAR 26.08.02.04 sets out the policy itself, COMAR 26.08.02.04-1, provides for identification and implementation of Tier II (high quality waters) of the antidegradation policy, and COMAR 26.08.02.04-2 that describes Tier III (Outstanding National Resource Waters or ONRW), the highest quality waters. No Tier III waters have been designated at this time. Any capital funding project occurring within Tier II catchment areas, which are areas that drain to Maryland's high quality designated Tier II stream segments, must undergo Antidegradation Review.

To determine if your project is located within Tier II catchment area, please contact Ms. Angel Valdez of MDE Environmental Standards and Assessment Program, at (410) 537-3606, or at angel.valdez@maryland.gov.

Please be aware that projects subject to an Antidegradation or Tier II review must adequately address comments that arise during the review before funding can be granted.

How Tier II Stream Segments are Designated

- **Currently high quality stream segments are designated for the characteristic of biology using Maryland Biological Stream Survey (or comparable) data**
- **Streams are recorded in Table O (COMAR 26.08.02.04-1) and the pending list of streams awaiting promulgation or corrections is maintained on the MDE website.**

The Basic Antidegradation Review Process

Many of the projects funded by the Water Infrastructure Financing Administration (WIFA) at MDE result in a net improvement to water quality. As a result, the antidegradation review process for WIFA generally involves making sure that any land disturbance activities associated with the project includes additional controls. Any other antidegradation reviews specific to project discharges (e.g. end-of-pipe) will be addressed separately through the permitting process.

To help expedite the review process the following list of practices has been provided. These practices include "accelerated stabilization, redundant controls, increased riparian buffers, passive or active chemical treatment, or a reduction in the size of the grading unit" as stated in the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control to address Tier II issues. All practices implemented should be evident in plans. When using the list below to aide in planning keep in mind that application and site specifics will ultimately determine each recommendation's applicability. Also realize that this list is not exhaustive and additional practices may be identified as specific plans become available.

- **Initial Considerations: including limiting vegetative disturbances, phasing and/or sequencing, accelerated stabilization, minimum weekly inspections, and timing of in-stream work to low flow periods or clear weather forecasts**

- **Expanded Riparian Buffers (for new structures/expansions only): from 100 to 230 feet, depending upon slope and soil composition, on all intermittent and perennial streams within project footprint to help further address direct hydrologic impacts to surface waters. See Table 1 for more details.**

Table 1

Adjusted Average Optimal Buffer Width Key for HQ Waters (minimum width 100 feet)				
	Slopes (%)			
Hydrologic Soil Group	0-5%	5-15%	15-25%	>25%
Ab	100	130	160	190
C	120	150	180	210
D	140	170	200	230

- **Streamside Management Zones (buffer areas for utility projects): where disturbance and work cannot be avoided, utilize minimally disturbing & selective vegetative clearing methods, restorative planting (not seeding) for major near-stream clearings totaling 1 acre or more, no mulch placement within the streamside management zones, if possible allow small shrub growth**

- **Enhanced Buffer Management: including sheetflow of discharge beyond the minimum 100 foot vegetative buffer or implementing redundant mechanisms in dewatering exercises such as devices in manifold, use of chemical filtration aides, combining two practices such as filter bags with vegetated buffers and silt fencing. Also incorporation of super silt fencing or an equivalent practice when working near streams.**

- **Enhanced Temporary Access Waterways Crossings: including utilizing horizontal directional drilling/jack and bore for all major stream crossings or sensitive crossings, including a frac-out plan; preferential use of partial diversions (where possible); and utilization of temporary access bridges over fords.**

- **Special Concern- pH and Water Quality: For all activities related to in-stream grout placement, either in bags or as fill:**

  1. **To prevent impacts to in-stream pH, such operations should occur "in-the-dry".**
  2. **An emergency treatment plan should be in place to address accidental material releases.**
  3. **Cure time allotted should reflect chemically stable grout material and should also represent the most conservative time in the expected cure range.**
  4. **The water quality standard numeric criteria for pH must be met in the 'first flush' before diversion is removed.**

- **Stormwater Management: follow the current guidelines within the Maryland Stormwater Design Manual (2009 Revised), including ESD to the MEP or other non-structural practices**

8. COMPLIANCE WITH BUILD AMERICA, BUY AMERICA (BABA) ACT

None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public drinking water system or water quality unless all of the *iron, steel, manufactured products, and construction materials* used in the project are produced in the United States (Build America, Buy America (BABA) Act, P.L. 117-58, Secs 70911 - 70917).

The Act requires the following Buy America preference:

(1) All iron and steel used in the project are produced in the United States. This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

(2) All manufactured products used in the project are produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation.

(3) All construction materials are manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States. The "construction materials" include an article, material, or supply other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that is or consists primarily of:
- **non-ferrous metals;**
- **plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);**
- **glass (including optic glass);**
- **lumber; or**
- **drywall.**

To provide clarity to item, product, and material manufacturers and processers, we note that items that consist of two or more of the listed materials that have been combined together through a manufacturing process, and items that include at least one of the listed materials combined with a material that is not listed through a manufacturing process, should be treated as manufactured products, rather than as construction materials. For example, a plastic framed sliding window should be treated as a manufactured product while plate glass should be treated as a construction material.

Certification Process:

The final manufacturer that delivers the iron, steel, manufactured products, or construction materials to worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. The certification should include the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a responsible party.

Additional documentation such as Step Certification may be needed if the certification is lacking important information. A Step Certification is a process under which each handler (supplier, fabricator, manufacturer, processor, etc) of the iron, steel, manufactured products, and construction materials certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin.

Waiver:

A request for waiver may be submitted to MDE. Pursuant to Section 70914(c) of the BABA Act, a waiver may be considered under one of the following categories:

1. **Applying the domestic content procurement preference would be inconsistent with the public interest (a "public interest waiver");**
2. **Types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality (a "nonavailability waiver"); or**

3. **Inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent (an "unreasonable cost waiver").**

MDE may agree with the waiver request and submit it to the Administrator of the Environmental Protection Agency for final approval. Alternatively, MDE may, in its sole discretion, reject the waiver request and elect not to fund the project.

De Minimis Nationwide Waiver:

A De Minimis Nationwide Waiver was issued by EPA, on October 21, 2022, waiving Build America, Buy America requirements for products used in and incorporated into a project that cumulatively comprise no more than five percent of the total project cost.

To be covered under this waiver, the grant/loan recipient must, in consultation with the contractor, take the following actions:

1. **Retain relevant documentation (i.e. invoices) as to those items being covered under this waiver in their project files.**

2. **Summarize in reports to MDE the types and/or categories of items to which this waiver is applied, including the cost of each category/type. The report must also include the total cost of items covered by the waiver (including installation cost), the total project cost, and the percentage of covered items calculated by cost.**

3. **Upon the receipt of the report, MDE, within 30 calendar day of receipt, will accept and file the report, request additional information, or advise the grant/loan recipient that the items cannot be covered under this waiver and a project specific waiver is needed.**

4. **If no comments are received by MDE within 30 calendar days, the grant/loan recipient would not need to take any further action, unless more items need to be covered, at which time cumulative summary would need to be submitted to MDE.**

9. **Borrower agrees to comply with 2 CFR 200.216, which requires that EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).**

Within seven (7) days of the bid opening, the apparent low bidder shall sign the form of "Assurances for Compliance with Federal Laws and Regulations" pertaining to non-discrimination in employment, debarment, anti-kickback, contract work hours and safety, compliance with prevailing Federal wage rates under the Davis-Bacon and related acts, Maryland Antidegradation Implementation Procedures, and compliance with Build America, Buy America (BABA) Act. The form is appended herewith in Section I.

ASSURANCES FOR COMPLIANCE WITH FEDERAL LAWS AND REGULATIONS

FOR WATER QUALITY-TREATMENT WORKS AND DRINKING WATER PROJECT

Project Name: _____ Contract No. (if applicable): _____

The contractor is required to comply with the following Federal laws and regulations:

1. **Non-discrimination in Employment in accordance with Executive Order 11246 of September 24, 1965 entitled "Equal Employment Opportunity" as amended by Executive Order 11375 of October 13, 1967.**

2. **Debarment in accordance with the Executive Order 12549 and Executive Order 11246.**

3. **Anti-kickback in accordance with the Copeland "Anti-Kickback" Act (18 U.S.C. 874).**

4. **Contract Work Hours and Safety Standards in accordance with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330).**

5. **Compliance with Guidelines Contained in 40 CFR 247-254 (RCRA - Section 6002).**

6. **The prevailing Federal wage rates as determined by the U.S. Department of Labor under the Davis-Bacon and related acts. The prevailing wage determination category that should be used for this project is Heavy Construction (including water and sewer). Available at: https://sam.gov/content/wage-determinations**

   General Decision Number: _____ Date: _____

7. **Maryland Antidegradation Implementation Procedures as promulgated in three regulations: COMAR 26.08.02.04 sets out the policy itself, COMAR 26.08.02.04-1, provides for identification and implementation of Tier II (high quality waters) of the antidegradation policy, and COMAR 26.08.02.04-2 that describes Tier III (Outstanding National Resource Waters or ONRW), the highest quality waters. No Tier III waters have been designated at this time.**

8. **Use of the iron, steel, manufactured products, and construction materials produced in the United States (Build America, Buy America (BABA) Act, P.L. 117-58, Secs 70911 - 70917).**

9. **2 CFR 200.216, which requires that EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).**

I do solemnly declare and affirm that I am obligated to comply with the above Federal laws and regulations. It is understood that non-compliance with any one of the above Federal laws and regulations will be sufficient reason to cause termination of the contract.

_____
Contractor

Signed by: _____ _____
Authorized Officer **Date**

_____ _____
Name (Print) **Title (Print)**

II. Maryland Department of the Environment
Maryland Water Quality & Drinking Water Revolving Loan Fund Programs
Disadvantaged Business Enterprise Program (DBE)
Guidance for Prime (Construction & A/E) Contractors

The Maryland Water Quality and Drinking Water Revolving Loan Fund Programs (RLF) receive federal funds from the U.S. Environmental Protection Agency (EPA). The funds are used to provide low interest rate loans to finance water quality and drinking water capital projects. As a condition of federal grant awards, EPA regulations require that loan recipients and sub-recipients (i.e., prime contractors and subcontractors) make a good-faith effort to award a fair share of work to DBEs who are small business enterprises (SBE's), minority business enterprises (MBE's) and women's business enterprises (WBE's). A/E service consultants who receive loan funds are also considered as prime contractors and must comply with DBE requirements. Additionally, EPA's DBE rule requires loan recipients and sub-recipients to adhere to the terms and conditions in Appendix A attached hereto.

To ensure compliance with EPA DBE requirements, the MWQFA has developed guidance for both Loan Recipients and Prime Contractors (sub-recipients) to undertake certain good faith efforts to provide opportunities for DBE firms to participate in contracts. EPA regulations require evidence of the demonstration of the six good faith efforts in trying to achieve the DBE participation goals. MDE's negotiated DBE participation goals with EPA have been approved as of February 6, 2019. The goals below are not a quota and apply to DBE participation only.

Procurement Category	*MBE Goal (%)*	*WBE Goal (%)*
Construction	22	16
Equipment	23	11
Services	25	18
Supplies	23	11

Good Faith Efforts: The following good faith efforts apply to the procurement categories involving EPA financial assistance funds (See Appendix B: EPA Good Faith Efforts):

Step 1: Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities by placing qualified DBEs on solicitation lists whenever they are potential sources.

Step 2: Establishing delivery schedules, where the requirement permits to encourage participation by DBEs. The prime contractor should allow a 30-day minimum advertising period for bidding.

Step 3: Dividing total requirements, when economically feasible, into small tasks or quantities, to permit maximum participation of DBEs.

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

Step 5: Using the services and assistance of the Maryland Department of Social and Economic Mobility (DOSEM), the United States Small Business Administration (SBA) and the Minority Business Development Agency (MBDA) of the U.S. Department of Commerce (See Appendix C).

Step 6: Require each sub-contractor, if subcontracts are to be let, to take the steps 1- 5.

Please submit all information to:
DBE Coordinator, MWIFA
1800 Washington Blvd., Baltimore MD 21230
Phone: 410-537-3146, FAX: 410-537-3968
https://mde.maryland.gov/programs/water/WQFA/Pages/mwbe.aspx

Disadvantaged Business Enterprise Program (DBE)

Guidance for Prime (Construction & A/E) Contractors

Demonstration of the Six Good Faith Efforts. See **Appendices A & B** for additional bidding instructions and contract administrative provisions.

A: Prime contractors are required to undertake good faith efforts. Steps 1 & 5 can be attained by developing a bidders list of qualified DBE firms that can bid as sub-contractors. The prime contractors should advertise in minority, local and regional newspapers and obtain a bidders list from the loan recipient to supplement their list. The bidders list used during sub-contractor solicitation must be available throughout the project's construction period.

In developing bidders list of qualified DBE firms for participation as sub-contractors in construction, equipment, services, and supplies, the prime contractors should contact and gather information from different resources **(See Appendix C)** such as:

- Loan Recipient
- U.S. Small Business Administration (US-SBA)
- Minority Business Development Agency (MBDA) of the US Department of Commerce
- Maryland Department of Social and Economic Mobility (DOSEM)

The DBE bidders lists may be classified with Standard Industrial Classification (SIC) or NAICS codes, should be updated periodically, and should be made available to sub-contractors to solicit additional sub-contractors, if necessary. **The prime contractor is required to keep the bidders list throughout the project's construction period.**

B: Prime contractors are also required to undertake good faith efforts. Steps 2, 3, & 4, can be utilized during the project planning, design and/or pre-bidding phase, to assure that qualified DBE firms have procurement opportunities in construction, equipment, services, and supplies.

To provide procurement opportunities to DBE firms, the Prime Contractor should undertake the following:

- Conduct pre-bid meetings to inform potential bidders/contractors about DBE requirements and provide guidance in undertaking the required good faith efforts.
- Use the bidders list developed in Item A (above) to solicit DBE firms as sub contractors.
- Invite DBE firms, where appropriate, to meetings, conferences, etc., to inform them of procurement opportunities and develop, where possible, reasonable contract and delivery schedules that encourage and facilitate participation by DBEs.
- Determine if a project can be broken down into smaller components/contracts to allow opportunity for DBE firms to bid as sub-contractors.
- For projects broken down into smaller components (e.g., painting, roofing, excavation, pipe laying, etc.) ensure that the delivery schedules are reasonable.
- Encourage DBE firms, where appropriate, to apply as a consortium, or as part of a consortium of DBEs, when a contract is too large for one of these firms to handle individually.

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Boulevard, Suite 515 Baltimore MD 21230-1718
410-537-3119, 1-800-633-6101 https://mde.maryland.gov/programs/water/WQFA/Pages/mission_statement.aspx

Disadvantaged Business Enterprise (DBE) Good Faith Efforts Checklist
To be Completed by Loan Recipient

Project Name: _____

Procurement Category: Check box for all M/WBE procurement categories being reported under the above referenced project.
Construction ☐ Equipment ☐ Services ☐ Supplies ☐

For <u>each procurement action</u>, please answer the following questions

	A: Develop Bidders List of DBE firms		
A1	Did you develop a Bidders List of DBE firms?	Yes ☐	No ☐
A2	Did you advertise via eMMA, minority, local/regional papers or Dodge Report?	Yes ☐	No ☐
A3	Did you send invitation for bids to DBE trade associations?	Yes ☐	No ☐
A4	Did you contact US-SBA/MBDA/DOSEM?	Yes ☐	No ☐
A5	Did you provide Prime Contractors with Bidders List	Yes ☐	No ☐
A6	Did you provide MDE with Bidders List?	Yes ☐	No ☐
	B: Smaller work components and delivery schedules		
B1	Did DBE firms have opportunities to bid as prime contractors?	Yes ☐	No ☐
B2	Did you break down the project, where economically feasible, into smaller components?		
	○ For DBE firms to bid as prime contactor	Yes ☐	No ☐
	○ For DBE firms to bid as sub-contactors	Yes ☐	No ☐
B3	Do project components have reasonable delivery schedules?	Yes ☐	No ☐
B4	Did you allow a reasonable time for DBEs to bid (e.g., min. of 30 days)?	Yes ☐	No ☐
B5	Did you encourage DBEs to bid as a consortium due to project size?	Yes ☐	No ☐
	C: Require prime contractor to Undertake Good Faith Efforts		
C1	Did you include the "MDE Insert" in the bidding documents?	Yes ☐	No ☐
C2	Did you require the prime contractors to apply the good faith efforts?	Yes ☐	No ☐
C3	Is DBE a "responsiveness" criteria in bid documents?	Yes ☐	No ☐
	D: Solicitation Summary of DBE firms *(Use Attachment 1 for each prime contract)*		
D1	Did you use the Bidders List to solicit prime contractors?	Yes ☐	No ☐
D2	Did DBE firms bid as prime contractors?	Yes ☐	No ☐
D3	Did you select any DBE firms as prime contractor?	Yes ☐	No ☐
D4	Is the prime contractor using any subcontractors?	Yes ☐	No ☐

Loan recipient must also complete Attachment 1 and have prime contractor list each DBE subcontractor on WIFA 6100 Form. In addition, WIFA 6100 Form must be submitted with bid proposal after completion by prime contractor.

Supporting Documentation

In support of the actions taken in items A, B, C and D (above), all borrowers and prime contractors must attach this checklist along with supporting documentation for "Yes" answers and an explanation for "No" answers. Examples of supporting documentation include: (i) Bidders List of DBE firms; (ii) list of sub-contract work elements possible under the prime contract; (iii) proof of contact with DBE firms as potential prime contractors (copies of invitations for bids/RFP, contact letters, faxes and telephone call sheets, etc.; (iv) copies of all procurement advertisements; and (v) list of all prime contractors that submitted bids/RFP.

_____ _____
Loan Recipient's Name and Title Loan Recipient Official's Signature/ Date

Contact Phone # _____

Attachment 1

MARYLAND DEPARTMENT OF THE ENVIRONMENT
SOLICITATION OF FIRMS
Loan Recipient must complete <u>one</u> form for each prime (construction & A/E) contract

Project Name: _____

Total Contract Amount (Prime Construction Contractor): $ _____

Please answer the following questions for each prime contract

Procurement Category: Check **<u>only one</u>** procurement category for each prime contract being reported under the above referenced project. **Construction ☐** **Equipment ☐** **Services ☐** **Supplies ☐**

Summary of Prime Contractors Solicited

1 Number of firms solicited (attach list/documentation): _____
2 Number of firms that responded (attach documentation): _____
3 Number of DBE firms that responded (attach documentation): _____

Details of Selected Firm

4 Name of Firm: _____

5 Address: _____

6 Contact Person (Name and Phone): _____

7 Total amount of Contract $ _____

8 Is the firm a Minority Business Enterprise? (MBE) Yes ☐ No ☐

9 Is the firm a Women Business Enterprise? (WBE) Yes ☐ No ☐

10 If the response to question 8 or 9 is **<u>Yes</u>,** please complete the following:

- M/WBE Certification Number: _____
- Certification Date: _____
- Expiration Date (if applicable): _____
- Certifying Agency: _____

Please submit all information to:
DBE Coordinator, MWIFA
1800 Washington Blvd., Baltimore MD 21230
Phone: 410-537-3146, FAX: 410-537-3968

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Boulevard Suite 515 Baltimore MD 21230-1718
410 537 3119 1-800-633-6101
https://mde.maryland.gov/programs/water/WQFA/Pages/mwbe.aspx

Disadvantaged Business Enterprise (DBE) Good Faith Efforts Checklist
To be completed by Prime (Construction & A/E) Contractor

Project Name: _____

Procurement Category: Check box for all M/WBE procurement categories being reported under the above referenced project. **Construction ☐** **Equipment ☐** **Services ☐** **Supplies ☐**

For <u>each procurement action</u>, please answer the following questions

A: Develop Bidders List of DBE firms

A1	Did you develop a Bidders List of DBE firms?	Yes ☐	No ☐
A2	Did you advertise via eMMA, minority, local/regional papers or Dodge Report?	Yes ☐	No ☐
A3	Did you send invitation for bids to DBE trade associations?	Yes ☐	No ☐
A4	Did you contact US-SBA/MBDA/DOSEM?	Yes ☐	No ☐
A5	Did you receive Bidders List from Loan Recipient?	Yes ☐	No ☐
A6	Did you provide MDE with Bidders List?	Yes ☐	No ☐

B: Smaller work components and delivery schedules

B1	Did DBE firms have opportunities to bid as subcontractors?	Yes ☐	No ☐
B2	Did you break down the project, where economically feasible, into smaller components for DBE firms to bid as subcontractors?	Yes ☐	No ☐
B3	Do project components have reasonable delivery schedules?	Yes ☐	No ☐
B4	Did you allow a reasonable time for DBEs to bid?	Yes ☐	No ☐
B5	Did you encourage DBEs to bid as a consortium due to project size?	Yes ☐	No ☐

C: Solicitation Summary of DBE firms *(Prime Contractor must fill WIFA 6100 Form)*

C1	Did you use the Bidders List to solicit subcontractors?	Yes ☐	No ☐
C2	Did DBE firms bid as subcontractors (provide list, work type, & price)?	Yes ☐	No ☐
C3	Did you select any DBE firms as subcontractor?	Yes ☐	No ☐
C4	Is the subcontractor using any additional subcontractors?	Yes ☐	No ☐

Prime contractor must provide to loan recipient: (1) list of ALL subcontractors (DBE and non-DBE) with type of work and estimated dollar amounts; (2) completed WIFA 6100 Form.

Supporting Documentation

In support of the actions taken in items A, B, and C, (above), all prime contractors must attach this checklist along with supporting documentation for "Yes" answers and an explanation for "No" answers. Examples of supporting documentation include: (i) Bidders List of DBE firms; (ii) list of sub-contract work elements possible under the prime contract; (iii) proof of contact with DBE firms as potential sub contractors (copies of invitations for bids/RFP, contact letters, faxes and telephone call sheets, etc.; (iv) copies of all procurement advertisements; and, (v) list of all sub contractors that submitted bids/RFP.

_____ _____
Prime Contractor's Name and Title Prime Contractor Official's Signature/ Date

Contact Phone # _____

Maryland Department of the Environment -- Water Infrastructure Financing Administration
Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form
(MDE WIFA 6100 Form)

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

PRIME CONTRACTOR NAME	PROJECT NAME
CONTACT NAME	CONTACT PHONE
ADDRESS	

Please list all DBE subcontractors you plan to utilize on this project. Use additional sheets as necessary.

SUBCONTRACTOR NAME	COMPANY ADDRESS	EST. DOLLAR AMOUNT TO BE SUBCONTRACTED	CURRENTLY DBE CERTIFIED? YES/NO

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

PRIME CONTRACTOR SIGNATURE	TITLE
PRINT FULL NAME	DATE

[1] A DBE is a Disadvantaged, Minority or Woman Business Enterprise that has been certified by any entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205.
[2] Subcontractor is defined as a company, firm, joint venture or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

APPENDIX A: EPA DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

EPA's Disadvantaged Business Enterprise Program rule applies to contract procurement actions funded in part by EPA assistance agreements awarded after May 27, 2008. The rule is found at Federal regulation Title 40, Part 33. Specific responsibilities are highlighted below.

Loan Recipient Responsibilities:

- Include MDE's DBE guidance in each contract with a primary contractor*, MDE, October 2008.*
- Employ the six Good Faith Efforts during prime contractor procurement (§ 33.301).
- Require prime contractor to comply with the following prime contractor requirements of Title 40 Part 33:
    a) To employ the six Good Faith Efforts steps in paragraphs (a) through (e) of § 33.301 if the prime contractor awards subcontracts (§ 33.301(f)).
    b) To pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient (§ 33.302(a)).
    c) To notify recipient in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor (§ 33.302(b)).
    d) To employ the six good faith efforts described in § 33.301 if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason. (§ 33.302(c)).
    e) To employ the six good faith efforts described in § 33.301 even if the prime contractor has achieved its fair share objectives under subpart D of Part 33. (§33.302(d)).
    f) Provide grant recipient DBE participation achievements with bid proposal
- Maintain records documenting its compliance with the requirements of Title 40 Part 33, including BIDDERS LIST and documentation of its, and its prime contractors', good faith efforts (§ 33.501(a)).

Prime Contractor Responsibilities:

- Employ the six Good Faith Efforts steps in paragraphs (a) through (e) of § 33.301 if the prime contractor awards subcontracts (§ 33.301(f)).
- Pay subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient (§ 33.302(a)).
- Notify the recipient in writing prior to prime contractor termination of a DBE subcontractor for convenience (§ 33.302(b)).
- Employ the six good faith efforts described in § 33.301 if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason. (§ 33.302(c)).

- Employ the six good faith efforts described in § 33.301 even if the prime contractor has achieved its fair share objectives under subpart D of Part 33. (§33.302(d)).
- Provide loan recipient DBE participation achievements with bid proposal: (1) list of ALL subcontractors (DBE and non-DBE) with type of work and estimated dollar amounts; (2) completed WIFA 6100 Form.
- Maintain records documenting its compliance with the requirements of Title 40 Part 33, including BIDDERS LIST documentation of its, and its prime contractors', good faith efforts (§ 33.501(a)).

APPENDIX B: TITLE 40 PART 33 SUBPART C—GOOD FAITH EFFORTS

§ 33.102 When do the requirements of this part apply?

The requirements of this part apply to procurement under EPA financial assistance agreements performed entirely within the United States, whether by a loan recipient or its prime contractor, for construction, equipment, services, and supplies.

§ 33.106 What assurances must EPA financial assistance recipients obtain from their contractors?

The recipient must ensure that each procurement contract it awards contains the term and condition specified in Appendix A to this part concerning compliance with the requirements of this part.

§ 33.206 Is there a list of certified MBEs and WBEs?

EPA OSDBU will maintain a list of certified MBEs and WBEs on EPA OSDBU's Home Page on the Internet. Any interested person may also obtain a copy of the list from EPA OSDBU. The Maryland Department of Social and Economic Mobility will also have a bidders list.

§ 33.301 What does this subpart require?

A recipient, including one exempted from applying the fair share objective requirements by § 33.411, is required to make the following good faith efforts whenever procuring construction, equipment, services and supplies under an EPA financial assistance agreement, even if it has achieved its fair share objectives under subpart D of this part:

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

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

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

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

(e) Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

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

§ 33.302 Are there any additional contract administration requirements?

(a) Loan recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient.

(b) Its prime contractor must notify loan recipient in writing prior to any termination of a DBE subcontractor for convenience by the prime contractor.

(c) If a DBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime contractor to employ the six good faith efforts described in § 33.301 if soliciting a replacement subcontractor.

(d) A recipient must require its prime contractor to employ the six good faith efforts described in § 33.301 even if the prime contractor has achieved its fair share objectives under subpart D of this part.

(e) A recipient must ensure that each procurement contract it awards contains the term and condition specified in the Appendix A concerning compliance with the requirements of this part. A recipient must also ensure that this term and condition is included in each procurement contract awarded by an entity receiving an identified loan under a financial assistance agreement to capitalize a revolving loan fund.

§ 33.410 Can a recipient be penalized for failing to meet its fair share objectives?

A recipient cannot be penalized, or treated by EPA as being in noncompliance with this subpart, solely because its MBE or WBE participation does not meet its applicable fair share objective. However, EPA may take remedial action under § 33.105 for a recipient's failure to comply with other provisions of this part, including, but not limited to, the good faith efforts requirements described in subpart C of this part.

Source: Federal Requirements and Contract Provisions for Special Appropriation Act Projects, US Environmental Protection Agency, Region III, June 2008

APPENDIX C: RESOURCE LISTING AND CONTACT INFORMATION FOR UTILIZATION OF MINORITY AND WOMEN'S BUSINESS ENTERPRISES

Resource Listing	Contact	Website if applicable
State of Maryland Governor's Office of Minority Affairs The mission of the Governor's Office of Minority Affairs (GOMA) is facilitating minority business enterprise activities through coordinating and promoting government programs aimed at strengthening and preserving the state's minority and women owned businesses.	Governor's Office of Minority Affairs Suite 1502 6 Saint Paul Street Baltimore MD 21202 767-8232 1-(877) 558-0998 f-(410) 333-7568 info@mdminoritybusiness.com	**http://www.oma.state.md.us/**
eMARYLAND MARKETPLACE ADVANTAGE The official online procurement tool for the state of Maryland.	Website	**https://emma.maryland.gov/page.aspx/en/usr/login?ReturnUrl=%2fpage.aspx%2fen%2fbuy%2fhomepage**
U.S. Small Business Administration (SBA) In addition to the national office, the SBA has local district and regional offices to assist small businesses in contracting with the public and private sector.	Website	**www.sba.gov/category/navigation-structure/contracting/working-with-government**
CCR/Pro-Net **is an extensive database that combines the SBA's Pro-Net database and the DOD's Central Contractor Registration database of small businesses.**	CCR Assistance Center 888-227-2423 269-961-5757 DSN: 661-5757	www.ccr.gov/ **Select "Dynamic Small Business**
U. S. Small Business Administration (SBA) - MD. District Office	City Crescent Bld. 6th Floor 10 South Howard St. Baltimore MD 21201 Phone: 410 962-6195	www.sba.gov/tools/local-assistance/districtoffices
Minority Business Development Administration (MBDA): The MBDA is an agency within the U.S. Dept. of Commerce, created to foster the development and growth of minority businesses in the U.S. and coordinates resources in the public and private sectors to help MBE's. Recipients and bidders should contact the centers and provide notices of contracting opportunities. Also, see the Phoenix database, which matches minority companies with business opportunities.	1401 Constitution Ave NW Washington, D.C. 20230 Email: support@mbda.gov 1.888.324.1551	www.mbda.gov/
Standard Industrial Classification Codes (SIC) **or North American Industry Classification System (NAICS) codes visit the website.**	Website	www.sba.gov/content/north-american-industry-classification-system-codes-and-small-business-size-standards

Maryland Department of Social and Economic Mobility (DOSEM) -- **Loan recipients and bidders may locate qualified M/WBE's through the MBE/WBE Directory.**	**Office Address** 100 Community Place, 4th Floor Crownsville, MD 21032	https://economicmobility.maryland.gov/Pages/default.aspx **https://marylandmdbe.gob2g.com/** Click on "Search Directory of Certified Firms." Select any combination of the fields to identify M/WBE's for the specific project opportunities.
U.S. EPA Office of Small, Disadvantaged Business Utilization (OSDBU) – **OSDBU's mission includes "fostering opportunities for partnerships, contracts, subagreements, and grants for small and socioeconomically disadvantaged concerns". One of the resources to assist prime contractors is a listing of small and disadvantaged businesses (a vendor profile system) registered with OSDBU.**	US.EPA Office of Small Programs 1200 Pennsylvania Avenue NW Mail Code 1230T Washington, D.C. 20460	**http://cfpub.epa.gov/sbvps/** http://www.epa.gov/osdbu/ **Select "search the OSDBU Registry"** Click on the search criteria of interest (ethnicity, size, SIC, etc.)
National Black Chamber of Commerce	1350 Connecticut Ave. N.W. Suite 405 Washington D.C. 20036 Phone: 202 466-6888 Fax: 202 466-4918	www.nationalbcc.org Email: info@nationalbcc.org
Virginia Hispanic Chamber of Commerce (Northern Va.)	8300 Boone Blvd., 4TH Floor Vienna, VA 22182 Phone: 804.378.4099 Fax: 703 893-1269	www.vahcc.com
U.S. Hispanic Chamber of Commerce	2175 K Street NW Suite 100 Washington, D.C. 20037	www.ushcc.com
National Association of Minority Contractors (NAMC)	666 11 Street N.W. Suite 520 Washington D.C. 20001 Phone: 202 347-8250	www.namcnational.org/
Maryland/Washington Minority Contractors (MWMCA)	1107 North Point Blvd, Suite 227 Baltimore, MD 21224 410.282.6101 410.282.6102 –fax	www.mwmca.org
National Association of Women's Business Owners (NAWBO) – National	1760 Old Meadow Rd. Ste 500 McLean VA 22102 Phone: 800.556.NAWBO 703.506.3268 703.506.3266-fax	www.nawbo.org

NAWBO Baltimore Regional Chapter	4404 Silverbrook Lane, Suite E-204 Owings Mills MD 21117 Phone: 410 876-0502 410.654.9734-fax	www.nawbomaryland.org Email: info@nawbomaryland.org
NAWBO Delaware Chapter	P.O. Box 4657 Greenville Station Greenville, DE 19807-4657 Phone: 302 355.9945	www.nawbodelaware.org Email: info@nawbodelaware.org
MD/DC Minority Supplier Development Council (MSDC)	10770 Columbia Pike Lower Level, Suite L100 Silver Spring MD 20901 Phone: 301 592-6710 Fax: 301 592-6704	http://mddccouncil.org/
National Minority Supplier Development Council, Inc. (NMSDC)	1040 Avenue of the Americas, 2nd Floor New York, New York 10018 Phone: 212 944-2430 212.719.9611-fax	www.nmsdcus.org/
UIDA Business Services is a Native American Procurement and Technical Assistance Center- maintains a comprehensive database of Native American owned firms	86 South Cobb Drive, MZ:0510 Marietta, GA 30063-0510 Phone, 770 494-0431 770.494.1236-fax or **Northeast Region** 2340 Dulles Corner Blvd Mail Stop: 1n01 Herndon, VA 20171 Phone: 703.561.3120 703.561.3124-fax	
Diversity Business **(A multi-cultural online resource)**	200 Pequot Avenue Southport, CT 06890 Phone 203.255.8966 203.255.8501-fax	www.diversitybusiness.com/
National Association of Women in Construction	327 S. Adams Street Fort Worth, TX 76104 Phone: 1-800-552-3506 Phone: 817.877.5551 817.877.0324-fax	www.nawic.org/

III. PRESIDENTIAL DOCUMENTS

PRESIDENTIAL EXECUTIVE ORDER 13202 OF FEBRUARY 17, 2001 and PRESIDENTIAL EXECUTIVE ORDER 13208 OF APRIL 8, 2001 are appended as Attachment II.

IV SEVERABILITY

In the event any provision of the within and foregoing Requirement, including any attachment thereto, shall be held illegal, invalid, unconstitutional or unenforceable by any court of competent jurisdiction, such holding shall not invalidate, render unenforceable or otherwise affect any other provision hereof.

V. PROJECT SIGNS

1. **The prime contractor shall provide and erect a construction site sign as described below at a prominent location at each construction site.**

2. **For projects funded in whole or in part by the Bipartisan Infrastructure Law (BIL), the prime contractor shall provide and erect an additional construction site sign at a prominent location at each construction site using the Investing in America Signage guidelines at https://www.epa.gov/invest/investing-america-signage.**

The owner shall approve the site for the signs' erection. The signs shall be prepared in accordance with detailed instructions provided by Maryland Department of the Environment (MDE).

It shall be the responsibility of the contractor to protect and maintain the signs in good condition throughout the life of the project.

Federal Register / Vol. 66, No. 36 / Thursday, February 22, 2001 / Presidential Documents 11225

Attachment II

Presidential Documents

Executive Order 13202 of February 17, 2001

Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects

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

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

(a) Require or prohibit bidders, offerors, contractors, or subcontractors to enter into or adhere to agreements with one or more labor organizations, on the same or other related construction project(s); or

(b) Otherwise discriminate against bidders, offerors, contractors, or subcontractors for becoming or refusing to become or remain signatories or otherwise to adhere to agreements with one or more labor organizations, on the same or other related construction project(s).

(c) Nothing in this section shall prohibit contractors or subcontractors from voluntarily entering into agreements described in subsection (a).

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

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

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

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

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

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

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

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

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

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

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

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

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



THE WHITE HOUSE,
February 17, 2001

FR Doc. 01-4622
Filed 02-21-01; 11:18 am]
Billing code 3195-01-P

Federal Register
Vol. 66, No. 70
Wednesday, April 11, 2001

Presidential Documents

Title 3—

The President

Executive Order 13208 of April 8, 2001

Amendment to Executive Order 13202, Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the Federal Property and Administrative Services Act, 40 U.S.C. 471 *et seq.*, and in order to (1) promote and ensure open competition on Federal and federally funded or assisted construction projects; (2) maintain Government neutrality towards Government contractors' labor relations on Federal and federally funded or assisted construction projects; (3) reduce construction costs to the Federal Government and to the tax payers; (4) expand job opportunities, especially for small and disadvantaged businesses; (5) prevent discrimination against Government contractors or their employees based upon labor affiliation or lack thereof; and (6) prevent the inefficiency that may result from the disruption of a previously established contractual relationship in particular cases; thereby promoting the economical, nondiscriminatory, and efficient administration and completion of Federal and federally funded or assisted construction projects, it is hereby ordered that Executive Order 13202 of February 17, 2001, is amended by adding to section 5 of that order the following new subsection:

(c) The head of an executive agency, upon application of an awarding authority, a recipient of grants or financial assistance, a party to a cooperative agreement, or a construction manager acting on behalf of the foregoing, may exempt a particular project from the requirements of any or all of the provisions of sections 1 and 3 of this order, if the agency head finds: (i) that the awarding authority, recipient of grants or financial assistance, party to a cooperative agreement, or construction manager acting on behalf of the foregoing had issued or was a party to, as of the date of this order, bid specifications, project agreements, agreements with one or more labor organizations, or other controlling documents with respect to that particular project, which contained any of the requirements or prohibitions set forth in sections 1(a) or (b) of this order; and (ii) that one or more construction contracts subject to such requirements or prohibitions had been awarded as of the date of this order.



THE WHITE HOUSE,
April 6, 2001.

[FR Doc. 01–9086
Filed 4–10–01; 8:45 am]
Billing code 3195–01–P

THE CONSTRUCTION SITE SIGN FOR PROJECTS FINANCIALLY SUPPORTED BY STATE REVOLVING LOAN FUNDS AND OTHER FUND SOURCES

White Background

Light Blue Scroll

Black Letters

PROJECT TITLE

Project Type (by MDE)

A PROJECT FINANCIALLY SUPPORTED BY THE

STATE OF MARYLAND AND U.S. ENVIRONMENTAL PROTECTION AGENCY

UNDER THE DIRECTION OF THE MARYLAND DEPARTMENT OF THE ENVIRONMENT

APPROVED BY THE MARYLAND BOARD OF PUBLIC WORKS

Wes Moore, Governor
Brooke E. Lierman, Comptroller
Dereck E. Davis, Treasurer

Total Project Cost: _____
State Loan: _____
State Grant: _____
Federal Funds: _____
Other Funds: _____
Local Funds: _____

4’

8’

Project Type:

Insert the selected item under the project title:

___ Green Infrastructure Project - Constructing environmentally beneficial “green” infrastructure

___ Wetlands - Creating wetlands to improve water quality and create wildlife habitat

___ Stream restoration - Restoring streams to improve water quality and create wildlife habitat

___ Living shorelines - Turning shorelines into living habitats to improve water quality and to reduce erosion and flooding

___ Septic connections - Connecting homes to public sewer to eliminate failing septic systems, improve water quality, and protect public health

___ Drinking water extension - Connecting homes to public water supply to improve drinking water quality

___ Stormwater project - Reducing stormwater runoff to improve water quality, protect public health, and reduce flooding

___ CSOs, Sewer project - Preventing sewer overflows to improve water quality and protect public health

___ ENR - Reducing pollution to improve Maryland waterways and the Chesapeake Bay and to protect public health

EDERAL WAGE RATE REQUIREMENTS UNDER THE DAVIS-BACON AND RELATED ACTS

Prevailing Wage Requirements for CWSRF Capitalization Grants

The recipient agrees to include in all agreements to provide assistance for the construction of treatment works carried out in whole or in part with such assistance made available by a State water pollution control revolving fund as authorized by Title VI of the Federal Water Pollution Control Act, also known as the CWA, (33 U.S.C. 1381 et seq.), or with such assistance made available under section 205(m) of that Act (33 U.S.C. 1285(m)), or both, a term and condition requiring compliance with the requirements of section 513 of that Act (33 U.S.C. 1372) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions. All contracts and subcontracts for the construction of treatment works carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of $2,000 the contract clauses as attached hereto entitled "Wage Rate Requirements Under the Clean Water Act, Section 513." This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

Preamble

With respect to the CWSRF program, EPA provides capitalization grants to each State which in turn provides sub grants or loans to eligible entities within the State. Typically, the sub recipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring sub recipients' compliance with the wage rate requirements set forth herein, those sub recipients shall have the primary responsibility to maintain payroll records as described in Section I-3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the sub recipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring sub recipients' compliance with the wage rate requirements set forth herein, those sub recipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

ATTACHMENT 1

I. Requirements Under Title VI of the Clean Water Act (CWA) For Sub recipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under Title VI of the CWA, with respect to State recipients and sub recipients that are governmental entities. If a sub recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a state recipient needs guidance, the recipient may contact EPA's Office of Grants and Debarment for guidance at EPA_Grants_Info@epa.gov. The recipient or sub recipient may also obtain additional guidance from the U.S. Department of Labor's (DOL) website at http://www.dol.gov/whd/.

1. Applicability of the DB prevailing wage requirements.

Under Title VI of the CWA, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution

control revolving fund. If a sub recipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the sub recipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

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

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

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

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

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

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

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the sub recipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF - financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to

make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or Title VI of the Clean Water Act, the following clauses:

(1) Minimum wages.

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

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the DB Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the DB 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.
Sub recipients may obtain wage determinations from DOL's website, https://sam.gov/.

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

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar) and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The DOL Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar), which indicates the State award official's disagreement and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The DOL Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

(2) Withholding. The sub recipient(s), shall upon written request of the EPA Award Official or an authorized representative of DOL, 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 DB prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the EPA may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

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

certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site.

The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the DOL for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient(s).

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

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

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

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

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

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

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the EPA or State may, after

written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program,

the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

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

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

(8) Compliance with DB and Related Act requirements. All rulings and interpretations of the DB and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

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

(10) Certification of eligibility.

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

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

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

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

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

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of $29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

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

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

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

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(3), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB.
Sub recipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

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

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

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

II. Requirements Under Title VI of the CWA - For Sub recipients That Are Not Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under Tit le VI of the CWA with respect to sub recipients that are not governmental entities. If a sub recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a state recipient needs guidance, the recipient may contact EPA's Office of Grants and Debarment for guidance at EPA_Grants_Info@epa.gov. The recipient or sub recipient may also obtain additional guidance from DOL's website at http://www.dol.gov/whd/.

Under these terms and conditions, the sub recipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

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

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

2. Obtaining Wage Determinations.

(a) Sub recipients must obtain proposed wage determinations for specific localities at https://sam.gov/. After the sub recipient obtains its proposed wage determination, it must submit the wage determination to Ms. Bambi Turner, bambi.turner1@maryland.gov, (410) 537-3146, for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official.)

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

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

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

(c) If the sub recipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the sub recipient shall insert the appropriate DOL wage determination from https://sam.gov/ into the ordering instrument.

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

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

3. Contract and Subcontract provisions.

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

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and

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

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

Sub recipients may obtain wage determinations from the DOL's website, https://sam.gov/.

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

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient(s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar) and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The DOL Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar), which

indicates the State award official's disagreement and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The DOL Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

(2) Withholding. The sub recipient(s) shall upon written request of the EPA Award Official or an authorized representative of the DOL, 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 DB prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the EPA may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

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

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization

grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site.

The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the DOL for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient(s).

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

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

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

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

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

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

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

(4) Apprentices and trainees--

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

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

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

(8) Compliance with DB and Related Act requirements. All rulings and interpretations of the DB and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

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

(10) Certification of eligibility.

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

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

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

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

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

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for

liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

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

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

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

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(3), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Sub recipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c). The sub recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The sub recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the sub recipient should spot check payroll data within two weeks of each contractor or subcontractor’s submission

of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Sub recipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the sub recipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

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

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

Prevailing Wage Requirements for DWSRF Capitalization Grants

The recipient agrees to include in all agreements to provide assistance for any construction project carried out in whole or in part with such assistance made available by a drinking water revolving loan fund as authorized by Section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12), a term and condition requiring compliance with the requirements of section 1450(e) of the Safe Drinking Water Act (42 U.S.C.300j-9(e)) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions. All contracts and subcontracts for any construction project carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of $2,000 the contract clauses as attached hereto entitled “Wage Rate Requirements Under The Clean Water Act, Section 513 and the Safe Drinking Water Act, Section 1450(e).” This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

Preamble

With respect to the DWSRF program, EPA provides capitalization grants to each State which in turn provides sub grants or loans to eligible entities within the State. Typically, the sub recipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring sub recipients’ compliance with the wage rate requirements set forth herein, those sub recipients shall have the primary responsibility to maintain payroll records as described in Section I-3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the sub recipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring sub recipients’ compliance with the wage rate requirements set forth herein, those sub recipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

ATTACHMENT 1

I. Requirements Under Section 1452(a)(5) of the Safe Drinking Water Act For Sub recipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance with respect to State recipients and sub

recipients that are governmental entities. If a sub recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact EPA's Office of Grants and Debarment for guidance at EPA_Grants_Info@epa.gov. The recipient or sub recipient may also obtain additional guidance from the U.S. Department of Labor's (DOL) website at http://www.dol.gov/whd/

1. Applicability of the DB prevailing wage requirements.

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

2. Obtaining Wage Determinations.

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

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

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

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

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

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a sub recipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the sub recipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the sub recipient shall either terminate the contract

or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The sub recipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the sub recipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project carried out in whole or in part with assistance made available by the DWSRF, and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the Safe Drinking Water Act, Section 1452(a)(5), the following clauses:

(1) Minimum wages.

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

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

Sub recipients may obtain wage determinations from the U.S. Department of Labor's website, https://sam.gov/.

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

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar) and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The Department of Labor Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar) which indicates the State award official's disagreement and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The Department of Labor Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

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

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of

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

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site.

The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient(s).

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

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

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

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

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

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

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

(4) Apprentices and trainees

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

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

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

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

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

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

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

(8) Compliance with DB and Related Act requirements. All rulings and interpretations of the DB and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

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

(10) Certification of eligibility.

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

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

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

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

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

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of $29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

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

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

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

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(3), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB.
Sub recipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

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

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

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

II. Requirements Under Section 1452(a)(5) of the Safe Drinking Water Act For Sub recipients That Are Not Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the Safe Drinking Water Act, Section 1452(a)(5) with respect to sub recipients that are not governmental entities. If a sub recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a State recipient needs guidance, the recipient may contact EPA's Office of Grants and Debarment for guidance at EPA_Grants_Info@epa.gov The recipient or sub recipient may also obtain additional guidance from DOL's website at http://www.dol.gov/whd/

Under these terms and conditions, the sub recipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

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

Under the Safe Drinking Water Act, Section 1452(a)(5), DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a sub recipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the sub recipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Sub recipients must obtain proposed wage determinations for specific localities at https://sam.gov/. After the sub recipient obtains its proposed wage determination, it must submit the wage determination to Ms. Bambi Turner, bambi.turner1@maryland.gov, (410) 537-3146, for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official.)

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

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

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

(c) If the sub recipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the sub recipient shall insert the appropriate DOL wage determination from https://sam.gov/ into the ordering instrument.

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

(e) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a sub recipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the sub recipient has failed to incorporate a wage determination or has used a wage determination that clearly does not

apply to the contract or ordering instrument. If this occurs, the sub recipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The sub recipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the sub recipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project carried out in whole or in part with assistance made available by the DWSRF, and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the Safe Drinking Water Act, Section 1452(a)(5), the following clauses:

(1) Minimum wages.

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

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

Sub recipients may obtain wage determinations from DOL's website, https://sam.gov/.

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

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

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

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

rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient(s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar) and supporting materials to WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently. The Department of Labor Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub recipient (s) to the State award official. The State award official will transmit a completed conformance request form (SF-1444 or similar) which indicates the State award official's disagreement and supporting materials to WHD-CBACONFORMANCE_ INCOMING@dol.gov, and to the EPA DB Regional Coordinator concurrently. The Department of Labor Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

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

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the

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

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site.

The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient(s).

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

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

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

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

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

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

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

(4) Apprentices and trainees--

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less

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

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

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

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

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

(8) Compliance with DB and Related Act requirements. All rulings and interpretations of the DB and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

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

(10) Certification of eligibility.

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

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

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

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

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

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The sub recipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor 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 (a)(2) of this section.

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

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

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(3), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Sub recipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

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

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

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

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DIVISION 00 - BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 73 46

HEAVY CONSTRUCTION WAGE RATES

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DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 94 39 – RECORD FIELD ORDER

FIELD ORDER NO.: [Number of Field Order]

Owner:	**Worcester County, Maryland**	Owner's Project No.:	
Engineer:	**George, Miles & Buhr, LLC**	Engineer's Project No.:	**250196**
Contractor:		Contractor's Project No.:	
Project:	**Mystic Harbour WWTP Biosolids Upgrade**		
Contract Name:	**Mystic Harbour WWTP Biosolids Upgrade**		
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: _____

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DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 94 49 – WORK CHANGE DIRECTIVE

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:	**Worcester County, Maryland**	Owner's Project No.:	
Engineer:	**George, Miles & Buhr, LLC**	Engineer's Project No.:	**250196**
Contractor:		Contractor's Project No.:	
Project:	**Mystic Harbour WWTP Biosolids Upgrade**		
Contract Name:	**Mystic Harbour WWTP Biosolids Upgrade**		
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:		

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DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 94 63 - RECORD CHANGE ORDER NO.: [Number of Change Order]

Owner:	**Worcester County, Maryland**	Owner's Project No.:	
Engineer:	**George, Miles & Buhr, LLC**	Engineer's Project No.:	**250196**
Contractor:		Contractor's Project No.:	
Project:	**Mystic Harbour WWTP Biosolids Upgrade**		
Contract Name:	**Mystic Harbour WWTP Biosolids Upgrade**		
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:	_____	_____
	_____	_____

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The site of the proposed Mystic Harbour WWTP Biosolids Upgrade project is located behind the Greene Turtle Restaurant at 9616 Stephen Decatur Highway, Ocean City, Maryland 21842.

B. Directions to the site are as follows: From US Route 50, turn South onto County Road 611 South in Ocean City, MD. Travel approximately 0.8 miles and take a left into the driveway of 9616 Stephen Decatur Highway, Ocean City, Maryland 21842. Follow the dirt road back until you enter WWTP.

C. The work under this Contract consists of constructing, complete with all equipment, controls/instrumentation, and accessories, the following but not limited to:

1. Primary Screening – *New Rotary Drum Screens and Compactors to replace existing units*
2. Storage Building – *Modifications to an existing CMU Building to allow it to be used to store necessary materials and equipment for WCPW operations.*
3. Sludge Transfer Pumping System – *Addition of a liquid sludge transfer system inclusive of equipment, piping, controls and instrumentation to transfer sludge from the new Sludge Holding Tank to a dewatering means.*
4. Mechanical Dewatering System – *New Unit Process inclusive of building to house mechanical dewatering device, dewater sludge conveyor(s) and ancillary equipment as well as piping, controls and instrumentation.*
5. Sludge Drying Beds and Greenhouses – *Rehabilitation and extension of existing Greenhouses and Drying Beds as well as the addition of two (2) new Drying Beds and Greenhouses.*
6. Sludge Holding Tanks – *New above grade stainless steel tankage to serve as waste activated sludge (WAS) storage*
7. Associated yard piping and site work. – *Replacement of portions of the existing piping and installation of new piping.*
8. Associated electrical, controls, HVAC & plumbing work. – *Installation of HVAC, Electrical Equipment, and Plumbing in new structures.*
9. SCADA – *Connecting the existing SCADA system serving the new equipment with the existing WWTP SCADA system.*

D. The work under this Contract includes all requirements to provide a fully finished and operable wastewater treatment facility including miscellaneous items and incidentals as shall be indicated, shown, specified or required to complete the work in strict conformity with the Contract Documents. The Contractor shall provide all labor, equipment, tools, appliances, materials and incidentals, and shall perform all operations required to completely finish all of the work to the satisfaction of the Owner and the Engineer. The Contractor shall be obligated to furnish a complete and functioning facility.

E. The existing WWTP treats sewage from the service area of the Mystic Harbour WWTP. The work under this Contract constitutes a major renovation of this treatment facility; however, the Contractor's attention is directed to the fact that wastewater service to the Mystic Harbour WWTP must be maintained throughout the construction period and only interrupted temporarily during yard piping tie-ins. At no time can wastewater service be cut off without the prior written approval of Worcester County Public Works. Any interruption to service must be kept to the shortest duration possible and with the approval of the County.

1.02 TIME OF COMPLETION OF CONTRACT AND LIQUIDATED DAMAGES

A. The Bid Form states the number of consecutive calendar days allowed from date of "Notice To Proceed" to date of substantial completion and final payment of work under this contract. Because of the urgent requirement for completion, these dates must be met. For each and every day that the Contractor is in default in completing the Contract as defined in the General Conditions and in the Bid, he shall pay to the Owner liquidated damages as outlined in the Agreement.

1.03 CONTRACT DOCUMENTS

A. All work shall be completed in accordance with the Contract Documents.

B. The Contract Drawings and Specifications are complementary. However, should a dispute arise as to which shall govern, the Contract Specifications will apply.

C. Any discrepancy between the "General Conditions" and the "Technical Specifications," the Technical Specifications shall govern.

1.04 WORK PERIOD

A. The Contractor will be allowed to work 40 hours per week Monday through Friday, 52 weeks per year.

B. The Contractor shall not work on Saturday, Sunday, or any Holidays observed by the Owner unless prior approval is secured from the Owner. If the Contractor desires to work longer than eight (8) hours per day or if he desires to work on weekends, he must first obtain the written permission of the Owner and Engineer.

C. Contractor, if granted permission to work overtime or outside of the defined work schedule, shall pay the Owner for cost of full–time inspection beyond 40 hours per week; with no offset inclement weather during said week

D. Should the Contractor extend his work beyond these specified hours, independent of inclement weather, any and all cost of weekend, holiday and/or overtime inspection, including but not limited to direct salaries, fringe benefits, overhead profit, administration and supervision, incurred by the Engineer, and/or, the Owner, will be the sole obligation of the Contractor. The overtime rates for the Engineer are:

$165 per hour for RPR

1.05 WAGE RATES

A. The Contractor shall comply, within the lump sum price bid and without extra cost to the Owner, with Davis-Bacon Act Wage Rates and Regulations which are applicable to this project.

B. Wage rate determinations are appended hereinbefore or will be issued by addendum at least five (5) days prior to bid date.

1.06 FIELD CONTROL OF THE WORK/SURVEYS

A. The Contractor shall engage an independent licensed surveyor qualified in the various types of survey work specified herein. The surveying firm shall have a trained staff large enough to perform the specified duties. Within fifteen (15) days after the award of the Contract, the Contractor shall submit the name of his licensed surveyor including his qualifications. The surveyor's duties shall be as outlined herein:

1. Survey, set, and maintain guide stakes required for earth movement and levels. The Contract Drawings indicate a benchmark. The Contractor shall use this benchmark in the execution of the work.
2 Establish the locations and level of all structures. Establish the limit of disturbed area.
3. Check grades, contours and levels throughout earth movement operation, making allowances for required depressions under paving and sodded areas.
4. Establish lines and grades for underground lines. Make interim checks as required to adhere to the Contract Drawings.
5. Provide a certification in writing to the Engineer as to the correctness of the grades, existing building elevations where sewer lines enter paving and utility locations. Indicate in the certification deviations (if any) from the Contract Drawings.
6. Provide As–Built Drawings of all water, sewer, and process lines outside the buildings. Show locations and invert elevations.
7. Inform the Engineer immediately if, during the survey, deviations from the Contract Drawings are uncovered.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS

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

B. Construction work under this contract shall be performed in a manner that minimizes impact to normal facility operations.

C. Discharge permit levels must not be violated as a result of the Contractor's construction activities. Contractor shall coordinate all sequencing of construction and work activities in advance with Owner and Engineer to ensure treatment facility will perform adequately.

D. All operations of existing equipment, valves and gates required to perform the work shall be done by the Owner. The Owner or his designated agent shall be informed in writing at least 24 hours, or longer where specified, in advance of the need to operate existing equipment, valves or gates or other actions which could affect facility operations.

E. To achieve reliable, continuous facility operation, all new facilities shall be tested and in operating condition as determined by the Owner and Engineer before final tie-ins are made which connect new facilities to existing facilities.

F. The Contractor shall submit to the Engineer drawings showing details of all temporary connections or facilities as required.

G. A minimum of seven (7) calendar days written notice is required from Contractor to Owner for any work requiring changes in operating procedures or removal of equipment, tanks, facilities, or roadways from service.

H. The Owner will be responsible for taking existing facilities off-line; however, Contractor shall be responsible for draining existing tanks.

1. Final wash down and cleaning, including removal of solids, of these tanks to the degree necessary to perform work within the tanks shall be the responsibility of the Contractor.

I. The Contractor's operations shall not disrupt the collection and removal of sewage sludge from the site and the delivery of equipment, supplies, and chemicals to the site.

J. Contractor shall furnish and install temporary equipment including pumps, piping, valves, bulkheads, electrical equipment and all system components necessary to maintain the existing plant in service during construction.

K. Contractor shall provide temporary power, instrumentation, controls, and alarms necessary to assure continued plant operation during the alterations of existing plant components or installation of new equipment.

L. Contractor shall maintain emergency backup power supply to all equipment determined by the Owner's plant superintendent to be essential to plant operation. Contractor shall provide temporary emergency generator and electrical connections, if necessary.

M. Contractor shall furnish any temporary access required, including ladders, platforms, grating, walkways and awaits, which shall comply with OSHA laws, for necessary plant operations.

N. No extra payment shall be made for any labor, materials, tools, equipment or temporary facilities required during the construction of facilities. All costs therefore shall be considered to have been included in the price bid of the Proposal.

O. Special Requirements

1. Existing Treatment Plant:
    a. The existing treatment plant, including the Flow Equalization System, MBR System, all associated systems required for MBR operation of the WWTP, and all support systems (including blowers, pumps, electrical power, and controls), shall remain in service for the full duration of the Project, except when taken offline as part of a planned shutdown managed by WCPW, as described below.
    b. Construction will require the closing of various gates and valves to isolate tanks and equipment. WCPW does not guarantee that the valves or gates will be completely watertight or operable. It is the Contractor's responsibility to take whatever measures are necessary to proceed with construction in the event that valves or stop gates leak or are inoperable.
    c. Contractor shall be responsible for installation of additional isolation valves on all existing and proposed piping, whether shown on the Contact Drawings or not, as is required to allow for connection into, or bypass of proposed or existing facilities, in order to complete the work.
    d. Contractor shall be responsible for draining, dewatering, cleaning and removal disposal of contents of all tanks and greenhouse drying beds areas that are part of the Project work.

2. Headworks:
    a. The replacement of the existing Primary Screens will require the diversion of influent wastewater to another facility. Accordingly, the Contractor shall complete this portion of the Work in its entirety within one contiguous sixty (60) calendar day period occurring between October 1 and April 1.
    b. If the Primary Screening System is rendered non-operational due to ongoing construction activities outside of this period, the Contractor shall be responsible for furnishing, installing, operating, and maintaining a temporary screening system capable of screening 1.85 MGD of raw wastewater at a 1 mm screening size for the entire duration of the outage. All costs associated with installing and decommissioning this system are to be borne by the Contractor.
3. Drying Beds:
    a. Only one (1) of the two (2) existing drying beds shall be demolished and reconstructed at a time. The existing gable end shall remain in place except for the gable end associated with the drying bed actively undergoing reconstruction. A drying bed shall not be permitted to remain uncovered when it is not actively undergoing reconstruction. At least one (1) drying bed shall remain operational at all times to allow WCPW to maintain solids handling operations.
4. Fencing:
    a. If site perimeter fencing is removed or disturbed during the course of construction, the Contractor shall secure the site at the completion of work each day.
5. Electrical:
    a. Instrumentation / Controls / SCADA:
        i. The Contractor shall maintain existing instrumentation, controls, and SCADA monitoring to facilitate the WWTP operations.
        ii. Provide temporary wiring, components, enclosures, and hardware required to maintain all controls and communications.
        iii. Coordinate controls and SCADA communications with Owner and Engineer.
    b. Temporary Lighting:
        i. The Contractor shall provide temporary lighting and / or maintain existing lighting for interior and exterior locations to facilitate the WWTP operations and construction activities, as required.
    c. Long Lead Items:
        i. The Contractor shall inform the Owner and Engineer of electrical and controls equipment with long lead times that may negatively impact the construction sequence.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Payment for the work completed under this Contract will be made at the lump sum, contingent/unit, and allowance prices bid, which prices shall include the furnishing of all labor, tools, equipment and materials and the performance of all work required to complete the project as indicated and specified in accordance with all requirements of the Project Manual and to the entire satisfaction of the Engineer.

B. It is intended that all work shown on the Contract Drawings and included in the specifications is to be paid for under the items listed in the proposal form. The absence from the proposal form of bid items for any specific category of work shall be interpreted as meaning that the cost of such work, accomplished as defined by the Contract Documents, shall be included in the prices bid for related items listed in the proposal form. Should the Contractor feel that the cost for any item of work has not been defined by a Bid Form payment item, he shall include the cost for that work in some other applicable bid item, so that his proposal for the project reflects his total price for completing the work in its entirety.

C. The prices stated in the proposal(s) include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Drawings and specified herein. The basis of payment for an item at the lump sum or unit price shown in the proposal(s) shall be in accordance with the description of that item in this Section.

D. All items in the Bid which are designated as “Contingent Bid Items” are to be used and will be paid for only at the written direction and authorization of the Engineer, if agreed to by the Owner. Payment under this section will be made for materials furnished and placed in addition to those shown or beyond the limits indicated or reasonably inferred from the Contract Documents. All materials furnished and installed shall be in accordance with these specifications. Measurements and payment will be in accordance with the proposal and will include but not necessarily be limited to the furnishing, hauling, placing, and installing of materials, and the furnishing of such manpower and equipment as required to accomplish the work as directed in writing by the Engineer.

E. All excavation under this Contract is unclassified; that is, the unit prices bid shall be taken to include and cover all materials required to be excavated and backfilled, whether wet or dry, and regardless of the character of the materials. The excavations, removal and replacement of road surfacing materials, curb, sidewalk, gutter and yard restoration, as required, shall be included in the unit prices bid with any exceptions as noted herein or as designated on the plans.

F. The cost of dewatering and associated work will not be separately paid for but shall be considered as incidental to other bid items and included in the prices bid for them.

G. All removal, relocation and disposal work as indicated in the Contract Documents, and/or as necessary to complete the proposed work shall be performed at no additional cost to the Owner. Cost of all removal, relocation and disposal work shall be included in the price bid.

H. For the unit price Items included in the Bid, the Contractor will be paid for the actual quantity of the authorized work done or material furnished under each item of the proposal, at the unit price bid for such item. The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the Owner, in accordance with the General Conditions.

I. All items of work shall be measured concurrently, upon installation and before covering or backfilling, by the Resident Project Representative and the Contractor's representative. All items so measured will be recorded by both parties in a format which can be kept current until completion of work. All measurements, to the maximum extent possible, shall be referenced to base dimensions and stationing shown on the Drawings.

J. Payments during the course of the work for lump sum items will be made on the basis of percentage completion of the work items listed in the Schedule of Values for each lump sum item. The Schedule of Values shall be prepared by the Contractor and submitted to the Engineer and shall serve as a breakdown of the Lump Sum bid for the purpose of arriving at a basis for the monthly estimate. The Schedule shall add up to 100% of the Lump Sum bid.

1.02 LUMP SUM BID ITEMS

A. Bid Item A1: Mobilization/General Conditions

1. Payment for mobilization and general conditions associated with the work shown under this Construction Contract shall be made at the lump sum price bid for Bid Item A1. The value of this lump sum bid item shall not exceed 5% of the value of Bid Item A2. At the onset of construction, fifty percent (50%) of the Bid Item A1 amount can be requested for payment

and the remaining 50% will be paid on a pro-rated basis for the remainder of the construction contract duration.

B. Bid Item A2: Treatment Plant Work and All Appurtenances

1. Payment for constructing the improvements to the Mystic Harbour WWTP shall be made at the lump sum price bid for Bid Item A2.
2. The lump sum prices bid for constructing the improvements to the Mystic Harbour WWTP shall include but not be limited to, all work related to construction and rehabilitation of the Screening and Biosolids facilities complete with primary screening equipment, sludge transfer system improvements, sludge holding tank mixing system, existing sludge drying bed(s) and greenhouse improvements, construction of two (2) new drying bed greenhouses sludge dewatering system and building, sludge holding tanks and appurtenances, SCADA system, electrical equipment, electrical conduits, all concrete testing as described in Section 03 30 00 Part 3.08, and installing other appurtenances on the site specified or detailed. The Work also includes the rehabilitation/modification of an existing building into a Storage Building. Also, included shall be all other work necessary for a full operational facility as detailed in the Contract Documents. Lump sum price bid shall include all incidental minor and miscellaneous items, work and materials for which no specific lump sum or unit price bid item is shown, and which are necessary to complete the work and to maintain or repair the work.
3. Payment for all demolition and disposal work shall be made within the lump sum price bid in Bid Item A2.

1.03 EXPLANATION OF CONTINGENT BID UNIT PRICE ITEMS

A. In the BID FORM, there are several items listed as “Contingent Unit Price Items”. These items are for work which may or may not be ordered by the Owner. These items will be used only if the Owner determines that they are required due to actual field conditions. A quantity is listed in the ”Unit Price Item” description. The Contractor will include the cost of these items in his BASE BID. In the event that the actual quantity used is higher or lower than that shown, the amount paid to the Contractor will be adjusted up or down in accordance with the price quoted by the Contractor.

B. All contingent unit price work shall be performed only as, and when, ordered in writing by the Engineer.

C. Bid Item B1: Excavation Below Subgrade

1. Measurement for this item will be made on the actual number of cubic yards of material removed and stone placed. This item will only be used when the Engineer directs the Contractor to remove unsuitable material encountered at subgrade for a structure or pipe and replace the material

with stone. Any material removed shall be disposed of off-site in a suitable manner.

2. Payment for this item shall be made at the per cubic yard price bid for "EXCAVATION BELOW SUBGRADE", which price shall be full compensation for all labor, materials, tools, equipment and incidentals required to excavate the unsuitable materials, haul and dispose of the unsuitable material off-site, and replace it with stone in accordance with Section 31 23 16 - STRUCTURAL EXCAVATION, BACKFILL AND COMPACTION.

D. Bid Item B2: Furnish and Place Gravel Bedding

1. Measurement for structures will be made on the actual number of cubic yards of gravel material placed where ordered by the Engineer. Measurement for gravel bedding under pipelines will be based upon the authorized depth and width of placement in trench. All gravel bedding indicated on the Contract Drawings to be furnished under structures shall be furnished under the Lump Sum Bid Price and will not be paid for as a part of this item. Only additional gravel bedding ordered by the Engineer will be paid for under this item.

E. Bid Item B3: Furnish and Place Special Backfill

1. Measurement for structures will be made on the actual number of cubic yards of special backfill hauled to the job site and placed where ordered by the Engineer. Measurement for special backfill for pipelines will be based upon the authorized depth and width of placement in trench. Any special backfill required to be furnished under the Contract Documents shall be furnished under the Unit Price Bid and will not be paid for as a part of this item. Only additional backfill as ordered by the Engineer will be paid for under this item.
2. Payment for this item will be made at the per cubic yard price bid for "FURNISH AND PLACE SPECIAL BACKFILL" which price shall be full compensation for all labor, materials, tools, equipment and incidentals required to haul special backfill to the site and to place it where directed by the Engineer.

F. Bid Item B4: Miscellaneous Excavation and Refill

1. Measurement for this item will be made on the actual number of cubic yards of material removed. Where the Engineer directs the Contractor to relocate a trench, the Contractor will be paid for the excavation and refill this bid item. This item will only be used if directed by the Engineer. All excavation and backfill required for the construction of the treatment facilities and other work shown on the Drawings shall be included in the lump sum price.

2. Payment for this item will be made at the per cubic yard price bid for “MISCELLANEOUS EXCAVATION AND REFILL”, which price shall be full compensation for all labor materials, tools, equipment and incidentals required to excavate and backfill in accordance with Section 31 23 16 - EXCAVATION, BACKFILL AND COMPACTION.

G. Bid Item B5: Furnish and Place Miscellaneous 4,000 PSI Concrete

1. Measurement for this item will be the actual volume of concrete in cubic yards place. Concrete for this item includes additional concrete encasement required by the Engineer and additional anchors/buttresses which are not designated on the Contract Drawings or in the Specifications. Concrete under this item will not be reinforced.
2. Payment for the work completed under this item will be made at the unit price per cubic yard for “MISCELLANEOUS 4,000 PSI CONCRETE”, which unit price payment shall constitute full compensation for all labor, materials, equipment, tools and incidentals required to provide all contingent concrete complete as ordered by the Engineer.

H. Bid Item B6: Concrete Spalling Repairs

1. Measurement for this item will be made on the basis of “each” spalling repair. “Each” repair is defined by a repaired volume of spalling no greater than 1’ x 1’ x 1’-deep, measured once all loose material has been removed from the location and the necessary saw cuts have been performed.
2. Payment for “Concrete Spalling Repair” will be made at the appropriate unit price bid for each repair. Locations that exceed the repair volume reference above for “each” repair will be paid on a prorated basis based on the volume repaired once all loose material has been removed from the area.
3. The prices bid shall be full compensation for all, labor, materials, tools, equipment and incidentals required to prepare and repair the spalling per the Contract Documents. required to perform this work in accordance with the specifications.

I. Bid Item B7: Miscellaneous Existing Reinforcing Prep and Anti-Corrosion Coating

1. Measurement for this item will be made on the actual number of lineal feet of rebar repaired. This item covers the cost of preparing the rebar and coating any existing rebar after the demo of the concrete structure has been performed. The Contractor will be paid for the surface preparation and installation of the anti-corrosion coating as specified.
2. Payment for this item will be made at the per linear foot price bid for “Miscellaneous Existing Reinforcing Prep and Anti-Corrosion Coating,” which price shall be full compensation for all labor materials, tools,

equipment and incidentals required to perform this work in accordance with the specifications.

J. Bid Item B8: Secure Modified Proctor Tests, AASHTO T-180, Method A

1. The price bid shall include excavation and backfill to secure the tests in locations as directed by the Engineer, paying a testing laboratory for all tests performed, and furnishing a copy of test results to the Engineer.
2. A minimum of one (1) sand cone test shall be performed per every ten (10) nuclear density tests.
3. Payment will be made for each test at the unit price bid.

K. Bid Item B9: Secure Field Density Tests, AASHTO T-191

1. The price bid shall include excavation and backfill to secure the tests in locations as directed by the Engineer, paying a testing laboratory for all tests performed and furnishing a copy of test results to the Engineer.
2. Contractor shall complete density tests at eight-inch intervals during backfill of the trench as directed by Engineer. The price bid shall include all tests required for the amount of lifts necessary at a single testing location.
3. Payment will be made, at the unit price bid, for only those tests which confirm compliance with specification requirements for compaction.

L. Bid Item B10: Secure Field Density Tests for Bearing Capacity, AASHTO T-191

1. The price bid shall include excavation and backfill to secure the tests in locations as directed by the Engineer, paying a testing laboratory for all tests performed and furnishing a copy of test results to the Engineer.
2. Contractor shall complete density tests at subgrade as directed by Engineer. The price bid shall include all tests required for the geotechnical engineer to determine the subgrade's bearing capacity.
3. Payment will be made, at the unit price bid, for only those tests which confirm compliance with specification requirements for bearing capacity.

1.04 DEDUCT ALTERNATE BID ITEMS

A. The following deduct alternate bid item may or may not be a part of the contract. The Owner will decide based on an evaluation of the bids received. The Owner reserves the right to incorporate alternate items if it deems to be in its own best interest. *The Low Bidder will be determined based on the Total Base Bid (Schedule A + Schedule B), minus the aggregate deductions for the items selected by the Owner from Schedule D. The Owner reserves the right to select any combination of deductive items listed in Schedule D.*

B. Bid Item D1: Furnish and Install Sludge Conveyors SLC-C-115 & SLC-C-116

1. The prices bid shall include all labor, materials, tools, equipment, and incidentals necessary to furnish and install Sludge Conveyors SLC-C-115 and SLC-C-116, including the supporting superstructure within Greenhouses #1 through #4 and all associated appurtenances. This item does not include the furnishing or installation of SLC-C-114, controls required for operation of SLC-C-114 as described in the Contract Documents, or any associated appurtenances related to SLC-C-114.

C. Bid Item D2: Furnish and Install Primary Screens, Compactors, and All Appurtenances

1. The prices bid shall include all labor, materials, tools, equipment, and incidentals necessary to furnish and install the Primary Screens and Compactors, including all supports, electrical work, controls, piping, appurtenances, and associated equipment required for a complete and operable installation. The prices bid shall also include all associated civil, structural, and architectural work shown to be associated with the Primary Screens/Screen Room.

D. Bid Item D3: Furnish and Install One (1) Liquid Sludge Storage Tank

1. The prices bid shall include all labor, materials, tools, equipment, and incidentals necessary to furnish and install the southernmost Liquid Sludge Storage Tank, including all supports, foundations, piping as delineated on the Contract Drawings, electrical work, controls, appurtenances, and associated equipment required for a complete and operable installation. The prices bid shall also include all associated civil, structural, and architectural work shown to be associated with the southernmost Liquid Sludge Storage Tank.

E. Bid Item D4: Storage Building Rehabilitation

1. The prices bid shall include all labor, materials, tools, equipment, supervision, and incidentals necessary to complete the rehabilitation of the existing Storage Building in accordance with the Contract Documents. The prices bid shall include all associated civil, structural, architectural, and other related work shown or specified as part of the Storage Building rehabilitation, including all demolition, removals, modifications, repairs, restoration, and installation of new work necessary to provide a complete and functional facility.

1.05 PAYMENT

A. Payment for Material not incorporated in the Work

1. Storage of Material:
   a. Payment for equipment and materials stored on the site and not actually incorporated in the work will be made on the basis of 95 percent of the amount of paid invoices submitted to the Engineer for incorporation in the monthly estimate.
2. Authorization for Payment:
   a. Payment will be authorized after delivery to the Construction site or other approved, owner controlled location within Worcester County, Maryland and after being certified by the Engineer as being stored in conformance with the manufacturer's recommendations and satisfactory evidence is provided that the items are as specified.
   b. Title to all items of equipment and materials upon which payment has been made shall rest with the Owner and document transferring title shall be executed by the Contractor. Transfer of ownership shall not relieve the Contractor of continuing insurance coverage and of protecting stored items against damage, deterioration or loss of any kind.
   c. Should material or equipment become damaged or stored improperly and contrary to manufacturer's recommendations, being therefore subject to later damage, then the Engineer will reduce the next following monthly payments by an amount sufficient to repair or replace such units.
   d. To initiate a request for partial payment the Contractor shall submit his request in writing to the Engineer with all necessary evidence.

1.06 PAYMENTS WITHHELD

A. The Owner may decline to pay all or any part thereof or, because of subsequent observations, it may nullify the whole or any part of any payment previously issued, to such extent as may be necessary in its opinion to protect the Owner from loss because of:

1. Defective work not remedied.
2. Third party claims filed or reasonable evidence indicating probable filing of such claims.
3. Failure of the Contractor to make payments properly to subcontractors or for labor, material or equipment.
4. Reasonable evidence that the work cannot be completed for unpaid balance of the Contract Sum.
5. Damage to the Owner or another Contractor.
6. Reasonable evidence that the work will not be or has not been completed within the Contract time.

7. Failure to carry out the work in accordance with the Project Manual.
8. Cancellation, material change or lapse of required insurance as specified in the Project Manual.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 31 13

PROJECT COORDINATION

PART 1 - GENERAL

1.01 INTERFACE WITH EXISTING FACILITIES

A. Work must be accomplished while the existing wastewater plant is maintained in service. Work shall be accomplished in a manner that minimizes interference with the operation of the wastewater facility.

B. All operational functions in the existing wastewater facilities shall be performed by the Worcester County Public Works Department, or their designated representatives, unless otherwise authorized.

C. Connections to existing pipes and structures shall be scheduled and coordinated in advance with the Owner and the Engineer. It may be necessary to make connections during the night hours or weekends. No claim for extra compensation or extension of contract time will be allowed on account of the necessity for connections to be made during normal "off" hours. Permission of the Owner shall be obtained by the Contractor prior to making any connections to the existing system.

D. When the Contractor desires certain existing electrical and/or mechanical functions to be interfaced, he shall inform the Owner and Engineer, in writing, a minimum of five (5) working days prior to the date he desires those interfaces to be made. The Contractor shall not alter the settings of or connect or disconnect any existing electrical or mechanical equipment without the approval of the Owner.

E. The Contract Drawings indicate that certain existing utilities must be relocated and/or rerouted during construction of the new treatment facilities. The Contractor shall be responsible for relocating these lines as necessary to allow for the construction of the new treatment facilities at no additional cost.

1.02 MAINTENANCE OF TRAFFIC

A. The existing roadways adjacent to the treatment plant units shall remain unobstructed at all times. The Contractor should make every effort to keep at least one lane of traffic open at all times.

B. It shall be the responsibility of the Contractor not to interfere with or create any hazards to traffic. No equipment or material will be stored or permitted to stand where

traffic must be maintained. It shall be the responsibility of the Contractor to control dust on all roads, drives and walkways on which traffic is being maintained.

C. The Contractor must provide access, at all times, for the plant operation to existing treatment units.

1.03 CONTRACTOR'S SEQUENCE OF CONSTRUCTION

A. The Contractor is responsible for all construction sequencing. The Contractor shall, in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES, submit and obtain approval of his construction schedule. Acceptance of this plan by the Engineer or the Owner denotes only lack of objection at the time and in no way implies that the Engineer or the Owner guarantees that particular sequence of construction as proposed by the Contractor will in fact work. Also any approval given is done so with the stipulation that all work done shall comply with the plans and specifications.

B. As construction proceeds, should the Contractor's sequence of construction cause operational problems that were unforeseen at the time of approval, the Engineer or the Owner reserves the right to withdraw the previous approval and require the Contractor to submit and obtain approval of an amended sequence of construction. The sequence of construction will be updated monthly.

C. Because some of the existing treatment facilities will remain in service while others are modified or removed from service, the Contractor's proper Sequence of Construction will be crucial to the continued operation of the treatment process.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION CONFERENCES

A. Prior to the start of construction, a general information meeting shall be held with the Owner, Engineer, Contractor and other interested parties in attendance. The meeting shall cover the general features of the project and various requirements of the project.

1.02 PROGRESS MEETINGS

A. During the entire duration of the contract, there will be Progress Meetings held once each month at the Project Site. The meetings will be attended by the Owner, Engineer, and Contractor and will be used to discuss the progress of the project and the coordination of subcontracts. Representatives of the Contractor will be required to attend all Progress Meetings. Representatives of subcontractors whose work may be discussed should also be available to attend.

B. It is imperative that progress meetings be held on a regular basis. If it becomes necessary to meet more frequently due to unforeseen conditions and problems, the meetings will be established to the satisfaction of all parties involved.

C. The Contractor's set of updated Record Drawings (Section 01 33 00 - 1.06) shall be reviewed prior to the start of each progress meeting.

D. The Contractor's updated Construction Schedule (Section 01 33 00 - 1.04) shall be reviewed at each progress meeting.

E. The Contractor shall submit Progress Photographs per Section 01 33 00 - 1.10.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 32 23

FIELD SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide and pay for field services for Project.

1. Survey work required in execution of Project.
2. The method of field staking for the construction of the work shall be at the option of the Contractor.
3. The accuracy of any method of staking shall be the responsibility of the Contractor. All engineering for vertical and horizontal control shall be the responsibility of the Contractor.
4. The Contractor shall be held responsible for the preservation of all stakes and marks. If any stakes or marks are carelessly or willfully disturbed by the Contractor, the Contractor shall not proceed with any work until he has established such points, marks, lines and elevations as may be necessary for the prosecution of the work.
5. Civil, structural or other professional engineering services specified or required to execute Contractor's construction methods.

B. The Contractor shall retain the services of a registered land surveyor licensed in the State of Maryland to identify existing control points and maintain a survey during construction.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Qualified engineer or registered land surveyor registered in the State of Maryland, acceptable to the Owner and the Engineer.

B. Registered professional engineer of the discipline required for the specific service on the Project, currently licensed in the State of Maryland.

1.03 SURVEY REFERENCE POINTS

A. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.

B. Make no changes or relocations without prior written notice to the Engineer.

C. Report to the Engineer when any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.

D. Require surveyor to replace Project control points which may be lost or destroyed at no additional cost to the Owner.

1.04 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of two permanent bench marks on site, referenced to data established by survey control points.

B. Record locations, with horizontal and vertical data, on Project Record Documents.

C. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:

1. Site improvements:
    a. Stakes for grading, fill and topsoil replacement.
    b. Utility slopes and invert elevations.
2. Batter boards for structure.
3. Building foundation, column locations and floor levels.
4. Controlling lines and levels required for mechanical and electrical trades.
5. Controlling lines and grades for all utility installations.

D. From time to time, verify layouts by same methods.

1.05 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. Surveys for Record Drawings. A copy of all survey information shall be submitted in the current AutoCAD Document (.DWG).

1.06 SUBMITTALS

A. Submit name and address of Surveyor and professional engineer to the Engineer.

B. On request of the Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by registered engineer or surveyor, licensed in the State of Maryland, certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

D. Submit drawings showing locations of all structures constructed. This drawing shall be included with the project record documents.

E. Submit cut sheets for all utility work to Project Engineer for review. Cut sheets shall include all required invert and rim information, indicate the applicable vertical datum and benchmark used, and be signed and sealed by Qualified engineer or registered land surveyor registered in the State of Maryland. All invert information shall be provided at a minimum 50' interval. For gravity sewers, one cut sheet shall be provided per manhole run.

1.07 RECORD DOCUMENTS

A. Contractor shall be responsible for recording, keeping and monitoring Record Drawings of work constructed in the field. Record Drawings will be kept on hand in the Contractor's field office for inspection by the Engineer. Two sets of initial draft Record Drawings shall be issued to the Engineer no later than 14-days from the date of substantial completion.

1. The Contractor shall enter changes and corrections on one set of Contract Drawings immediately during the project progress. The record drawings shall indicate, in addition to all interior changes and corrections, the actual location referenced from two permanently fixed surface structures of all subsurface utilities installed or uncovered by him. All piping inverts at valves, fittings, and every 100' station. Field measure locations using existing utility poles, pavement, or GPS survey coordinates. All locations should be documented in the Record Documents and be verified in witness of the Engineer's project representative.

B. After restoration and substantial completion, the Contractor shall field survey, and record on the drawings the following information:

1. Underground Piping valve boxes.
2. Tanks, Wastewater Treatment Plant, and Electrical
    a. Dimensions for all finished concrete pads with locations of equipment shall also be provided along with record drawings of control and electrical cabinets. All piping in and out of the water treatment plant building should be located with inverts at the building foundation. All elevations and locations shall be documented and verified in witness of the Engineer's project representative.

C. If the Contractor fails to maintain the record drawings as required herein, final payment, with respect to the Contract as a whole, will be withheld until proper record drawings have been furnished to the Engineer.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION (Not Used)

Not used.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Shop drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills or material and other data prepared by the Contractor, his subcontractors, suppliers, or manufacturers which illustrate the manufacturer, fabrication, construction and installation of the work, or a portion thereof.

B. All costs necessary for compliance with the requirements of this Section of the Specifications shall be included under the lump sum price bid.

C. Detailed shop drawings, data, literature for fabricated materials or equipment to be incorporated in the work shall be submitted to the Engineer for review for general compliance with the Project Manual before fabrication. The Contractor shall obtain and check manufacturer's shop drawings, certified prints and other pertinent data for conformance with all requirements of the Plans and Specification and in ample time to permit satisfactory progress of the work. After the completion of such checking and verification by the Contractor, the Contractor shall sign or stamp such drawing, which stamp shall state as follows:

Specification Section _____

Checked by _____
(Contractor's Name)

Signed by _____
(Checker's Name)

D. All data, drawings and correspondence from subcontractors, manufacturers or suppliers shall be routed through the Contractor. The Engineer shall review only such data and details as are transmitted to him by the Contractor. All correspondence from the Contractor to the Engineer shall refer to the appropriate section of these specifications containing the subject matter of the inquiry.

E. All shop drawings shall be in conformity with all requirements of the plans and specifications. All shop drawings, except diagrams, brochures, schedules and illustrations, shall be to an appropriate scale, no smaller than 1/8 inch = 1 foot 0 inches, and shall give all dimensions necessary for installation and incorporation in the work.

All shop drawings shall be accurate and complete, showing outline and section views, details, materials, accessories, appurtenances and related items. Shop drawings showing piping and conduit systems shall incorporate sufficient views to show all fittings and specialties including locations and spacing of hangers and supports. Piping and/or conduit systems 3–inches in diameter and smaller may be shown as single line. Equipment and specialties installed within and/or connected to piping and conduit systems shall be cross–referenced to equipment and specialty shop drawings by shop drawing identification number, manufacturer name, catalog or model number, and equipment numbers shown on the plans. Electrical shop drawings shall include, but are not necessarily limited to, complete terminal identification diagrams and schedule, complete point–to–point interconnection diagram, complete single line and elementary wiring diagrams for all power, signal, control and lighting systems, together with panel layout drawings. Terminal point and wire identification on all working drawings shall be identical to related terminal point and wire identifications on equipment and panels, and absolutely no deviation from this requirement will be permitted.

F. The Contractor shall submit to the Engineer a minimum of twelve (12) copies of shop drawings and approval data plus any additional number required for the Contractor's use. The Engineer will retain eight (8) copies of each submittal and return four (4) copies to the Contractor. The Engineer's notation of the action taken will be noted on all of the returned copies. At the time of each submission, the Contractor shall call to the Engineer's attention, **in writing**, any deviations that the shop drawings may have from the requirements of the Plans and Specifications.

G. Upon review by the Engineer of the above drawings, lists, samples and other data the same shall become a part of the Contract, and the fabrications furnished shall be in conformity with the same, provided that the review of the above drawings, lists, specifications sample or other data shall in no way release the Contractor from his responsibility for the proper fulfillment, by any fabrication, or the requirements of this Contract.

H. Corrections or comments made on the shop drawings during the Engineer's review do not relieve the Contractor from compliance with the requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Project Manual. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, and in performing his work in a safe manner. If the shop drawings deviate from the Project Manual, the Contractor shall advise the Engineer of the deviations, in writing accompanying the shop drawing, including the reasons for the deviations, and shall request deviation from the Project Manual.

I. The Contractor's attention is specifically directed to the fact that no work shall be fabricated, nor equipment or materials ordered, nor any construction performed, prior to approval by the Engineer of shop drawings applicable thereto. Construction performed in violation of this requirement will be neither approved nor certified for payment until

applicable shop drawings have been submitted and approved. If the Engineer so directs, the Contractor shall disassemble and remove any such construction performed prior to approval by the Engineer of shop drawings applicable thereto, and the Contractor will be allowed no additional compensation nor extension of contract time. If any equipment or materials are ordered by the Contractor prior to submission and approval of shop drawings he does so at his own risk.

J. It shall be the responsibility of the Contractor to make all the necessary changes in other items, which result from deviations or changes requested by the Contractor and approved by the Engineer, so that all items perform the requirements and intent of the Project Manual.

K. The shop drawings are intended to be utilized by the Contractor for additional fabrication, assembly and erection data. The shop drawings do not change or supersede the Plans and Specifications except in specific cases when the Contractor requests in writing and receives approval in writing for a deviation from the Plans and Specifications. The Contractor's request for a change shall give, in detail, the specific change requested and shall state the reason for the change. Changes requested by the Contractor and approved by the Engineer shall not be construed to include approval of any change except the changed details specifically requested and approved.

L. The Contractor will also submit to the Engineer for review, with such promptness as to cause no delay in work, all samples required by the Project Manual. All samples shall have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers, and the use for which intended.

M. After review by the Engineer, shop drawings shall be returned to the Contractor marked as follows: APPROVED, APPROVED AS NOTED, REVISE AND RESUBMIT, or REJECTED. Unapproved shop drawings (i.e., REVISE AND RESUBMIT or REJECTED) shall be returned to the Contractor for necessary modifications; only two (2) copies of unapproved shop drawings will be returned. Subsequently, the Contractor shall submit a minimum of ten (10) copies of complete, revised shop drawings to the Engineer for approval.

N. The turnaround time by the Engineer on shop drawings will be: 14 days from date of receipt for shop drawings pertaining to Divisions 1 through 14 and 21 days from date of receipt for Divisions 23 and 26 (Mechanical & Electrical items).

O. Within fourteen (14) days of the Preconstruction Conference, the Contractor shall submit a list of all shop drawings to be submitted. This list can then be used as a check to ensure that all items are submitted.

1.02 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall furnish the Engineer four (4) bound paper copies of a complete instruction manual for installation, operation, maintenance and lubrication of each component of mechanical and electrical equipment. The operation and maintenance manual shall be submitted at least ninety (90) days prior to the anticipated completion of the project.

B. Manuals shall include operating and maintenance information on all systems and items of equipment. The data shall consist of catalogs, brochures, bulletins, charts, schedules, equipment numbers, wiring diagrams and assembly drawings which shall describe location, operation, maintenance, lubrication, operating weight, lubrication charts showing manufacturer recommended lubricants for each rotating or reciprocating unit and other necessary information for the Owner to establish a complete maintenance program.

1. Manuals shall include a complete and detailed listing describing routine maintenance for each time interval: daily, weekly, monthly, quarterly, semi–annually and yearly. Routine maintenance shall include lubrication, adjustments, inspections, calibrations, etc., and a list of acceptable equivalent lubricants from at least three (3) different major manufacturers whose products are locally available. A manufacturer and/or vendor responsible such as "see instruction manual" will not be acceptable.

C. Lubrication Chart and Lubrication

1. The Contractor shall furnish the Owner a lubrication chart for all equipment furnished or installed by him. The chart shall include the following for each item of equipment:
   a. Name of the item.
   b. Location of the item.
   c. Each point of lubrication on the item.
   d. For each point of lubrication, the identification of the lubricant recommended and the recommended frequency of lubrication.
2. The information on the chart shall be developed from manufacturers' printed data or from manufacturers' specific recommendations.
3. The identification of the lubricant by manufacturer's name and product identification (such as Mobil X421) shall be furnished. The name of the manufacturer to be used will be furnished to the Contractor by the Owner.
4. Following the initial operation of the equipment the Contractor shall re-lubricate, changing and adding lubricants, at the intervals or frequency as recommended by the manufacturer until final acceptance.

D. The following items shall also be submitted:

1. Two (2) prints of one (1) 8x10 color photograph of each major piece of equipment.
2. Name of manufacturer with address and phone number for service and parts.
3. Name, address and phone number of the nearest service representative for the manufacturer.
4. Complete "nameplate" data including serial number for each piece of equipment.
5. A list of spare parts including part number and other information needed to order parts.
6. Weight of individual components of each piece of equipment weighing over 100 pounds.
7. Complete electrical wiring diagrams.

E. Where an O&M manual includes information on equipment not supplied or installed, the extraneous information shall be marked out to avoid confusion.

F. Where an O&M manual contains a written warranty or guarantee, it shall be certified to meet the minimum length of time and requirements defined in the Project Manual.

1.03 ELECTRONIC O&M DATA

A. In addition to the printed operations and maintenance materials specified above, the Contractor shall furnish all specified operations and maintenance materials in electronic format prior to Substantial Completion. Electronic equipment manual files shall be submitted in Adobe Acrobat Reader (.PDF) format.

B. Electronic files shall be submitted on one or more USB flash drives. Two sets of USB flash drives shall be provided, one for Owner and one for Engineer. USB flash drives shall be labeled with the project name, supplier, equipment identification and specification section.

C. In addition to the complete manual submitted in PDF format, the supplier shall furnish electronic files containing the following information in Microsoft Word (.doc).

1. Operation Description – Discuss operational procedures for the equipment supplied. Operational procedures shall include “startup procedures,” “normal operation,” “automated operation,” and “shutdown procedures.” Where multiple modes of automatic operation exist, describe each mode separately.
2. Controls – Provide a table outlining the controls provided for the unit. Utilize two columns in the table. The left-hand column shall indicate the location of the control (e.g., local to the pump, remote control panel, etc.).

In the right-hand column describe the control and its function.

3. Troubleshooting – Provide a troubleshooting table with three columns entitled “Problem,” “Possible Causes,” and “Corrective Action.” Under the “Problem” column, identify possible problems that may occur with the equipment or system including but not limited to, all malfunctions that can be expected for the equipment and all alarm indications provided by the system. Under the “Possible Causes” column, identify the causes that may be the root of each “problem.” Under the “Corrective Action” column, provide direction to verify and rectify / repair the “Problem.”
4. Preventive Maintenance – Provide a preventive maintenance table containing headings for “Daily,” “Weekly,” “Monthly,” and “Annual” (or other period as required) maintenance requirements. Under each heading, indicate visual inspections, procedural inspections, calibration routines, lubrication, and all other manufacturer-suggested preventive maintenance procedures required for the equipment or system. List recommended lubricants and any special tools required for the recommended maintenance.
5. Nameplate Data – Provide nameplate data tables consisting of two columns. In the left-hand column, indicate the equipment name, equipment designation, manufacturer, model number, serial number, year installed, dimensions, min and max speed, min and max torque, measurement range, accuracy, and all other data that may assist maintenance persons in identifying, replacing, and maintaining the piece of equipment. Provide the appropriate values and designations in the right-hand column. Provide a separate nameplate data table for each major system component, including gear reducers, motors, etc. Motor nameplate data tables shall include as a minimum, manufacturer, model, serial number, enclosure type, voltage, speed, service factor, frame size, NEMA design, and insulation class.
6. Manufacturer and Sales Representative Information – Indicate the equipment manufacturer name, mailing address, telephone number, fax number, email address, website address, and contact person’s name. Provide the same information for the local manufacturer’s representative who supplied the equipment.

D. PLC and HMI data files to be provided on USB flash drives in their native format and PDF report format where applicable. These USB flash drives are to be provided with O&M and updated when any program change is made during warranty period.

1.04 CONSTRUCTION SCHEDULE

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

B. The CPM shall be done in Primavera software (or compatible if acceptable by Owner) and shall show the schedule for completion of each major item broken down into tasks – one for each section of the specifications, e.g., excavation, concrete, HVAC, etc.

C. The Construction Schedule shall be submitted within ten (10) days after the Notice to Proceed.

D. The CPM shall be updated monthly to reflect actual progress versus original schedule. This CPM shall be used to document any additional time requested for changes in the scope of work. Time extension requests will only be reviewed if justification is given by the Contractor and shown to affect the critical path.

1.05 BREAKDOWN OF LUMP SUM PRICES (SCHEDULE OF VALUES)

A. Within ten (10) days of the Notice to Proceed, the Contractor shall submit, for approval, a breakdown into construction categories of his lump sum bid price. This breakdown shall add up to the full 100 percent value of his lump sum bid, and all parts of it shall be covered by the Performance Bond. The breakdown shall be used for the purpose of arriving at a basis for monthly estimates. The Mobilization category shall be limited to five (5) percent of the Total Base Bid.

1.06 RECORD DRAWINGS

A. During the progress of the job, the Contractor shall keep a careful record at the job site of all changes and corrections to the information shown on the Drawings. The Contractor shall enter such changes and corrections on one set of Contract Drawings immediately. The record drawings shall indicate, in addition to all interior changes and corrections, the actual location referenced from two permanently fixed surface structures of all subsurface utilities installed or uncovered by him. At the time of beneficial occupancy of each facility involved under the Contract, the Contractor shall submit to the Engineer one set of record drawings showing the aforementioned data. If the Contractor fails to maintain the record drawings as required herein, final payment, with respect to the Contract as a whole, will be withheld until proper record drawings have been furnished to the Engineer.

B. The Contractor shall keep one copy of all Project Manual, Change Orders, RFIs, and approved Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These shall be available to the Engineer and shall be delivered to him upon completion of the Project.

1.07 SUBMISSION OF MANUFACTURER'S CERTIFICATES

A. General:

1. The Contractor shall submit Manufacturer's Certificates for the installation of those items of major equipment named in the various sections of specifications and in accordance with Section 01 87 13.
2. Such Manufacturer's Certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction.

B. Manufacturer's Representative:

1. The definition of "manufacturer's representative" shall be as follows: a representative from the manufacturer's plant, familiar with the actual problems of manufacturing, installing and operating the particular equipment or product and with enough years of experience in this field to determine the successful operation of the equipment or product. Sales representatives or agents of the manufacturers will not be acceptable.
2. As related to his obtaining the manufacturer's certificates, the Contractor shall include in this contract price the cost of furnishing competent and experienced manufacturer's representatives who shall represent the manufacturer on equipment and products furnished and listed under this Contract, to assist the Contractor to install, adjust, start up and test the equipment and products in conformity with the Project Manual. After the equipment and products have been operated through the trial period for each phase of construction and before being put into permanent service by the Owner, such manufacturer's representative shall make all adjustments and tests required to provide that such equipment and products are in proper and satisfactory operating condition and meet the requirement for issuing the manufacturer's certificate.

1.08 WARRANTY SUBMITTALS REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer’s warranty period shall be concurrent with the Contractor’s for a period of one year from Substantial Completion, unless otherwise specified in the individual specification.

B. Copies of all approved equipment warranties shall be bound in accordance with Section 01 78 36.

C. All equipment warranties shall be received and approved prior to approval of the final payment application for the project.

1.09 OPERATING INSTRUCTIONS

A. Particular sections of these General Requirements require that the Contractor furnish qualified personnel to instruct Plant personnel in the proper operation and maintenance of equipment and systems provided in this Contract. Such instruction periods shall be in accordance with the requirements of the individual sections of the General Requirements, Section 01 87 13, and with the following paragraphs.

B. When specified in individual sections of these specifications, upon completion of all work and testing for a particular section of the General Requirements, the Contractor shall furnish, at no extra cost to the Owner, the necessary manufacturer's engineers, representatives, technicians, skilled labor and helpers and shall operate all systems and equipment for the specified instruction period. During this period, the manufacturer's representatives shall fully instruct the Engineer and/or his representatives and the Plant personnel in the operation, maintenance, lubrication and adjustment of all systems and equipment.

C. If the Operation and Maintenance Manuals specified herein are not available at the time of the instruction period, the Contractor shall provide the Engineer with one copy of the manufacturer's operation literature for each system or item of equipment. Installation and operating sheets or booklets normally shipped with equipment may be used for this purpose.

D. The Contractor shall schedule the instruction period for a time mutually agreeable with the Engineer and the Owner. A minimum of ten (10) days' notice shall be provided.

E. All training may be video taped by the Owner.

1.10 PROGRESS PHOTOGRAPHS

A. The Contractor shall furnish the Owner with photographs; the cost such shall be included in the lump sum bid. Photographs shall be taken before the site has been disturbed and on an average of once a month during construction, and at the completion of the work. They shall be clearly marked to orient the photograph as to the portion of the work and state the date the photograph was taken. A minimum of twelve (12) high-definition photographs shall be taken each month and provided to the Owner, along with a USB flash drive containing the images.

1.11 LIST OF SUBCONTRACTORS

A. The Contractor shall submit a list of subcontractors for approval with their bid.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 35 00

SPECIAL PROCEDURES

1.01 GENERAL:

A. The following Special Procedures shall take precedence over the Plans and other Sections of these specifications.

B. This section includes:

1. Safety
2. Codes, Rules, Permits and Fees
3. Time for Completion and Liquidated Damages
4. Working Period and Overtime
5. Interface with Existing Facilities
6. Contractor's Sequence of Construction

1.02 SAFETY:

A. The Contractor shall comply, within the prices bid and without extra cost to the Owner, with all safety regulations or determinations issued by any agency of the Federal Government, including OSHA and the State of Maryland.

1.03 CODES, RULES, PERMITS AND FEES

A. General:

1. Local, State and Federal permits secured by the Owner will be included in DIVISION 00 Procurement and Contracting Requirements or will be provided to the prospective Bidders by Addenda. The Contractor shall comply with the provisions of all such permits, and the cost of all work dictated by such permits shall be included in the prices bid.
2. The Contractor shall give all necessary notices, obtain all permits (except those referenced above) and pay all governmental taxes, fees and other costs in connection with the work, file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction, obtain all required Certificates of Inspection and Approval for the work and deliver same to the Engineer, except as otherwise noted herein.

B. Compliance: All materials furnished, and all work installed shall comply with the requirements of all governmental departments having jurisdiction.

1.04 INTERFACE WITH EXISTING FACILITIES

A. Work shall be accomplished in a manner that minimizes interference with the operation of the treatment plant while it is in service.

B. All operational functions in the existing treatment plant shall be performed by Owner **personnel**, or their designated representatives, unless otherwise authorized.

C. Connections to existing pipes and structures shall be scheduled and coordinated in advance with the Owner and the Engineer. It may be necessary to make connections during the night hours or weekends. No claim for extra compensation or extension of contract time will be allowed on account of the necessity for connections to be made during normal "off" hours. Permission of the Owner shall be obtained by the Contractor prior to making any connections to the existing system.

D. When the Contractor desires certain existing electrical and/or mechanical functions to be interfaced, he shall inform the Owner and Engineer, in writing, a minimum of five (5) working days prior to the date he desires those interfaces to be made. The Contractor shall not alter the settings of or connect or disconnect any existing electrical or mechanical equipment without the approval of the Owner.

1.05 CONTRACTOR'S SEQUENCE OF CONSTRUCTION

A. The Contractor is responsible for all construction sequencing. The Contractor shall, in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES, submit and obtain approval of his construction schedule. A fully detailed and comprehensive CPM schedule with critical path items so noted shall be submitted within ten (10) days of the notice to proceed and found acceptable to the Owner and Engineer. Approval of updated monthly CPM schedules will be a pre-condition for approval of payment applications. Acceptance of this plan by the Engineer or the Owner denotes only lack of objection at the time and in no way implies that the Engineer or the Owner guarantees that particular sequence of construction as proposed by the Contractor will in fact work.

B. As construction proceeds, should the Contractor's sequence of construction cause operational problems that were unforeseen at the time of approval, the Engineer or the Owner reserves the right to withdraw the previous approval and require the Contractor to submit and obtain approval of an amended sequence of construction. The sequence of construction will be updated monthly.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 CODES, RULES, PERMITS AND FEES

A. General:

1. The Owner shall obtain the following permits:
   a. MDE Sewerage Construction Permit
   b. Office of the State Fire Marshall – Approval
   c. Worcester County Soil Conservation District – Approval
   d. Worcester County Stormwater Management Waiver
2. The Contractor shall obtain the following permits (non-inclusive):
   a. Other Permits as Necessary
3. Local, State and Federal permits secured by the Owner will be included in Special Provisions or will be provided to the prospective Bidders by Addenda. The Contractor shall comply with the provisions of all such permits, and the cost of all work dictated by such permits shall be included in the prices bid.
4. The Contractor shall give all necessary notices, obtain all permits (except those referenced above) and pay all governmental taxes, fees and other costs in connection with the work, file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction, obtain all required Certificates of Inspection and Approval for the work and deliver same to the Engineer, except as otherwise noted herein.

B. Compliance: All materials furnished, and all work installed shall comply with the requirements of all governmental departments having jurisdiction.

C. The Contractor is hereby advised that he will be subject to periodic unannounced erosion and sediment control inspections by the Maryland Department of the Environment and may be subject to fines for placing soil, dirt, mud, rocks, debris, or any type of sediment in a position where it is likely to pollute the Waters of the State.

1.02 THIRD PARTY INSPECTIONS AND TESTING

A. See Section 01 45 29 for Third Party Inspections and Testing requirements.

1.03 STANDARDS

A. Any reference to standards in the Project Manual shall always imply the latest issue in effect including all revisions at the time bids are taken, of said standards unless otherwise stated.

B. Abbreviations for various organizations which may be used in these Specifications are as follows:

Abbreviation	Organization
AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AFBMA	Anti–Friction Bearing Manufacturers Association
AIA	American Institute of Architects
AIMA	Acoustical and Insulating Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
ASME	American Society Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CS	Commercial Standard
FS	Federal Specification
IEEE	Institute of Electrical and Electronics Engineers
ILI	Indiana Limestone Institute
MBM	Thousand feed, board measure
NAAMM	National Association of Architectural Metal Manufacturers
NBHA	National Builder's Hardware Association
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
PCI	Prestressed Concrete Institute
PS	Product Standard of NBS
SDI	Steel Door Institute

SPBI	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council
SMAC	Sheet Metal & Air Conditioning Contractor's National Association
TCA	Tile Council of America
UL	Underwriter's Laboratories
WWPA	Western Wood Products Association

1.04 VERIFICATION OF DIMENSIONS

A. The Contractor shall be responsible for field verification of all dimensions of existing facilities and other items which are shown on the Contract Drawings.

B. The Contractor shall be responsible for cross checking dimensions between different drawings as facilities are being laid out. Any discrepancies shall immediately be brought to the attention of the Engineer.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.01 LABORATORY

A. Contractor shall select, employ and pay for services of an Independent Testing Laboratory to perform specified inspection, sampling and testing where specified in the various sections of the specifications.

1. Contractor shall coordinate with laboratory to facilitate execution of its required services.
2. Employment of laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.
3. Contractor shall submit to the Engineer the name and qualifications/certifications of the Independent Testing Laboratory for review.

1.02 LABORATORY DUTIES

A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction.

1. Comply with specified standards.
2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify Engineer of observed irregularities or deficiencies of work or products.

D. Promptly submit electronic PDF to Owner and Engineer and three (3) hard copies of written report of each test and inspection to Engineer Field Representative. Each report shall include:

1. Date issued.
2. Project title and number.
3. Testing laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.

5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in the Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by Engineer.

E. Perform additional tests as required by Engineer or the Contractor.

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the Work.

1.04 CONTRACTOR RESPONSIBILITIES

A. Coordinatewith laboratory personnel and provide access to Work.

B. Furnish incidental labor and facilities:

1. To provide access to Work to be tested and to maintain traffic in order to provide laboratory personnel a safe work site.
2. To obtain and handle samples at Project site or at source of product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

C. Inspection and testing exclusively for the Contractor’s convenience shall be the sole responsibility of the Contractor, at no additional cost to the Owner.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 FIELD OFFICE

A. The Contractor shall provide, within the lump sum price bid and without extra cost to the Owner, a suitable field office in an approved location on the site of the project for the exclusive use of the Owner and Engineer. The office shall be a trailer or suitable building set up, equipped and made ready for use prior to the beginning of work on the project and shall remain until all field records pertinent to the project have been completed. The Contractor shall, within the lump sum price bid and without extra cost to the Owner, pay all costs of operating and maintaining the field office including but not limited to charges for electric and telephone service, sanitary facilities, heating, fuel oil, etc.

B. The field office shall be equipped with one fire extinguisher, two office-type desks and chairs, one drafting board, one safe, one four-drawer fire resistant file cabinet, twelve (12) chairs, one conference table, one copier/scanner machine capable of interfacing with Engineer provided PC, and one high speed internet connection. The field office shall be heated during cold weather and have sufficient window area to furnish natural light. The windows shall be constructed to open and close to allow ventilation. The office shall be suitably air conditioned if used during summer months. The office will be provided with neat sanitary toilet accommodations. Minimum office floor space shall be 320 square feet.

C. The Contractor shall maintain the field office in good condition and appearance for the duration of the project. It shall be removed when project is complete and the site cleaned up and left in a neat and acceptable manner.

D. The Contractor will not receive any monies for the trailer until the trailer is approved by the Owner.

1.02 ELECTRIC POWER

A. It shall be the obligation and responsibility of the General Contractor to provide and maintain temporary facilities for furnishing light and power necessary for operations under the General Contract and to make all necessary arrangements therefore, including all required connections, ordering the meter, and paying all fees and inspection charges.

B. The General Contractor shall make the temporary power facilities available to any and all approved Subcontractors, for their use in connection with their Contracts, and may charge each Subcontractor for such service an amount not to exceed a fraction of the cost of the project. Removal of temporary facilities shall be by the General Contractor. The installation and meters shall remain until need for same by each Subcontractor has ceased or until completion of the General Contract.

1.03 TEMPORARY HEAT AND VENTILATION

A. It shall be the obligation and responsibility of the General Contractor to provide and maintain temporary heat by means of portable electric, oil or gas-fired units. The General Contractor shall provide and pay for all fuel and electricity used in the temporary facilities and shall provide proper smoke pipes or other means to prevent smoke or smudge from marking up walls, ceilings or other parts of equipment.

B. Should the temporary heating facilities require electric service, the General Contractor shall provide the necessary wiring and power.

C. After their installation and testing, the permanent heating system facilities may be used for temporary heat, it shall be the responsibility of the General Contractor to guarantee the heating system for a period of two years following final acceptance of the General Contract or beneficial occupancy of the General Contract, whichever comes first. It also shall be the responsibility of the General Contractor to replace all filters before the final acceptance of the General Contract.

D. It shall be the responsibility of the General Contractor to repair any damage to heating and ventilating equipment suffered as the result of use by the General Contractor.

1.04 WATER SUPPLIES

A. The Contractor shall provide an adequate supply of potable water for use in the field office and on site for construction activities. Owner will make available potable water; Contractor will pay the cost of potable water used. The Owner will make available non-potable (plant) water during the construction of this facility at no charge The Contractor will be responsible for any and all temporary piping and connections required to obtain potable or non-potable water.

1.05 SANITARY FACILITIES

A. The Contractor shall provide and maintain approved sanitary facilities for the full term of the Contract.

1.06 CONSTRUCTION SIGN

A. The Contractor shall provide two (2) construction signs to be displayed throughout the duration of construction. Engineer to provide format, see Project Manual Section 00 73 10.

B. The Contractor shall be responsible for placing and removing the sign on the job site as directed by the Owner.

1.07 FIELD CONDITIONS AND MEASUREMENTS

A. The Contractor shall base all measurements, both horizontal and vertical from established benchmarks and monuments. The Contractor shall be responsible for field verification of all dimensions and conditions at the job site.

B. Should the Contractor discover any discrepancy between actual conditions and those indicated, which prevent following good practice or the intent of the Contract Drawings and Specifications, he shall notify the Engineer and shall not proceed with his work until he has received instructions from the Engineer.

C. No claims shall be made for extra payment or extensions of Contract completion time if the Contractor fails to notify the Engineer of any discrepancy before proceeding with the aspect of the work.

1.08 PROTECTION OF PERSONS AND PROPERTY

A. The Contractor shall be responsible for initiating, maintaining and providing supervision of safety precautions and programs in connection with the work including, but not limited to, all legally required precautions and programs.

B. The Contractor shall take all reasonably necessary precautions for safety of, and shall provide all reasonably necessary protection to prevent damage, injury or loss to: (1) employees on the work and other persons who may be affected thereby; (2) the work, materials and equipment to be incorporated therein; and (3) other property at or adjacent to the site.

C. The Contractor shall give all notice and comply with all applicable laws, ordinances, rules, regulations, and orders of public authorities bearing on the safety of persons and property and their protection from damage, injury or loss arising from Contractor's operations hereunder.

D. The Contractor shall be liable for damage or loss (other than damage or loss to property insured under the property insurance provided or required by the Project Manual to be provided by the Owner) to property at the site to the extent caused in whole or in part by the Contractor, a Subcontractor of the Contractor or anyone directly or indirectly employed by either of them, or by anyone for whose acts they may be

liable, except damage or loss attributable to the acts or omissions of the Owner, the Owner's separate contractors or anyone directly or indirectly employed by them or by anyone for whose acts they may be liable and not attributable to the fault or negligence of the Contractor.

1.09 CONTRACTOR STORAGE AND WORK AREAS

A. The Contractor will be responsible for providing storage and work areas for use by the Contractor for parking of workmen's vehicles, storage of materials, tools, field offices, equipment and other items necessary for construction. The exact limits of the areas will be designated in the field by the Owner during the Pre-bid Conference. The Contractor shall be fully responsible for the security of these areas, including fencing, and other means of security. Under no circumstances will the Owner be responsible for the security of any property belonging to the Contractor, his subcontractors, or any of his work forces.

B. Contractor shall maintain all staging areas including grass cutting.

1.10 DRAINAGE

A. The Contractor shall keep all existing surface and subsurface drainage and water courses unobstructed, or provide equal courses effectively placed, and prevent accumulations of surface water.

1.11 SOIL EROSION AND SEDIMENT CONTROL

A. Adequate control of soil erosion and sedimentation of both a temporary and permanent nature on areas disturbed by this work shall be provided at no extra cost to the Owner, subject to the approval of the Engineer.

B. It shall be the Contractor's responsibility to adhere to the approved Sediment and Erosion Control permit issued by the Worcester County Conservation District. The contractor shall also be responsible for all monitoring and documentation required by the NPDES stormwater discharge permit.

1.12 SAFETY

A. Precaution shall be exercised at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery and equipment shall be guarded and all hazards shall be eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law.

B. The Contractor shall comply with the U.S. Department of Labor, Safety and Health Regulations for Construction promulgated under the Occupational Safety and

Health Act of 1970 (Public Law 91-596) and under Section 107 of the Contract Work Hours and Safety Standards (Public Law 91-54).

C. Nothing in the Occupational Safety and Health Act of 1970 shall be construed to supersede or in any manner affect any workmen's compensation law or to enlarge or diminish or affect in any manner the common law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of or in the course of employment.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 51 00

BYPASS PUMPING SYSTEM (IF NECESSARY)

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. The Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc., to implement temporary bypass pumping systems as needed for the purpose of diverting the treatment plant flow around the work area for the time that is required in order to comply with the Contractor's order of work and to maintain the treatment works in operation.

1.02 RELATED SECTIONS

A. Section 01 11 00: Summary of Work

B. Section 01 33 00: Submittal Procedures

C. Section 01 40 00: Quality Requirements

1.03 SUBMITTALS

A. The Contractor shall provide a specific detailed description of each proposed bypass pumping system at least 30 days prior to the intended full time use of any bypass pumping system.

B. The submittal shall include, but not be limited to, the following:

1. A written description of the plan.
2. Quantity, capacity, and location of all pumping equipment.
3. Pump performance curves.
4. The size, type and routing of all suction and discharge pipes and the means of connecting the system.
5. Description of controls and emergency power supply.

C. Engineer shall review, but not approve, the bypass pumping system submittal. Engineer shall review for compliance to performance requirements only.

1.04 BYPASS PUMPING COORDINATION MEETING

A. Once the bypass pumping submittal has been reviewed by the Engineer and at least 14 days prior to the intended full time use of any bypass pumping system, a coordination meeting shall be held. Participants shall include: Contractor, Owner and Engineer.

B. No bypass pumping shall take place until the submittal has been reviewed by the Engineer and the coordination conference has taken place.

1.05 PERFORMANCE REQUIREMENTS

A. The design, installation and operation of the temporary bypass pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction, including local noise ordinance.

B. The plant must be able to convey a minimum of 1.85 mgd of flow at all times. Bypass pumping capacity must be provided such that the temporary bypass pumps convey a minimum of 1.85 mgd of flow and shall match influent flow (have variable speed). A backup pump of the same capacity as the largest temporary bypass pump in service must also be provided. The bypass pumping system must be manned continuously (24 hours per day, 7 days per week) during operation by a representative of the Bypass Pumping System Supplier. In the case of a pump failure, the backup pump shall be placed into service within one hour of the failure of the primary pump. The supplier shall be capable of having a new backup pump on site within six hours of a pump failure. Adequate fuel supply for one day of operation must be on site.

C. The bypass pumping system shall be tested in the presence of the Engineer and Owner to demonstrate a state of readiness of all of the equipment.

1.06 SPECIAL PRECAUTIONS

A. The Contractor is notified that influent distribution at the plant is critical and must be maintained at all times. If any spills of raw wastewater occur due to the failure of the Contractor to maintain the temporary pumping when needed, the Contractor shall be responsible for any fines levied on the Owner by the state, federal or any other applicable agency.

PART 2 – PRODUCTS

2.01 PUMPS

A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the specified flow range without surging, cavitation or vibration. The pump shall not overload the driver at any point on the pump operating curve. The pump shall

be suitable for use with raw unscreened sewage and trash. The pump shall be a self-contained unit designed for temporary use.

B. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system or they can be submersible pumps. The pumps shall be diesel powered.

C. Pumps that are engine driven shall be on skid bases with a centralized lifting bracket and integral fuel tank. The pump shall be direct coupled to an electric start diesel engine. Provide an integral belt driven compressor to operate the air ejector priming system.

D. Contractor shall provide the necessary start-stop controls for each pump.

E. Pumps shall have variable speed to match plant influent flow.

2.02 PIPING

A. In order to prevent the accidental spillage of flows, all discharge systems must be constructed of rigid pipe with positive, leak-proof connections.

B. Pipe 12 inches and larger shall be flanged ductile iron or high density polyethylene pipe with fused joints for a leak-proof piping system.

2.03 TEMPORARY PLUGS

A. Plugs shall be inflatable and constructed of specially treated industrial fabric and reinforced neoprene. Plugs shall be equipped with steel pull rings and aluminum end clamps.

B. All plugs shall be firmly attached to a stationary object at ground level by a steel cable in order to prevent loss of plug in the pipeline.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall include furnishing oil, fuel, grease, lubricants, tools and spare parts that may be required to maintain the operation of the pump throughout the construction period, as recommended by the manufacturer. The Contractor shall be solely responsible for maintaining the temporary bypass pumps and appurtenances. At the end of the construction period, the Contractor shall remove the pump and appurtenances.

B. The pumps shall be installed for temporary use only. The Contractor shall be responsible for proper operation of the complete pumping system, which includes pump, driver, controls and appropriate pipe connections, during the construction period.

C. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

D. The Contractor shall insure that the temporary bypass pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

E. The temporary pumping system shall be placed in service a minimum of 24 hours before any work may begin and shall demonstrate continuous trouble-free operation. It shall remain operable until all components of the new structure(s) have been tested and approved for operation. At that point, the bypass system shall be shut off and regular operation of the structure(s) will begin. The bypass pumping system shall stay intact until the new structure(s) demonstrates 24 hours of continuous trouble-free operation.

F. Once written permission is issued, the Contractor shall remove all components of the temporary pumping system. The Contractor shall perform all restoration work to the satisfaction of the Owner.

END OF SECTION

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 EQUIPMENT AND PRODUCTS SPECIFIED

A. Where any item of equipment or product or system is specified, it is to be understood that equal quality equipment or products or systems, of either a named manufacturer or of an unnamed manufacturer, which meet the detailed requirements of the specifications, are intended. In each case, the equipment, product or system is subject to the approval of the Engineer as to the equality thereof. It is distinctly understood that: (1) the Engineer and the Owner are to use their own judgment in determining whether or not any item of equipment or product proposed is equal in quality to that specified; (2) the decision of the Engineer and the Owner on all such questions of equality shall be final; and (3) in the event of any adverse decision by the Engineer or Owner, no claim of any sort shall be made or allowed against the Engineer or the Owner.

B. Substituted items or items other than those named shall be equal or better in quality and performance and must be suitable for the available space, required arrangement and application. The Contractor shall submit any and all data necessary to determine the suitability of substituted items.

C. If any submitted equipment necessitates changing architectural or structural items, or electrical, water, gas, air or other utility services from the sizes, capacities and configurations shown on the Drawings, it shall be the Contractor's responsibility to bear the cost of engineering fees to analyze, design, specify and formulate the construction changes necessitated by the proposed deviations from the specified equipment and/or the Contract Drawings. All re-designs shall bear the seal and be the responsibility of a professional Engineer.

D. Substituted items are warranted by the Contractor to perform equal or better than those specified. Substituted items failing to do so will be replaced by the Contractor at no cost to the Owner. No excuses such as improper design, construction, operation, or maintenance shall be accepted.

E. The Contractor's attention is directed to the fact that the Bid Form requires that, on certain pieces of equipment, the Contractor must base his Bid on a named piece of equipment. In the Bid Form, the Contractor is allowed to offer an alternative piece of equipment for review.

1.02 "OR EQUAL" SPECIFICATIONS

A. The specifications have been subjected to prior review with the intent of removing proprietary, exclusionary or discriminating requirements other than those based upon performance, unless the requirements are necessary to test or demonstrate a specific thing or to provide interchangeability of parts and equipment.

B. In a few sections of the specifications, an item of material or equipment is specified by the name of a manufacturer without addition of the "or equal" expression, it is to be understood that these items are so specified for reasons of standardization and to provide interchangeability of parts and equipment.

C. Minor items including such articles as electrical fittings, plumbing fittings, hardware and other similar articles will be identified by one brand name to generally indicate design. For these items, a substitution of equal items are generally acceptable by the Engineer.

1.03 SINGULAR NUMBER

A. Where material, a device or part of the equipment is referred to in the singular number, it is intended that such reference shall apply to as many items of material, devices or parts of the equipment as are required to complete the installation.

1.04 EQUIPMENT UNIFORMITY

A. All pumps, blowers, valves and other multiple-unit equipment shall be, to the greatest extent possible within its category, the product of a single manufacturer.

1.05 STORAGE AND PROTECTION OF MATERIALS AND EQUIPMENT

A. All equipment and materials provided and work performed under this Contract shall be protected from damage before and after installation. The Contractor shall be responsible for work, equipment, and materials until inspected, tested and finally accepted.

B. During construction, the open ends of work shall be effectively closed with temporary covers or plugs to prevent the entry of foreign material.

C. Where permanent equipment called for under this Contract is installed before the erection of adequate protective structures, the Contractor without additional compensation, therefore, shall provide approved effective and durable covers for fully protecting such equipment against damage from the elements or from any other cause.

D. Electrical equipment shall be carefully and effectively covered with waterproof material and otherwise protected at all times from the elements.

E. All structures, machinery, equipment, piping, electric conduit, wiring and accessories and appurtenances shall be adequately supported and safeguarded against all damage or injury during performance of work under this Contract. The Contractor shall be responsible for all damage or injury resulting from his operations and shall repair such damage immediately and to the satisfaction of the Engineer and the Owner.

F. Store and protect products in accordance with the manufacturer's recommendations.

G. Uncovered Storage:

1. The following types of materials may be stored out-of-doors without cover:
   a. Reinforcing steel
   b. Piping
   c. Castings
   d. Handrailing
2. Store the above materials on wood blocking so there is no contact with the ground.

H. Covered Storage:

1. The following type of material may be stored out-of-doors if covered with material impervious to water:
   a. Rough lumber
   b. Masonry units
2. Tie down covers with rope, and slope to prevent accumulation of water on covers.
3. Store materials on wood blocking.

I. Fully Protected Storage:

1. Store all products not named above in buildings or trailers which have a concrete or wooden floor, a roof and fully closed walls on all sides.
2. Provide heated storage space for materials which would be damaged by freezing.
3. Protect mechanical and electrical equipment from being contaminated by dust, dirt and moisture.
4. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.
5. Temporarily connect equipment with built-in space heaters to a power source and keep heaters in operation.
6. Prior to installation of the units, they shall be stored at locations approved by the Engineer.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 DEFINITIONS

A. Substantial Completion: The project will be considered substantially complete when all equipment and systems have been installed and tested and the facility is ready to begin conveying raw sewage and handling waste activated sludge and solids in an automated fashion complete with alarms.

1.02 CLEANUP

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped and restored surfaces.

G. Remove waste and surplus materials, rubbish, sheds, tools and construction facilities from the site.

1.03 TOOLS, ACCESSORIES AND SPARE PARTS

A. The Contractor shall, unless otherwise stated, furnish with each type, kind and size of equipment, one complete set of any special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment.

B. Each piece of equipment shall be provided with a substantial name plate, which is securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture and principal rating data.

C. Where the Specifications require spare parts to be furnished by the Contractor, said spare parts for each item of equipment shall be kept separate and tagged to identify the specific item of equipment to which they belong, shall be packaged so as to preclude damage from handling and storage, and shall be bagged or packaged together where items are small in dimension.

1.04 LUBRICATION

A. Following the initial operation of the equipment the Contractor shall re-lubricate, changing and adding lubricants, at the intervals or frequency as recommended by the manufacturer until final acceptance.

B. The Contractor shall furnish one (1) year's supply of each type of lubricant. A typewritten list shall be furnished with the lubricants, designating the specific lubricant to be used for each piece of equipment. This is in addition to the required operating and maintenance manuals which will also contain lubrication requirements.

1.05 DELAYS AND EXTENSIONS OF TIME

A. The Contractor shall not be entitled to payment or compensation of any kind from the Owner for direct, indirect or impact damages, including but not limited to costs of acceleration arising because of hindrance or delay from any cause whatsoever, whether such hindrances or delays be reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable; provided, however, that this provision shall not preclude recovery by the Contractor of damages for hindrances or delays due solely to fraud or bad faith on the part of the Owner or his agents.

B. In the event the Contractor requests an extension of the Contract Time, he shall furnish such justification and supporting evidence as the Owner may deem necessary for a determination of whether or not the Contractor is entitled to an extension of time under the provisions of the Contract. The Owner shall base his findings of fact and decision on such justification and supporting evidence and shall advise the Contractor in writing thereof. If the Owner finds that the Contractor is entitled to any extension of the Contract Time, the Owner's determination of the total number of days' extension shall be based upon the currently approved progress schedule and on all data relevant to the extension. Such data will be incorporated into the schedule in the form of a revision thereto, accomplished in a timely manner. The Contractor acknowledges and agrees that actual delays in activities or time required to accomplish change order activities which, according to the schedule, do not affect the critical path and therefore do not have any effect upon Contract completion time, will not be a basis for an extension of time.

1.06 WARRANTY AND GUARANTEE

A. After the project is substantially complete and the Engineer has issued the Certificate of Substantial Completion, all guarantees and warranties shall commence. The Contractor is reminded that certain pieces of equipment may be installed, tested and operational before substantial completion. Applicable Contract Lump Sump prices should include any increases for extending manufacturers warranty and guarantees to cover this early start up and the normal warranty and guarantee period outlined in this section.

B. The Contractor warrants and guarantees to the Owner for a period of one (1) year following:

1. That all materials and equipment provided under this Contract are new, unless otherwise specified.
2. That all work is of good quality and free from faults and defects and in accordance with the requirements of the Project Manual.
3. That all equipment and systems and each and every part thereof, shall operate (with proper care and attention) in a satisfactory and efficient manner, and in accordance with the Project Manual.
4. That the Contractor shall, upon receipt of written notice from the Owner, promptly replace with workmanship and materials which comply with these Specifications, and re-execute, correct or repair, without cost to the Owner, all work which may be found to be not in accordance with the Project Manual.
5. That the guarantee obligations assumed by the Contractor under this Project Manual shall not be held or taken to be in any way impaired because of the Specifications, indication or approval by or on behalf of the Owner of any articles, materials, means, combinations of things used or to be used in the construction, performance and completion of the work, or any part thereof.
6. That no use or acceptance by the Owner of the work or any part thereof, nor any failure to use the same, nor any repairs, adjustments or corrections made by the Owner due to the Contractor's failure to comply with any of his obligations under the Project Manual, shall impair in any way the guarantee obligations of the Contractor under this Contract.

C. Contractor shall post a maintenance bond in the amount of 5% of the full contract value.

D. If the Contractor fails to make repairs during the guarantee period, the Owner may cause such damaged or defective work to be repaired and made good at the cost and expense of the Contractor, including, but not limited to, compensation if required for additional professional services. The Contractor shall also bear the expenses of making good all work destroyed or damaged by the correction, removal or replacement of his defective work.

1.07 TESTING OF EQUIPMENT AND SYSTEMS

A. Preliminary Testing:

1. When the Contractor has completed the installation of all equipment including electrical appurtenances, he shall perform preliminary testing on each piece of equipment.
2. Contractor shall provide for the inspection of each piece of equipment by authorized and qualified manufacturer's representatives. These manufacturer's representatives shall verify that all equipment has been installed properly.
3. Manufacturer's representatives shall verify that the individual equipment and/or components are functioning in accordance with the Project Manual.
4. The manufacturer of each piece of equipment shall provide a manufacturer's certificate in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

B. Pre-Final Testing:

1. After receipt of all manufacturer's certificates, the Contractor will be required to perform wet tests on all pieces of equipment.
2. Tanks shall be filled to maximum operating water level and allowed to stand 48 hours. Tanks shall be inspected for any noticeable leaks on the exterior of the structure or any drop in the water level in the tank. The Contractor may utilize treated wastewater effluent from the existing facility. Contractor will be responsible for furnishing piping and pumps as necessary to fill tanks. Contractor will also be responsible for disposing of water once tests are completed.
3. Pre-final testing shall include the actual running of equipment to ensure that all electric and controls are properly connected. This testing shall be done under the supervision of the manufacturer's representative.
4. Pre-final testing shall include operation of the system components with clear water for three continuous days (unless otherwise noted) and shall be completed prior to the final testing / plant startup.
    a. Clear water operation testing does not apply to electrical and control systems.
    b. Clear water operation testing is required for new systems as well as modified existing systems unless otherwise noted.

C. Satisfactory Performance:

1. Satisfactory performance is defined as the plant accepting sewage with all equipment and systems operating satisfactorily for a minimum of thirty (30) consecutive days.

2. From time to time during the operating period, the Contractor shall demonstrate, as required by the Engineer, that all equipment and systems are capable of operating throughout the full range of specified operation.

1.08 FINAL ACCEPTANCE

A. Upon completion of all work under this Contract including the testing of equipment and placing the plant in operation and operating the plant continuously for thirty (30) days, the Contractor shall request, in writing, final acceptance by the Owner.

B. Upon receipt of the request, the Engineer, the Owner, and the Contractor will make a Final Inspection of the Project to determine the status of completion as follows:

1. If the Engineer does not consider the Project to be complete, the Engineer will notify the Contractor in writing of this fact and will include the reasons why the Project is not considered complete.
2. Any items not satisfactorily completed or unsatisfactory as determined by the Engineer, shall be promptly remedied or completed.
3. Upon satisfactory correction of defects or incomplete information or work, the Engineer will certify to the Owner that the plant is finally complete.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 78 36

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Compile specified warranties and bonds.

B. Co-execute submittals when so specified.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to the Engineer for review and transmittal to Owner.

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Two each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product or work item.
2. Firm, with name of principal, address and telephone number.
3. Scope.
4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service maintenance contract.
6. Provide information for Owner's personnel:
    a. Proper procedure in case of failure.
    b. Instances which might affect the validity of warranty or bond.
7. Contractor and Subcontractors name, street address and telephone number of responsible principal.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8-1/2 inch x 11 inches, punch sheets for standard three post binder.
   a. Fold larger sheets to fit into binders.
2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
   a. Title of Project
   b. Name of Contractor

C. Binders: Commercial quality, three post binder, with durable and cleanable plastic covers and maximum post width of two inches.

1.04 WARRANTY SUBMITTALS REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) year, unless otherwise specified, commencing at the time of the completion of the conditional acceptance period.

B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under all Divisions and which have at least a ***1 hp motor or which lists for more than $1,000***. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one year warranty period even though certificates of warranty may not be required.

C. Equipment warranties shall not commence prior to the date the equipment is installed, tested, and placed into successful operation. The Contractor shall be responsible for coordinating with manufacturers and suppliers to ensure that warranty periods are effective from the date of installation or startup. If standard manufacturer warranties begin at shipment or delivery, the Contractor shall provide extended warranties or other documentation acceptable to the Owner to ensure full warranty coverage from the date of startup.

1. In the event that the equipment manufacturer or supplier is unwilling to provide a one year warranty commencing at the time of the completion of the conditional acceptance period, the Contractor shall obtain from the manufacturer, a two (2) year warranty commencing at the time of equipment delivery to the job site. This two year warranty from the manufacturer shall not relieve the Contractor of the one year warranty starting at the time of the completion of the conditional acceptance period.

D. All work shall be guaranteed for a period of one year as described in EJCDC General Condition – SECTION 7.17.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 87 13

EQUIPMENT GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Specified Elsewhere.

1. Section 09 91 00: Paints
2. Division 26: Electrical
3. Division 33: Utilities
4. Division 40: Process Interconnections
5. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment
6. Division 46: Water and Wastewater Equipment

1.02 PERFORMANCE AFFIDAVITS

A. Provide performance affidavits for products listed in the Schedule of Equipment Testing and Manufacturer's Services, included at the end of this Section, and as required in the individual technical sections.

B. Submit performance affidavits in conformance with Section 01 33 00.

C. By these affidavits, each manufacturer must certify to the Contractor and the Owner, jointly, that he has examined the Contract Documents and that the equipment, apparatus, process or system he offers to furnish will meet in every way the performance requirements set forth in the Contract Documents. Equipment design, manufacturing and assembly specifications are an integral part of the performance requirements.

D. Shop drawings will not be reviewed prior to receipt by the Engineer of an acceptable performance affidavit.

E. The performance affidavit must be signed by an officer (vice president or higher) of the basic corporation, partnership or company manufacturing the equipment, and witnessed by a notary public.

F. The performance affidavits shall be in the following format:

Addressed to:	Contractor and Owner)
Reference:	Contract No. (Project)
Text:	"(manufacturer's name) has examined the Contract documents and verified that the (product) meets in every way the performance requirements and design specifications set forth in Section (s) _____ of the Contract Documents."
Signature:	Corporate officers shall be vice president or higher (unless statement authorizing signature is attached).
Notary:	Signature(s) must be notarized.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: The construction requirements of State, County, or other political subdivision specifications exceeding the requirements of the codes, standards, and approving bodies referenced herein shall be met and complied with.

1. Both the Underwriters' Laboratories (UL) Listings and Approvals and the National Electrical Manufacturers' Associations (NEMA) stamps or seals shall be evidenced where applicable to electrical apparatus forming parts of the "mechanical" equipment.

B. Certificates and Permits: Upon completion of work, and prior to final payment, furnish to the Engineer formal certification of final inspections from authorities having jurisdiction and secure required permits, if any, from same. Additionally, prepare detailed diagrams and drawings which may be required by those authorities having jurisdiction.

C. Reference Standards: Steel Structures Painting Council.

1. Surface Preparation Specifications.
   a. SSPC-SP 6, Commercial Blast Cleaning.
   b. SSPC-SP 8, Pickling.
   c. SSPC-SP 10, Near-White Blast Cleaning.
2. Paint Application Specifications: SSPC-PA 1, Shop, Field and Maintenance Painting.

1.04 SUBMITTALS

A. Shop Drawings: Shop Drawings, Operation and Maintenance Manual, and as-built drawings shall be submitted as specified in Section 01 33 00 – SUBMITTAL PROCEDURES and as further stipulated hereinafter.

B. Submit shop drawings for the following items within thirty (30) days after Notice To Proceed:

1. All Pumps
2. Sludge Mixing Blowers
3. Sludge Holding Tanks
4. Belt Filter Press
5. Electrical Gear

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: In addition to requirements for materials handling and storage as stated in the General Conditions of the Contract, the following applies:

1. When unloading materials, equipment and machinery provide special lifting harness or apparatus as may be required by manufacturers. Handle materials, equipment and machinery in accordance with manufacturer's written instructions.
2. Store materials, equipment and machinery, both on and off site, in accordance with manufacturer's written instructions. Additionally, provide manufacturer's certificates of proper materials, equipment or machinery storage. Prior to issuance of such certificates, a manufacturer's representative shall visit the site of storage and examine materials, equipment or machinery in actual storage conditions.

1.06 JOB CONDITIONS

A. Electrical Interface.

1. Install or mount, such electrical components or apparatus as provided by product manufacturer's specified under the various sections.
2. Power wiring, including final connections of such to electrical components or apparatus of Products specified shall NOT be performed as work of Division 40, 43, or 46 but as work of Division 26 - ELECTRICAL.
3. Motor starters required under this Division of the Specifications will be provided under Division 26 of the Specifications except the motor starters specified with equipment in this Division of the Specifications.

B. Field and Shop Coat Compatibility: To insure satisfactory paint and coating performance, it is a Contract requirement that products applied in the shop and field be mutually compatible.

1. Contractor shall require fabricators and equipment manufacturers to apply shop coats that are compatible with field coats specified in Section 09 91 00 - PAINTS.

1.07 GENERAL DESIGN OF EQUIPMENT AND MACHINERY

A. All equipment and machinery furnished under this contract shall be of the latest and most improved design suitable for the service of which it is to be used. All equipment and machinery shall be designed and constructed to operate efficiently, continuously and quietly under the specified requirements with a minimum of labor, power, maintenance, renewals and repairs. The design and construction of all equipment and machinery shall be such as to permit operation with minimum noise, wear and vibration (maximum amplitude of 3.0 mils unless otherwise specified) when properly installed.

B. Ample room for erecting, repairs, inspecting and adjusting all equipment and machinery shall be provided. The design, construction and installation of all equipment and machinery shall conform to and comply with the latest safety codes and regulations.

C. The design and construction of the several units shall be such that they shall present a uniform appearance, and the arrangement shall be such that their operation shall be in harmony in every respect. Whenever possible, fittings and fixtures of the same make and model shall be used for the several units and their connections. All equipment of identical type and service shall be the product of the same manufacturer.

D. All equipment selected shall be of such size and general arrangement to suit the space in which it is to be installed.

E. The various parts of the equipment and machinery shall be of plain shape and good lines, especially designed and constructed for strength and durability. Casting shall be designed and constructed to cool uniformly without shrinking strains and shall have good sized fillets at all re-entrant corners. Sudden change of section shall be avoided.

F. Whenever possible, parts of each unit shall be made to gauge and be a duplicate of and interchangeable with the same parts of other machines of the same size and kind.

G. The workmanship shall be of the highest class throughout.

H. All assemblies shall be completely shop fabricated and structural steel parts shall be shop erected. Assemblies and structural steel parts shall be matchmarked before being disassembled for shipment. Parts shall be shipped assembled in as large unit as possible to minimize field reassembly. All parts shall be amply proportioned for all stresses which may occur during operation, and for any additional stresses which may occur during fabrication and erection.

I. Unless otherwise specified, welding shall be in accordance with the latest standard specifications for "Gas Tight Welding" of the American Welding Society.

J. Unless otherwise specified, galvanizing shall be hot-dipped, in accordance with the latest standard specifications for "Zinc Coating" of the ASTM, Serial Designation A-123.

PART 2 - PRODUCTS

2.01 MATERIAL IN CONTACT WITH POTABLE WATER

A. All materials, mechanical devices and coatings in contact with potable water shall comply with National Sanitation Foundation/American National Standards Institute Standards (NSF/ANSI) 60 and 61 and shall be inert, nontoxic, and shall not import any taste, odor or color to the water.

2.02 MATERIALS

A. Unless otherwise specified, materials shall be in accordance with the following latest Standard Specifications of the ASTM:

1.	Structural Steel:	A-36
2.	Welding Steel Pipe:	A-53
3.	Iron Castings:	A-48
4.	Babbitt:	B-23
5.	Bronze Castings:	B-30
6.	Bronze (Manganese):	B-138
7.	Bronze (Silicone):	B-98
8.	Steel Bolts:	A-307
9.	Hot Dip Zinc Coating:	A-123

B. All materials shall, if required, be tested and shall fulfill all requirements. Physical tests may be made by the Owner. The Contractor at his own expense shall furnish test pieces and samples in the number, shape, size and finish required by the Engineer. All broken material shall become the property of the Owner. The failure of test specimens to fully conform to the requirements of the specifications shall be sufficient cause for rejection of the whole melt or stock from which samples were obtained.

C. Iron castings shall be smooth, clean and free from scale, lumps, blisters and other defects. No plugging, welding or filling will be allowed.

D. The alloy grade number of all babbitt shall be that bearing alloy of a composition recommended by the manufacturer of the equipment or machinery for the service required, subject to the approval of the Engineer.

E. All bronze shall be made of new material and shall be free from objectionable imperfections. If the materials show signs of improper mixing when being machined, the castings will be rejected.

2.03 JOURNALS, BEARINGS AND KEYS

A. Journals and bearing surfaces shall be of sufficient size and properly proportioned for the least wear and to avoid heating under all conditions, and where necessary, provisions shall be made for easy removal and for proper adjustments. Journals shall be suitable boxes which, where necessary, shall be lined with babbitt metal hammered into grooves and bored in place. If bearings are of the ball bearing type, both inner and outer races as well as the balls shall be heat treated steel to resist wear. The balls shall be of ample size to carry the maximum loads with a large factor of safety to prevent flaking, spalling, or crushing. The balls shall be properly spaced and held in position by rugged continuous spacing or retainer rings.

2.04 MOTORS AND CONTROLS - GENERAL

A. Motors and controls shall conform to the latest requirements of IEEE and NEMA, and where applicable, shall be UL listed. Minimum sizes are specified with the driven equipment. Motor starting and control equipment is specified either with the motor which is controlled or in an electrical specification section. The Contractor is advised to consult all specification sections to determine responsibility for motors and controls.

B. Motors shall be designed, built and tested in accordance with the latest revision of NEMA Standard MG 1.

C. Motors shall be suitable for use under the conditions and with the equipment to which applied, and designed for operation on the electrical systems specified or indicated.

1. Motor capacities shall be such that the horsepower rating and the rated full-load current will not be exceeded while operating under the specified operating conditions. Under no condition shall the motor current exceed that indicated on the nameplate.
2. Motor sizes noted in the individual equipment specifications are minimum requirements only. It is the responsibility of the equipment manufacturers and of the Contractor to furnish motors, electrical circuits and equipment of ample capacity to operate the equipment without overload, without exceeding the rated full-load current, or overhearing at full-load capacity under the most severe operating service of this equipment. Motors shall have sufficient torque to accelerate the total WR^2 of the driven equipment to operating speed.
3. Motors shall be continuous duty type and shall operate quietly at all speeds and loads.
4. Motors shall be designed for operation on 60 hertz power service. Unless otherwise specified or shown, motors less than 1/2 horsepower shall be single phase, and motors 1/2 horsepower and larger shall be 3 phase.
5. Motors shall be mounted so that the motor can be removed without removing the entire driven unit.

D. Single phase motors smaller than 1/20 horsepower shall be ball or sleeve bearing, drip-proof, totally enclosed or explosion proof, as specified, 115 volts, permanent split capacitor or shaded pole type. These motors shall not be used for general power purposes and shall only be provided as built-in components of such mechanical equipment as fans, unit heaters, humidifiers and damper controllers.

E. Single phase motors 1/20 horsepower and larger shall be ball bearing, drip-proof, totally enclosed or explosion proof, as specified, with Class A or B insulation, as standard with the motor manufacturer; 115, 115/230, 200 or 230 volts as required; capacitor start-induction run, permanent split capacitor, or repulsion start-induction run type.

F. Except as otherwise specified in the various specification sections, 3 phase motors shall meet the requirements of this paragraph. Motors shall be NEMA design B squirrel cage induction type. Insulation shall be Class F and motor shall be rated at no greater than 50°C rise for open motors and 65°C rise for closed motors both above an ambient temperature of 45°C. At 40°C ambient temperature explosion proof and totally enclosed motors shall have a 1.00 service factor and drip-proof motors shall have a service factor of 1.15 or higher. Motors specified for operation at 480 volts shall be nameplated 460 volts.

G. Three phase motors shall be E-plus Energy Efficient Standard Duty Motor of the Electric Motor Division of Goulds, Inc., the MAC II High Efficiency motor of Westinghouse Electric Corporation, the equivalent product of Baldor Company, or equal.

2.05 FLANGES AND BOLTS

A. Flanges, except as otherwise specified, shall be cast solid, and bolt holes shall be drilled and spot-faced on the back. Stud holes shall not be drilled through. Flanges shall be uniform in thickness and shall come fair and, if required, shall be turned or chipped in a net and workmanlike manner.

B. Jacking screws shall be provided for covers, etc. were required, and also suitable eye bolts for lifting. Bolts and nuts shall be of the best quality of open hearth, free machining steel. Bolts shall have good, sound well-fitting threats; nuts shall be cold pressed. All heads, nuts and threads shall be of the American Standard regular sizes. All ferrous bolts and nuts shall be galvanized by the hot dipped process.

2.06 COUPLINGS

A. Except where otherwise specified for a particular item of equipment, all equipment where flexible couplings are specified or are required for the purpose, a standard self-aligning forged steel coupling with sealed lubrication, as manufactured by Thomas, Koppers, Falk, Sier-Bath, or equal shall be provided between each motor and its driven equipment. One hub of the coupling shall be firmly fixed and keyed to the equipment shaft with the other hub similarly secured to the abutting drive shaft. Couplings shall be

placed as close as possible to the driven equipment and the motor bearings to make compactly arranged units. Couplings shall be of all metal construction and shall be moistureproof and dustproof. Arrangements of couplings shall be such that there is sufficient room to place a dial indicator for alignment checking of shafts of the motor driven equipment. Each coupling shall be provided with an easily removable guard meeting all OSHA requirements.

B. All equipment and motors/drives shall be field aligned using a dial indicator in accordance with the procedures established by the latest revision of the Hydraulic Institute Standards. Parallel and angular misalignment shall not exceed the limits recommended by both the equipment and the coupling manufacturer.

2.07 EQUIPMENT BEDPLATES

A. The various items of motor driven equipment, such as pumps, shall be mounted on structural steel bedplates. The bedplates shall be adequate size to accommodate the equipment and its motor, to form an integral rigid mounting platform. Steel or brass shims shall be used to level equipment bedplates mounted in contact with concrete pads or floors. Jacking bolts or jacking (leveling) nuts on mounting studs shall not be used in lieu of shims. Bedplates shall be grouted to the concrete base and shall be filled with grout in all instances where the manufacturer has made provision for introducing grouting mixture into bedplate cavities. It shall be the Contractor's complete responsibility to determine the proper method, to provide all materials and components required, and to coordinate the work, to set, couple, align and install all equipment in a satisfactory manner.

B. All centrifugal fans shall be mounted on steel springs or rubber-in-shear vibration isolation units. These may be either shop provided with the equipment or separately field mounted.

2.08 ANCHORS

A. Stainless Steel Anchor Bolts: ASTM A 320 Grade B8, AISC Type 304.

B. Expansion Anchors: Conforming to Federal Specification FF-S-325, Group II, Type 4, Class 1 Stainless Steel Type 304; such as Hilti Kwik-Bolt, Phillips Red Head Wedge-Anchor and Molly Parabolt, or equal.

2.09 SHOP PAINTING

A. Prior to painting remove all rust, dust and scale as well as other foreign substances on ferrous metal surfaces to be prime painted in the shop, by sand-blasting or pickling.

1. Sand-blasting shall conform to requirements of the latest edition of SSPC-SP6, Commercial Blast Cleaning.

2. Pickling shall conform to requirements of the latest edition of SSPC-SP8, Pickling, or SSPC-SP10.

B. The ferrous metal surfaces thus cleaned shall be prime painted as soon as possible after cleaning to prevent new rusting.

C. All ferrous metal surfaces of equipment, apparatus, and devices shall receive a shop coat of primer (except acceptable factory finished surfaces) unless otherwise specified.

D. Apply shop paint in accordance with SSPC-PA-1. Minimum dry mil thickness at 1.5 to 2 mils.

2.10 SPECIAL TOOLS

A. Special tools shall include any type of tool that has been specially made for use on an item of equipment for assembly, disassembly, repair or maintenance. Any special tools that are required to assemble, disassemble, repair or maintain any mechanical equipment shall be furnished with the equipment.

2.11 NAMEPLATES FOR EQUIPMENT AND INSTRUMENTATION

A. Nameplates shall be included for all equipment provided under this Contract. Nameplates shall be attached to the machinery casing and to the panel where required for panel boards. Nameplates shall be white-laminated phenolic plastic having engraved black letters and beveled white trim, except where specified otherwise. Nameplates shall be engraved with minimum 1/4-inch letters showing the equipment name and number as given on the Contract Drawings or as specified during the shop drawing submittal. All equipment and instrumentation nameplates shall be screwed into the equipment frames or where directed by the Engineer. Nameplates shall be furnished by the Contractor.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The general arrangement of pipe and equipment shall be as shown on the Drawings. Detailed drawings of proposed departures due to actual field conditions or other causes shall be submitted to the Engineer for approval. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment as indicated, without substantial alteration. Because of the small scale of the drawings, it is not possible to indicate the exact location of piping, all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the space requirements for proper clearances and the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such offsets, fittings, valves and accessories as may be required to meet such conditions.

B. Each trade shall determine the location, size, etc. of all chases and openings required for the proper installation of its work, and shall see that such are provided. Where it is necessary to run pipes or ductwork through walls or fittings, the trade performing the work shall notify the Contractor so that proper provisions can be made for same. Each trade shall furnish and set all inserts, sleeves, hanger supports, etc. required for its work and shall be responsible for their proper and permanent location.

C. All piping and ductwork exposed to view shall be run generally parallel with the lines of the building and as close to walls and column as may be practical and consistent with proper grade and the maintenance of proper clearances for access to all parts requiring servicing.

D. The Contractor, in the prosecution of the work, shall do no cutting of woodwork, masonry, concrete or other materials after same have been installed, without the written permission of the Engineer. No waterproofing shall be cut for any purpose except on written approval of the Engineer.

3.02 FIELD QUALITY CONTROL

A. Upon completion of structural work as well as installation and adjustment of equipment in a manner satisfactory to the Engineer, the Contractor with his own forces, including such equipment and other experts as may be necessary (hereinafter collectively referred to as "Contractor's Personnel") shall place equipment in operation.

B. See Section 01 70 00 for requirements prior to placing equipment into service.

C. Operating procedures during said period are subject to Engineer's approval.

D. Operation of equipment prior to satisfactory completion of Performance Tests is the Contractor's complete responsibility.

3.03 MANUFACTURERS REPRESENTATIVE SERVICES

A. The attached schedule outlines the various items of equipment specified in other sections and lists the responsibilities of the equipment manufacturer for each Section of the specifications.

END OF SECTION

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SCHEDULE OF EQUIPMENT TESTING AND MANUFACTURER'S SERVICES

						SERVICES OF MFG. REP.			
EQUIPMENT ITEMS	SPEC. SECTION	PERF. AFFIDAVIT	SHOP TESTS	FIELD TESTS	INST. CERT.	INSTAL-LATION DAYS	FINAL ACCEPTANCE DAYS	INSTRUCT. DAYS/ FOLLOW UP VISITS	WRITTEN INSTRUC-TIONS
Screw Bulk Materials Conveyor	41 12 13.36	Yes	No	Yes	Yes	1	½	½	Yes
Rotary Lobe Blowers	43 11 33	Yes	Yes	Yes	Yes	1	½	½	Yes
Rotary Lobe Pumps	43 23 58	Yes	Yes	Yes	Yes	0	1	1	Yes
Floating Decanter	43 36 00	Yes	No	Yes	Yes	5	1	2	Yes
Bolted Stainless Tank	43 41 11	Yes	No	Yes	Yes	Determined By Installing Manufacturer	1	2	Yes
Rotary Drum Screens	46 21 33	Yes	Yes	Yes	Yes	2	1	1	Yes
Screenings Washing and Compacting Equipment	46 21 73	Yes	Yes	Yes	Yes	1	½	½	Yes
Coarse Bubble Diffusers	46 51 21	Yes	No	Yes	Yes	0	½	½	Yes
Belt Filter Press	46 76 21	Yes	Yes	Yes	Yes	5	4	5	Yes

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 30 00

SUBSURFACE EXPLORATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Prior to submitting his Bid, the Bidder shall make his own investigations of the on-site conditions and materials and shall base his Bid upon his own findings. The Owner will not approve any request for change order based upon the contention that subsurface conditions or materials vary from those indicated on the Drawings. The Contractor's bid shall be based upon his own investigation of these materials and conditions.

B. Test Boring Logs: The test boring logs are contained herein under Specification ***Section 00 31 32 Geophysical Data***, The geotechnical report, including test boring logs, is included in the Contract Documents for informational purposes. The information contained herein represents conditions observed at the specific locations and times of investigation and is not intended as a representation or warranty of subsurface conditions throughout the site. Neither the Owner nor the Engineer guarantees that actual subsurface conditions will be the same as those indicated. The Contractor shall make its own interpretation of the information and shall be solely responsible for any conclusions drawn therefrom. The Contractor is responsible for conducting any additional investigations deemed necessary for the performance of the Work. Reliance upon the existing geotechnical information is at the Contractor's sole risk.

C. Bidders performing soils investigations prior to bid opening are required to notify the Tidewater Utilities, Inc. before entering any easement areas. Upon completion of soils investigation, any disturbed area must be restored to its original condition subject to approval by the Owner.

1.02 EXISTING SUBSURFACE LINES

A. All known subsurface lines, pipes, conduits, and structures are shown on the plans and profiles. The lines shown are based upon the best available plans and maps. The locations have not been verified by test pits and the Engineer/Contractor assumes no responsibility for the accuracy of the Drawings. In any area where the Subcontractor must make connections to or cross existing lines, the Contractor is responsible to test pit the lines and verify the locations prior to completing any sitework. In the event that lines are not found located as shown on the plans the Subcontractor shall notify the Engineer so that an evaluation can be made as to the magnitude and method of any adjustments in the plans. The elevations of the pipelines at these locations are critical,

and thus, these locations should be test pitted as soon as possible after the Notice to Proceed.

B. **The Contractor shall be required to verify the location and depth of all critical lines using test pits before beginning work. The cost of these test pits shall be included in the lump sum price bid.**

C. The Contractor shall be solely responsible for any damage to any underground or aboveground lines encountered in any manner during construction. When crossing and working in the vicinity of existing lines it will be the Contractor's responsibility to properly support and maintain the operation of the lines. Extreme care must be exercised in excavation and refill operations. The Contractor will correct at his own expense any damage caused to existing lines.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 41 00

DEMOLITION FOR ADDITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Includes demolition and removal of construction as required to allow new construction operations to proceed smoothly and as indicated or specified. Demolition of systems must occur in a manner that allows Owner's operations to continue during construction. The Contractor shall demolish, remove, and or dispose of all items necessary for the accomplishment of the project.

B. All underground utilities shown on the site to be abandoned shall be permanently plugged, abandoned in–place and filled with flowable fill or fully removed, if necessary to construct other work.

C. Submit proposed demolition and removal procedures to the Engineer for approval two (2) weeks before work is started.

1. Items to be reviewed shall be, but not limited to, dust control, sequence of work, removal of material, Owner materials to be salvaged, protection of existing equipment, access and egress of material, etc. Demolition procedures must be coordinated with the Owner’s operating personnel and operations, and adjusted accordingly, if necessary.

D. Comply with applicable codes and accident and fire prevention regulations.

1.02 DUST CONTROL

A. Take appropriate action to check the spread of dust and to avoid the creation of a nuisance in the surrounding area.

1.03 PROTECTION

A. General: The means and methods of performing demolition operations is the sole responsibility of the Contractor.

B. Buildings: Protect existing work that is to remain in place. Repair items damaged during performance of the work or replace with new.

C. Personnel Safety: Perform work in a safe manner in order to avoid accidents and property damage. Workmen must be experienced in this type of work. Equipment should be of suitable type, in good working condition, and operated by skilled operators. Furnish all signs, lights, railings, barricades, and other items as necessary to meet safety regulations. Adequate protection of persons and property shall be provided at all times.

D. Traffic: Where pedestrian and driver safety are endangered in the area of removal work, use traffic barricades with flashing lights. Provide alternate routes around closed or obstructed traffic ways.

E. Explosives: Not permitted.

F. Strictly observe regulations when removing tanks and piping which may have contained flammable liquids or gases.

G. Prevent access of unauthorized persons.

PART 2 – PRODUCTS

2.01 EXISTING FACILITIES TO BE REMOVED

A. Salvageable items may be removed at any time after demolition work starts (if not specifically claimed by Owner); storage or sale on the site of removed items not permitted.

B. Utilities and Related Equipment

1. Prevent damage to overhead and underground power cables, telephone, and water and sewer lines during demolition operation.
2. Arrange with utility companies for disconnection of services before starting work.

C. Paving and Slabs: Remove concrete or asphalt concrete paving and slabs including base where indicated.

1. Break up and remove foundation walls, footings, etc., including any below-grade concrete slabs, to a point minimum 2 feet below grade or as required to complete proposed work.
2. Backfill, compact, and rough grade areas excavated, including cavities created by removal of demolished items, in accordance with DIVISION 31, within the lump sum items bid for Demolition at no additional cost to Owner.

D. Utility removal, relocation, etc., shall be sequenced such that utility service to existing building shall not be interrupted. Provide all necessary appurtenances to adequately support remaining piping after required portions are removed.

E. Remove designated buried sewer and storm drain piping systems, capping with concrete plugs those segments to be abandoned and fill with flowable fill, and provide temporary capping of those segments to be reused.

F. Disconnect and remove designated process piping systems, including valves and fittings; provide temporary capping of those segments of the system to be reused. Plug openings in walls and floors where utilities are removed.

G. Detach, dismantle, and remove metal components of process equipment from designated tanks, including miscellaneous metal work items associated with access to and operation of such equipment.

H. Patch and refinish existing visible surfaces to match “new” appearance of adjacent surfaces.

I. All water, sewer, drain, process plumbing and HVAC pipelines that are to be terminated shall be done so as follows:

1. Piping penetrating walls in buildings, tunnels, and crawlspaces shall be cut at the inside face of the wall and sealed with concrete flush with wall; pipe outside of wall shall be removed to 12 inches from the face of the wall and caped watertight. Cast iron pipe shall be capped using a blind flange or a retained gland and lug as required (Dresser Style 127, Smith Blair or equal). Copper and steel lines shall be sealed by soldering or welding a cap to the line.
2. Piping penetrating floors shall be removed flush with floor and sealed with grout. Final floor surface shall match the adjacent areas.
3. Underground piping shall be removed and the end filled with grout to form a watertight seal. Pipe shall be removed to the point nearest the building wall penetration that has been excavated.
4. Electric wiring to be terminated shall be completely removed back to the nearest junction box. Exterior conduits shall be treated as underground piping and sealed using Duxseal or concrete.

2.02 ITEMS TO BE SALVAGED AND TURNED OVER TO OWNER

A. It is the Owner’s right to retain any existing component demolished or otherwise removed from the existing facility by the Contractor. Contractor representative shall conduct walk through of building with Owner prior to commencement of work.

2.03 DISPOSITION OF MATERIAL

A. Contractor is responsible for all removal of all demolition materials to an approved off-site location chosen by the Contractor and approved by the Owner.

B. Title to Materials: Title to materials and equipment to be removed, except as specified otherwise, is vested in the Contractor upon receipt of notice to proceed. The Owner will not be responsible for the condition or loss of or damage to such property after notice to proceed. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

2.04 CLEANUP

A. Debris and Rubbish: Remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up spillage from streets and adjacent areas.

B. Dispose of debris and rubbish in an approved off site disposal area.

C. Regulations: Comply with Federal, State, and local hauling and disposal regulations.

PART 3 – EXECUTION

Not used.

END OF SECTION

DIVISION 03 - CONCRETE

SECTION 03 11 00

CONCRETE FORMING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work under this section includes job fabricated forms, form liners, coatings, ties, accessories, and removal of forms.

B. Related Work Specified Elsewhere:

1. Section 03 20 00: Concrete Reinforcement
2. Section 03 30 00: Cast-In-Place Concrete

1.02 QUALITY ASSURANCE

A. Design Criteria:

1. It is the Contractor’s responsibility for design, engineering, and construction of formwork.
2. Design formwork in accordance with American Concrete Institute's Recommended Practice for Concrete Formwork ACI 347.
3. Design forms to repeat regularly on regularly repeating structural units or bays. Submit shop drawing covering such forming condition.

B. Allowable Tolerances: Set and maintain concrete forms within tolerance limits stated in American Concrete Institute's Recommended Practice for Concrete Formwork ACI 347.

C. Referenced Standards:

1. American Concrete Institute:
   a. ACI 347, Recommended Practice for Concrete Formwork.
   b. ACI 350, Code Requirements for Environmental Engineering Concrete Structures and Commentary.
2. American Plywood Association: APA Grade-Trademarks.
3. U.S. Department of Commerce Product Standards: PS-1 for Construction and Industrial Plywood.

1.03 JOB CONDITIONS

A. Protection:

1. Protect formwork materials before, during and after erection to ensure acceptable finished concrete work. Also protect in-place materials and other operations of work in connection with concrete pours.
2. In event of damage to erected forms, make necessary repairs or replacements prior to concrete pours at no expense to the Owner.

PART 2 - PRODUCTS

2.01 FORMS

A. Lumber:

1. Form framing, sheathing, and shoring shall conform to ACI 347.
2. Use lumber free of material defects that would deform the finished concrete product.

B. Plywood:

1. Form Sheathing and Panels: Not less than 5/8 inch thick Exterior Type B-B Plywood Class I and II EXT-APA conforming to U.S. Product Standard PS-1. Plywood forms with metal edges will be acceptable.
2. Use Type II only on surfaces not exposed to view.
3. Provide moldings for chamfers (if any) both milled and planed smooth.

C. Steel: Metal Forms of pre-engineered design may be used in lieu of wood forms.

2.02 FORM TIES AND ACCESSORIES

A. Form Ties:

1. Provide factory fabricated, adjustable-length, removable or snap-off metal form ties conforming to ACI 347 and ACI 350;
2. Use ties in construction of liquid retaining structures that are designed to prevent seepage or flow of water along the embedded item.
3. Use snap-off metal ties with ends that break at least 1½ inch from the face of the wall. Assembly should provide cone shaped depressions in the forms at the surface at least 1 inch in diameter and 1½ inch deep to allow filling and patching.
4. Removable ties that leave holes larger than 1 inch are not permitted.
5. Form ties fabricated on the project site and wire ties or flat bands are not acceptable.

6. Wood spacers are not permitted within the pour.

B. Metal Accessories:

1. Include spacers, chairs, ties, or other devices for properly assembling, placing, spacing, and supporting the reinforcement in place.
2. Provide metal accessories with solid plastic feet for exposed slabs and similarly exposed concrete surfaces, both interior and exterior, where accessories come in contact with forms.
3. Aluminum metal accessories that come in contact with or are embedded in concrete shall be prohibited.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to placement of concrete, inspect forms for cleanliness and accuracy of alignment.

3.02 PREPARATION

A. Apply form coatings in accordance with manufacturer's specifications.

B. Do not allow excess form coating material to accumulate in the forms.

C. Do not allow form coatings to come in contact with construction joints or reinforcing steel.

D. Caulk and tape butt joints in formwork.

3.03 ERECTION

A. Construct forms in accordance with ACI 347 to required dimensions, plumb, straight and mortar tight, and paste tight where appearance is important. Securely brace and shore forms to prevent displacement and to safely support imposed concrete load.

B. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent the loss of concrete mortar. Locate temporary openings on forms in as inconspicuous a location as possible.

C. Provide openings in concrete formwork of the correct size and in the proper location to accommodate other operations of construction work in the project. Accurately place and securely support items to be built into forms.

D. Wet forms sufficiently to prevent joints in wood forms from opening prior to concrete pour.

3.04 FORM REMOVAL (ACI 347)

A. After concrete has been placed, forms, bracing and supports shall remain undisturbed long enough to allow the concrete to reach the strength necessary to support with safety its own weight plus any live load and earth pressure that might be placed upon it without causing excessive settlement or deflection or any temporary or permanent damage to the structure.

B. Where in his opinion, the leaving in place of forms contributes to the permanent benefit of the structure, the Engineer may order the forms to remain for a longer period than that considered to be sufficient time in the judgment of the Subcontractor.

C. However, should the Engineer acquiesce in the removal of forms by the Subcontractor, the Engineer assumes no responsibility as a result of their removal.

D. The Subcontractor is fully and personally responsible and is in no manner relieved of this responsibility for such removal.

E. Take special care to prevent the breaking of edges and corners of concrete in the stripping of forms.

F. Hammer-pack holes left by tie rods with stiff mortar of the same materials as, but somewhat leaner than, that in the concrete. Render the patch inconspicuous.

END OF SECTION

DIVISION 03 - CONCRETE

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fabrication and placement of concrete reinforcing materials.

1.02 REFERENCES

A. ASTM A615: Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.

B. ASTM A1064: Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

C. CRSI: Manual of Standard Practice.

1.03 SUBMITTALS

A. Shop Drawings.

1. Submit drawings showing layout and details of reinforcing.
2. Use figured dimensions only, scaling drawings not permitted.
3. Review of shop drawings is limited to design intent only. No responsibility for a detailed check of member length, size, spacing, or similar detail information is assumed by virtue of such review.

B. Affidavit.

1. Furnish an affidavit, in duplicate, from the steel manufacturer that steel manufactured for this project meets the requirements of these specifications.

1.04 DELIVERY, HANDLING AND STORAGE

A. Deliver materials bundled, tagged, and marked.

B. Store at the site to prevent damage and accumulation of dirt or excessive rust.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Deformed Reinforcing Bars: New billet steel, ASTM A615, Grade 60. Stirrups and ties shall be Grade 40.

B. Welded Wire Fabric Reinforcing: ASTM A1064.

C. Metal Accessories: Include spacers, chairs, ties, or other devices for properly assembling, placing, spacing and supporting reinforcement in place. Provide metal accessories for exposed slabs and similarly exposed concrete surfaces, both interior and exterior, with solid plastic feet where accessories come in contact with forms. Provide chairs for reinforcing for slabs and beams on earth with metal pads attached to the feet to prevent penetration of the earth form.

D. Tie Wire: Steel ASTM A1064.

2.02 FABRICATION

A. Fabricate to conform to required shapes and dimensions. Comply with CRSI "Manual of Standard Practice".

PART 3 - EXECUTION

3.01 PLACING

A. Place reinforcement accurately in strict accord with plans and CRSI Manual for Placing Reinforcing Bars.

B. Support and tie in a way which will prevent displacement while concrete is being placed.

C. Note requirements for earth forms and exposed concrete.

D. Remove loose rust and mill scale, earth and other materials which reduce or destroy bond with concrete.

E. Install wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire.

END OF SECTION

DIVISION 03 - CONCRETE

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Materials, mixing, placing, testing, curing, and finishing of plain and reinforced cast in place concrete.

B. Use air-entraining admixture for all concrete subject to freeze/thaw, unless otherwise shown or specified.

1.02 REFERENCES

A. ASTM C31: Method of Making and Curing Concrete Test Specimens in the Field.

B. ASTM C33: Concrete Aggregates.

C. ASTM C39: Test Method for Compressive Strength of Cylindrical Concrete Specimens.

D. ASTM C150: Portland Cement.

E. ASTM C260: Air-Entraining Admixtures for Concrete.

F. ASTM C494: Chemical Admixtures for Concrete.

G. ACI 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

H. FS HH-F-341: Fillers, Expansion Joint; Bituminous (Asphalt and Tar) and Non-bituminous.

1.03 SUBMITTALS

A. List of materials and manufacturers for review.

B. Design Mixes: Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials

including type; brand; source and amount of cement, fly ash, pozzolans, silica fume, ground slag polypropylene fibers, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Engineer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submit copies of the fly ash, silica fume and pozzolan test results, in addition. The approval of fly ash, silica fume and pozzolan test results must be within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as ACI-Certified Flatwork Technician and Finisher and a supervisor who is an ACI-Certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities".

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548. The agency shall be contracted by the Contractor, and all testing costs shall be a part of their lump sum bid.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01, or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician – Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician – Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following, unless modified by requirements in the Contract Documents:

1. ACI 301, “Specifications for Structural Concrete,” Sections 1 through 5.
2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”

F. Concrete Testing Service: The Contractor shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C 150, Type 1. Use only one brand throughout the project.

B. Aggregates.

1. Coarse aggregate: ASTM C 33. Free of loam, clay, or foreign matter. Crushed stone or gravel, hard, durable and free of adherent coatings. Maximum size number 57 unless noted otherwise. Maximum size for toppings, slabs, and fills 3 inches and less in thickness is 3/8 inch.
2. Fine Aggregate: Natural sand free of loam, clay or foreign matter.

C. Admixtures: Use only one brand throughout the project. Named or approved substitute.

1. Accelerator may be used only if design mixes utilizing the accelerator are submitted and accepted.
2. Do not use admixtures containing calcium chloride.

D. Water: ASTM C94 and potable.

E. Expansion Joint Filler: FS HH-F-341, Type 1, pre-molded bituminous impregnated fiberboard strips.

F. Plastic Vapor Retarder: Polyethylene sheet, ASTM E1745 Class A, not less than 10 mils thick.

1. Available Manufacturers:
   a. Fortifiber Corporation
   b. Raven Industries, Inc.
   c. Reef Industries, Inc.
   d. Stego Industries, LLC
   b. Approved Substitution

G. Concrete Curing Materials

1. Absorptive Cover: Provide burlap, cotton mats, and other absorbent materials for curing concrete, as described in ACI 308R.
2. Moisture-Retaining Cover: Provide waterproof paper cover for curing concrete conforming to ASTM C171, regular or white, or polyethylene sheeting conforming to ASTM C171, or polyethylene-coated burlap consisting of a laminate of burlap and a white opaque polyethylene film permanently bonded to the burlap; burlap must conform to ASTM C171, Class 3, and polyethylene film must conform to ASTM C171. When tested for water retention in accordance with ASTM C156, weight of water lost 72 hours after application of moisture retaining covering material must not exceed 0.039 gram per square centimeter of the mortar specimen surface.
3. Membrane-Forming Curing Compound: Provide liquid type compound conforming to ASTM C309, Type 1, clear, Type 1D with fugitive dye for interior work and Type 2, white, pigmented for exterior work.

H. Biodegradable Form Release Agent: Provide form release agent that is colorless, biodegradable, and rapeseed oil-based, soy oil-based or water-based, with a zero VOC content. A minimum of 85 percent of the total product must be biobased material. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide form release agent that does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene.

PART 3 - EXECUTION

3.01 PREPARATION FOR PLACEMENT OF CONCRETE

A. Formwork. Also see Section 03 11 00 Concrete Forming.

1. Ascertain that work under other Divisions, which passes through and/or is set in the concrete, such as sleeves, anchors, inserts and conduits, has been set in place. Notify other trades in ample time for them to install any portion of their work.
2. Remove water, hardened concrete, debris, ice, and other foreign materials from forms (earth or fabricated).
3. Sprinkle formwork with water just prior to placement of concrete.

B. Embedded Items: Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

C. Reinforcing: Inspect before placing concrete.

D. Runways: Provide as required so that equipment used to deposit concrete is not wheeled over reinforcement.

E. Bonding: Before depositing new concrete on or against concrete which has already set, thoroughly roughen existing surfaces and clean of laitance, foreign matter and loose particles. Retighten forms and thoroughly wet existing surfaces.

F. Equipment: At no time during the mixing, placing or curing of concrete let aluminum equipment come in contact with fresh concrete.

G. Construction Joints: Dowel and key and locate as to least impair the strength of the structure. Location shall be approved. Where construction joints occur in reinforced concrete, joints shall follow a plane perpendicular to principal reinforcement with a bulkhead shaped to produce a keyed surface.

H. Plastic Vapor Retarders: Place, protect and repair vapor retarders according to ASTM E1643 and manufacturer's written instructions. Lap joints 6 inches and seal with manufacturer's recommended tape.

I. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

3.02 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE ASTM C94/C94M, and ACI/MCP-2, except as modified herein.

A. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready-mix concrete.

1. Measuring: Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."
2. Mixing: ASTM C94/C94M and ACI/MCP-2. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Do not add water to concrete during delivery, at project site, or during placement.
3. Transporting: Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use

aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.03 PLACING CONCRETE

A. Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10-foot centers maximum in each direction when pouring interior slabs and on 20-foot centers maximum for exterior slabs.

1. General Placing Requirements: Deposit concrete continuously or in layers of such thickness that no concrete is placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete to receive other construction must be screeded to proper level to avoid excessive skimming or grouting. Do not use concrete which becomes nonplastic and unworkable or does not meet quality control limits as specified or has been contaminated by foreign materials. Use of retempered concrete is permitted. Remove rejected concrete from the site.
2. Footing Placement: Concrete for footings may be placed in excavations without forms upon inspection and approval by the Inspector. Excavation width must be a minimum of 4 inches greater than indicated.
3. Vibration: ACI/MCP-2. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

4. Pumping: ACI/MCP-2. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.
5. Cold Weather: ACI/MCP-2. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.
6. Hot Weather: Maintain required concrete temperature using Figure 2.1.5 in ACI/MCP-2 to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.
7. Follow-up: Check concrete within 24 hours of placement for flatness, levelness, and other specified tolerances. Adjust formwork and placement techniques on subsequent pours to achieve specified tolerances.
8. Placing Concrete in Forms: Deposit concrete placed in forms in horizontal layers not exceeding 24 inches. Remove temporary spreaders in forms when concrete placing has reached elevation of spreaders. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Provide vibrating equipment adequate in number of units and power of each unit to properly consolidate concrete. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced points not farther apart than visible effectiveness of machine. Do not insert vibrator into lower courses of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate

concrete and complete embedment of reinforcement and other embedded items without causing segregation of concrete mix. Do not start placing of concrete in supporting elements until concrete previously placed in columns and walls is no longer plastic and has been in place a minimum of 2 hours.

9. Placing Concrete Slabs: Place and consolidate concrete for slabs in a continuous operation, within the limits of approved construction joints until placing of panel or section is completed. During concrete placing operations, consolidate concrete by mechanical vibrating equipment so that concrete is worked around reinforcement and other embedded items and into corners. Consolidate concrete placed in beams and girders of supported slabs and against bulkheads of slabs on ground by mechanical vibrators as specified. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other approved method. Limit consolidation operations to time necessary to obtain consolidation of concrete without bringing an excess of fine aggregate to the surface. Concrete to be consolidated must be as dry as practical and surfaces thereof must not be manipulated prior to finishing operations. Bring concrete correct level with a straightedge and struck off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Sprinkling of water on plastic surface is not permitted. Provide finish of slabs as specified.

10. Bonding: Surfaces of set concrete at joints, except where bonding is obtained by use of concrete bonding agent, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface. Obtain bonding of fresh concrete that has set as follows: At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating. Provide cement grout that consists of equal parts of Portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set. Bonding of fresh concrete to concrete that has set may be obtained by use of a concrete bonding agent. Apply such bonding material to cleaned concrete surface in accordance with approved printed instructions of bonding material manufacturer.

3.04 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

A. Defects: Repair formed surfaces by removing minor honeycombs, pits greater than 1 square inch surface area or 0.25-inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete must not vary more than the allowable tolerances of ACI/MCP-4. Exposed surfaces must be uniform in appearance and finished to a smooth form finish unless otherwise specified.

B. Not Against Forms (Top of Walls): Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

C. Formed Surfaces

1. Tolerances: ACI/MCP-1 and as indicated.
2. As-Cast Rough Form: Provide for surfaces not exposed to public view. Patch these holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inches in height.
3. Standard Smooth Finish: Finish must be as-cast concrete surface as obtained with form facing material for standard smooth finish. Repair and patch defective areas as specified; and all fins and remove other projections on surface.
4. Grout Finish: Provide finish that is standard, smooth coated with grout as specified. Give finish to interior and exterior concrete vertical surfaces that are to be exposed to view. Grout is required consisting of one part portland cement to 1-1/2 parts fine aggregate by volume, mixed with water to produce a consistency of thick paint. Portland cement portion must be a blend of standard Portland cement and white portland cement, proportioned as determined by trial mixes so that final color of grout when dry approximates color of surrounding concrete. Fine aggregate must pass No. 30 mesh sieve. Surface of concrete is required to be wetted, and grout must be applied immediately to wetted surfaces. Spread grout over surface with clean burlap pads or sponge-rubber floats to fill pits, air bubbles, and surface holes. Remove excess grout by scraping, then rubbing surface with clean burlap to remove visible grout film. Keep grout damp by means of fog spray during setting period. Complete finish the day it is started and make limits of a finished area at natural breaks in finished surface.

3.05 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

A. ACI/MCP-2, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Where straightedge measurements are specified, Contractor must provide straightedge.

1. Finish: Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.
    a. Scratched: Use for surfaces intended to receive bonded applied cementitious applications. After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance as defined below, roughen the surface with stiff brushes of rakes before final set.
    b. Floated: Use for exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float must begin when the surface has stiffened sufficiently to permit the operation. During or after the first floating, check surface with a 10-foot straightedge applied at no less than two different angles, one of which is perpendicular to the direction of strike off. Cut down high spots and fill low spots during this procedure to produce a surface level within 1/4 inch in 10 feet.
    c. Concrete Containing Silica Fume: Finish using magnesium floats or darbies.
    d. Steel Troweled: Use for floors intended as walking surfaces, and for reception of floor coverings. First, provide a floated finish. Next, the finish must be power troweled two times, and finally hand troweled. The first troweling after floating needs to produce a smooth surface which is relatively free of defects, but which may still show some trowel marks. Perform additional trowelings done by hand after the surface has hardened sufficiently. The final troweling is done when a ringing sound is produced as the trowel is moved over the surface. Thoroughly consolidate the surface by the hand troweling operations. The finished surface must be essentially free of trowel marks and uniform in texture and appearance. The finished surface must produce a surface level to within 1/4 inch in 10 feet. On surfaces intended to support floor coverings, remove any defects of sufficient magnitude to show through the floor covering by grinding.

e. Broomed: Use on exterior walks, platforms, patios, and ramps, unless otherwise indicated. Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

f. Pavement: Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straightedge to check slope and flatness; correct and refloat as necessary. Obtain final finish by belting. Lay belt flat on the concrete surface and advance with a sawing motion; continue until a uniform but gritty nonslip surface is obtained. Round edges and joints with an edger having a radius of 1/8 inch.

g. Chemical-Hardener Treatment: Apply liquid-chemical floor hardener where indicated after curing and drying concrete surface. Dilute liquid hardener with water and apply in three coats. First coat must be one-third strength, second coat one-half strength, and third coat two-thirds strength. Apply each coat evenly and allow to dry 24 hours between coats. Approved proprietary chemical hardeners must be applied in accordance with manufacturer's printed directions.

2. Flat Floor Finishes: ACI/MCP-2. Construct in accordance with one of the methods recommended in Table 7.15.3, "Typical Composite Ff/FL Values for Various Construction Methods." ACI/MCP-1 for tolerance tested by ASTM E1155.

a. Specified Conventional Value:
   - Floor Flatness (Ff) 40
   - Floor Levelness (FL) 30

b. Measurement of Floor Tolerances: Test slab within 24 hours of the final troweling. Provide tests to Contracting Officer within 12 hours after collecting the data. Floor flatness inspector is required to provide a tolerance report which must include:
   - Key plan showing location of data collected.
   - Results required by ASTM E1155.

c. Remedies for Out of Tolerance Work: Contractor is required to repair and retest any floors not meeting specified tolerances. Prior to repair, Contractor must submit and receive approval for the proposed repair, including product data from any materials proposed. Repairs must not result in damage to structural integrity of the floor. For floors exposed to public view, repairs must prevent any uneven or unusual coloring of the surface.

3.06 CONCRETE SLABS ON GRADE

A. Place concrete slabs on earth over drainage fill on a compacted sub-grade in accordance with the Geotechnical report. Provide vapor retarder and expansion joint material where indicated.

B. Place construction joints under walls and partitions where feasible.

C. Review with Engineer location of joints and sequence of pouring slabs prior to first slab pour.

3.07 CURING AND PROTECTION

A. ACI/MCP-2 unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs, including ceiling tiles and gypsum wall board .

1. General: Protect freshly placed concrete from premature drying and cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of cement and proper hardening of concrete. Start initial curing as soon as free water has disappeared from surface of concrete after placing and finishing. Keep concrete moist for minimum 72 hours. Final curing must immediately follow initial curing and before concrete has dried. Continue final curing until cumulative number of hours or fraction thereof (not necessarily consecutive) during which temperature of air in contact with the concrete is above 50 degrees F has totaled 168 hours. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, final curing may be terminated when the average compressive strength has reached 70 percent of the 28-day design compressive strength. Prevent rapid drying at end of final curing period.
2. Moist Curing: Remove water without erosion or damage to the structure. Prevent water run-off.
    a. Ponding or Immersion: Continually immerse the concrete throughout the curing period. Water must not be more than 50

degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

b. Fog Spraying or Sprinkling: Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

c. Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Provide sheeting that is at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

d. Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3. Liquid Membrane-Forming Curing Compound: Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI/MCP-2 indicates that hot weather conditions cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

   a. Application: Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats must be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound must form a uniform, continuous, coherent film that does not check, crack, or peel. Immediately apply an additional coat of compound to areas where

the film is defective. Re-spray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

b. Protection of Treated Surfaces: Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

4. Liquid Chemical Sealer-Hardener: Apply sealer-hardener to interior floors not receiving floor covering and floors located under access flooring. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. Do not apply the sealer hardener until the concrete has been moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

5. Requirements for Type III, High-Early-Strength Portland Cement: The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

6. Curing Periods: ACI/MCP-2 except 10 days for retaining walls, pavement or chimneys, 21 days for concrete that is in full-time or intermittent contact with seawater, salt spray, alkali soil or waters. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Engineer.

7. Curing Methods: Accomplish curing by moist curing, by moisture-retaining cover curing, by membrane curing, and by combinations thereof, as specified.

   a. Moist curing: Accomplish moisture curing by any of the following methods: Keeping surface of concrete wet by covering with water Continuous water spraying Covering concrete surface with specified absorptive cover for curing concrete saturated with water and keeping absorptive cover wet by water spraying or intermittent hosing. Place absorptive cover to provide coverage of concrete surfaces and edges with a slight overlap over adjacent absorptive covers.

   b. Moisture-cover curing: Accomplish moisture-retaining cover curing by covering concrete surfaces with specified moisture-retaining cover for curing concrete. Place cover directly on concrete in widest practical width, with sides and ends lapped at least 3 inches. Weight cover to prevent displacement; immediately repair tears or holes appearing during curing period by patching with pressure-sensitive, waterproof tape or other approved method.

   c. Membrane curing: Accomplish membrane curing by applying specified membrane-forming curing compound to damp concrete surfaces as soon as moisture film has disappeared. Apply curing compound uniformly in a two-coat operation by power-spraying

equipment using a spray nozzle equipped with a wind guard. Apply second coat in a direction at right angles to direction of first coat. Total coverage for two coats must be not more than 200 square feet per gallon of curing compound. Respray concrete surfaces which are subjected to heavy rainfall within 3 hours after curing compound has been applied by method and at rate specified. Maintain continuity of coating for entire curing period and immediately repair damage to coating during this period. Membrane-curing compounds must not be used on surfaces that are to be covered with coating material applied directly to concrete or with a covering material bonded to concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, painting, and other coatings and finish materials.

8. Curing Formed Surfaces: Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.
9. Curing Unformed Surfaces: Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing. Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified above, as applicable. Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.
10. Temperature of Concrete During Curing: When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period. When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period. Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.
11. Protection from Mechanical Injury: During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

12. Protection After Curing: Protect finished concrete surfaces from damage by construction operations.

3.08 FIELD QUALITY CONTROL

A. Sampling: ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

B. Testing

1. Slump Tests: ASTM C143/C143M. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.
2. Temperature Tests: Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.
3. Compressive Strength Tests: ASTM C39/C39M. Make six test cylinders for each set of tests in accordance with ASTM C31/C31M. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, three cylinders at 28 days, and hold one cylinder in reserve. Take samples for strength tests of each mix design of and for concrete placed each day not less than once a day, nor less than once for each 160 cubic yards of concrete, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than six sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than f'c or if any strength test result falls below f'c by more than 450 psi, take a minimum of three ASTM C42/C42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test is considered structurally adequate if the average of three cores is equal to at least 85 percent of f'c and if no single core is less than 75 percent of f'c. Retest locations represented by erratic core strengths. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.
4. Air Content: ASTM C173/C173M or ASTM C231/C231M for normal weight concrete . Test air-entrained concrete for air content at the same frequency as specified for slump tests.

5. Strength of Concrete Structure: Compliance with the following is considered deficient if it fails to meet the requirements which control strength of structure in place, including following conditions:
    a. Failure to meet compressive strength tests as evaluated
    b. Reinforcement not conforming to requirements specified
    c. Concrete which differs from required dimensions or location in such a manner as to reduce strength
    d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified
    e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration
    f. Poor workmanship likely to result in deficient strength

3.09 JOINTS

A. Construction Joints: Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Locate construction joints as follows:

1. In walls at not more than 60 feet in any horizontal direction; at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into wall.
2. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier.
3. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.
4. Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs. Joints must be perpendicular to main reinforcement. Reinforcement must be continued across construction joints.

B. Isolation Joints in Slabs on Ground: Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, and elsewhere as indicated on plans. Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

C. Control Joints in Slabs on Ground (does not include pile supported slabs that span between piles): Provide joints to form panels as indicated. Under and on exact line of each control joint, cut 50 percent of welded wire fabric reinforcement before placing concrete. Joints must be 1/8-inch wide by 1/5 to 1/4 of slab depth and formed by inserting hand-pressed fiberboard strip into fresh concrete until top surface of strip is flush with slab surface or by cutting the concrete with a saw after the concrete has set. After concrete has cured for at least 7 days, the Contractor must remove inserts and clean groove of foreign matter and loose particles. Pile-supported slabs are not considered slabs on ground and control joints shall not be placed in these slabs unless specifically shown in the construction documents.

D. Sealing Joints in Slabs on Ground: Isolation and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible. Sealing is not required for isolation and control joints to be covered with finish flooring material. Groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.10 INSTALLATION OF ANCHORAGE DEVICES

A. General: Anchorage devices and embedded items required for other work that is attached to, or supported by, set and build in cast-in-place concrete as part of the work of this section, using setting drawings, instructions, and directions for work to be attached thereto.

B. Placing Anchorage Devices: Anchorage devices and embedded items must be positioned accurately and supported against displacement. Fill openings in anchorage devices such as slots and threaded holes with an approved, removable material to prevent entry of concrete into openings.

3.11 CONCRETE CONVEYING

A. Transfer of Concrete at Project Site: Handle concrete from point of delivery and transfer to concrete conveying equipment and to locations of final deposit as rapidly as practical by methods which prevent segregation and loss of concrete mix materials.

B. Mechanical Equipment for Conveying Concrete: Equipment must ensure a continuous flow of concrete at delivery end, as approved. Provide runways for wheeled concrete-conveying equipment from concrete delivery point to locations of final deposit. Interior surfaces of concrete conveying equipment must be free of hardened concrete, debris, water, snow, ice, and other deleterious substances.

END OF SECTION

DIVISION 03 – CONCRETE

SECTION 03 48 00

PRECAST CONCRETE SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Includes plant-cast architectural concrete units as detailed.

1.02 SUBMITTALS

A. Product Data: Submit product data including concrete, pigments, admixtures, and connection materials.

B. Samples: Submit samples, nominal size 12 inch by 12 inch by appropriate thickness, of each type of unit and finished facing for approval of quality, color and texture. Submit prior to fabrication.

C. Shop Drawings: Submit shop drawings including, but not limited to, the following.

1. Dimensions, finishes, relationships to adjacent materials, and provisions for erection and placement.
2. In-place location of units, fabrication details, plans, elevations, anchorages, reinforcement, connection details and methods.
3. Show identification marks, coordinated to Shop Drawings, and date of manufacture on all units to facilitate handling and erection.
4. Provide setting diagrams, templates and directions as required for installation.

D. Plant Certification: Submit written certification that fabricator’s plant is certified by the Architectural Precast Association (APA) or is certified as Group A1 by the Precast/Prestressed Concrete Institute (PCI).

E. Engineering Calculations: Submit engineering calculations sealed by a structural engineer licensed to practice in the jurisdiction of the Project.

F. Mix Design: Submit proposed concrete mix design for each type and color of concrete mix required, including backup mix.

G. Material Test Reports: Submit material certificates signed by manufacturer for concrete materials, reinforcing materials, admixtures, and similar items.

H. Welder's Certification: Submit for each welder.

1.03 QUALITY ASSURANCE

A. Fabricator's Qualifications: Fabricator shall have a minimum of five years experience in producing units similar to those required for this Project, with sufficient production capacity to produce and deliver required units without causing delays in the work. Fabricating plant shall be certified by one of the following:

1. Architectural Precast Association (APA).
2. Precast/Prestressed Concrete Institute (PCI), Group A1.

B. Installer's Qualifications: Installer shall a record of at least 5 years of successful installation of units similar to those required for this Project.

C. Welder's Qualifications: Provide certification that welders to be employed in the Work are certified by AWS and applicable local building officials, and have been re-certified in the last 12 months.

D. Mock-ups: Provide initial production units for job-site assembly and other materials for approval. Coordinate type and location of mock-ups with project requirements. Accepted units will be used as the standard for acceptance of production units. Remove and replace units which are not accepted.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle precast units in strict accordance with fabricator's instructions and recommendations and industry standards. Protect from damage. Lift and support units only at designated lifting points as shown on approved Shop Drawings.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

PART 2 - PRODUCTS

2.01 FABRICATORS

A. Approved Fabricators: Provide units produced by a fabricator which participates in the Architectural Precast Association's Plant Certification Program for Production of Architectural Precast Concrete Products and is designated as an APA-certified plant; or is certified to Group A1 Certification by PCI.

2.02 MATERIALS

A. Concrete Materials:

1. Portland Cement: ASTM C 150, Type I or III, using colors to achieve required finish colors. Use only one brand, type and color from the same mill. Gray cement may be used for non-exposed back-up mixes.
2. Aggregates: ASTM C33, gradation may differ to achieve required finish characteristics. Select course and fine aggregate colors and screen sizes to match approved sample. Verify that adequate supply, from one pit or quarry, for each type of aggregate is available for the whole Project. Obtain entire aggregate supply prior to starting Work or have aggregate supply held in reserve by supplier.
3. Lightweight Aggregate: ASTM C 330.
4. Water: Potable.
5. Admixtures: Select to be compatible in specified mix and as follows: Air entraining, ASTM C260; water reducing, ASTM C494 Type A, B, C, F or G; silica fume, ASTM C1240 for cement replacement for high performance concrete; coloring agent, ASTM C979 compatible with other concrete materials.

B. Reinforcing Materials:

1. Reinforcing Bars: ASTM A 615, Grade 40 or 60, unless otherwise required to meet structural requirements. Use galvanized reinforcing bars, ASTM A767, hot-dip galvanized where concrete cover is less than 1-1/2 inches.
2. Steel Welded Wire Fabric: ASTM A 1064, plain, cold drawn.
3. Pre-stressing Tendons: ASTM A 416, Grade 250 or 270, uncoated, 7-wire, low relaxation strand.

C. Connection Materials:

1. Steel Shapes and Plates: ASTM A 36.
2. Malleable Iron Castings: ASTM A 47.
3. Carbon Steel Plates: ASTM A 283.
4. High Strength, Low Alloy Structural Steel: ASTM a 572.
5. Carbon Steel Tubing: ASTM A 500, Grade B.
6. Anchor Bolts: ASTM A 307, carbon steel or ASTM A 325, high strength: bolts, nuts and washers.
7. Welded Headed Studs: AWS D1.1, Type B.
8. Deformed Steel Wire Bar Anchors: ASTM A 1064.
9. Stainless Steel Plate: ASTM F 593, Type 304 or Type 316; bolts and studs, nuts and washers.
10. Welding Electrodes: Comply with AWS Standards.

D. Finish for Steel Connection Materials:

1. Hot-Dip Galvanizing: ASTM A 123 or A 153, for steel exposed to weather in final assembly.
2. Shop Prime Remaining Steel Shapes: SSPC-Paint 25. Hot-dip galvanized ASTM A 153 setting bolts or projecting steel in masonry applications.
3. Anchor Bolts, Nuts, Washers: ASTM A 563, Grade C.
4. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.

E. Bearing Pads: Elastomeric pads, AASHTO M251; ASTM D 412.

F. Grout Materials:

1. Cement Grout: Cement ASTM C 150; sand ASTM C 404; proportions 1:2.5 by volume, minimum water for replacement and hydration.
2. Non-shrink Grout: ASTM C 1107.

2.03 MIXES

A. Design mixes for each type of concrete specified shall be prepared by an independent testing agency or by an architectural precast manufacturing plant at precast fabricator's option.

B. Proportion mixes by either testing agency trial batch or field test data methods in accordance with ACI 211.1, using materials to be used on Project, to provide Concrete with properties as follows:

1. Compressive Strength: 4000 psi when tested in accordance with ASTM C 39.
2. Maximum water cement ratio 0.40 at point of placement.
3. Air-entrainment admixture to result in air content at point of placement complying with ACI requirements.
4. Water absorption maximum 6% by weight when tested in accordance with ASTM C642.

2.04 COLOR AND FINISHES

A. Color: Selected from standard color ranges described by the Architectural Precast Association.

B. Finish: Smooth finish, as cast, finish as described by the Architectural Precast Association.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation, tolerances, true and level bearing surfaces, and other conditions affecting performance of architectural precast concrete units. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Do not install units until supporting structure has been completed and attained allowable design compressive strength.

3.02 ERECTION

A. Erect level, plumb and true to line. Do not allow cumulative dimensional errors to develop. Adjustments such as shimming which would place additional stress on units will not be permitted. Adhere to dimensional tolerances in accordance with PCI recommendations. Replace damaged units which cannot successfully be repaired.

B. Erection Tolerances: Erect with tolerances listed in PCI MNL 117, Appendix I or ACI 533R.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces of units after erection if soiled or stained.

1. Wash and rinse according to architectural precast concrete fabricator's recommendations.
2. Do not use cleaning materials or methods that change the appearance of architectural precast concrete finishes. Test clean a small area to verify suitability of materials and methods.

B. Protect finished surfaces from soiling or damage.

END OF SECTION

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DIVISION 03 - CONCRETE

SECTION 03 60 00

GROUTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Providing grout where indicated on the Drawings.

B. Related Work Specified Elsewhere:

1. Section 03 30 00: Cast-in-Place Concrete.

C. Individual grouting requirements as specified in various other sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Reference Standards.

1. American Concrete Institute: ACI 308, Recommended Practice for Curing Concrete.
2. American Society for Testing and Materials:
   a. ASTM C 33, Concrete Aggregates.
   b. ASTM C 150, Portland Cement.
   c. ASTM C 1019, Standard Test Method for Sampling and Testing Grout.
   d. ASTM C 476, Standard Specification for Grout for Masonry.
   e. ASTM 404, Standard Specification for Aggregates for Masonry Grout.

1.03 SUBMITTALS

A. Submit design mixes or product data in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Prevent moisture damage and contamination of materials.

B. Store materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.05 JOB CONDITIONS

A. Protect against high and low temperatures and bad weather in accordance with American Concrete Institute standards for placement of concrete.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Grout (Sand/Cement).

1. Portland Cement: ASTM C 150 Type II. (I Norm., II Sulfate R., III High Early.)
2. Sand: ASTM C 33, fine aggregate.

B. Water: Potable quality, free from deleterious amounts of acids, alkalis, and organic substances.

C. Non-Shrink, Non-Metallic Grout: Factory premixed material containing no corrosive irons, aluminums, chemicals, or gypsums.

1. Grouts containing water reducers, accelerators, or fluidifiers shall have no drying shrinkage greater than the equivalent sand cement and water mix as tested per ASTM C 596.
2. Grout shall be non-shrink before initial set and show no expansion after set as tested per ASTM C 596.
3. Initial set of grout not less than 60 minutes per ASTM C 191 test.
4. Use Type II cement in grout formulation.
5. Acceptable Manufacturers: U.S. Grout Corporation; FIVE STAR; or equal.

2.02 GROUT QUALITY

A. Grout (Sand/Cement): Mixture of Portland Cement, fine aggregate and water in the same proportions used in cast-in-place concrete with coarse aggregate omitted. Use ready-mix type unless otherwise approved by the Architect.

B. Non-Shrink Grout: Use ready-mix type requiring only the addition of water. Do not add other materials. Water requirement proportions shall conform to manufacturer's specifications for the desired mix consistency.

C. Grout shall meet the requirements of ASTM C476 course grout and shall reach a minimum compressive strength of 3000 pounds per square inch at 28 days.

PART 3 - EXECUTION

3.01 PREPARATION

A. Forming.

1. Use forming procedures that allow proper and complete placement of grout.
2. Anchor support elements so no movement is possible.
3. Remove supports only after grout has hardened.
4. Pre-treat with forming oils wood forms that may absorb moisture.

B. Preparation of Surface.

1. Grout (Sand/Cement): Clean areas to be grouted free of oil, grease, laitance, dirt and other contaminants. Remove loose material. Remove rust, paint, and oil from metal components in contact with grout.
2. Non-Shrink Grout: Prepare in accordance with manufacturer's printed instructions.

3.02 MIXING

A. Time.

1. Grout (Sand/Cement): In accordance with requirements for cast-in-place concrete.
2. Non-Shrink Grout: In accordance with manufacturer's printed instructions.

3.03 PLACING

A. Grout (Sand/Cement): Place and cure grout as follows:

1. Following surface preparation, saturate the concrete with water; then remove excess water and brush on a coat of neat cement. Place grout while neat cement is wet.
2. Place in a single pour. Straight-edge exposed grout surface for trueness; consolidate and finish with a steel trowel.
3. Cure and seal in accordance with ACI 308.
4. After curing, fill scored joints with joint sealer.

B. Non–Shrink, Non–Metallic Grout: Perform grout placement in accordance with the recommendations of ACI and the manufacturer's published specifications for mixing and placing. Place non-shrink, non-metallic grout only where indicated on the Drawings.

END OF SECTION

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DIVISION 03 - CONCRETE

SECTION 03 80 00

PERVIOUS CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

A. Place pervious concrete at the sludge drying beds as shown on the drawings.

1.02 APPLICABLE PUBLICATIONS

A. American Society for Testing and Materials (ASTM) Publications for Pervious Concrete:

C 29	Test for Unit Weight and Voids in Aggregate
C 33	Specification for Concrete Aggregates
C 42	Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C 117	Test Method for Material Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
C 138	Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete
C 150	Specifications for Portland Cement" (Types I or II only)
C 1157	Performance Specification for Hydraulic Cement
C 172	Practice for Sampling Fresh Concrete
C 260	Specification for Air-Entraining Admixtures for Concrete
C 494	Specification for Chemical Admixtures for Concrete
C 595	Specifications for Blended Hydraulic Cements (Type IP or IS only)
C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C 989	Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
C 1077	Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
D 448	Specification for Standard Sizes of Coarse Aggregate for Highway Construction
D 1557	Tests for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 Pound Rammer and 18-inch Drop

E 329 Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction

1.02 SUBMITTALS

A. Pervious Concrete Contractor and Producer Qualifications: If pervious concrete is used, prior to award of the contract, the placing contractor shall submit to the Owner and Engineer a statement attesting to qualifications and experience and the following:

1. A minimum of 2 completed Pervious Concrete projects with addresses.
2. Unit weight acceptance data.
3. In-situ pavement test results including void content and unit weight.
4. Sample of product (i.e. core or test panel).
5. Proposed equipment to be used for placement and compaction.
6. If the placing contractor and/or concrete producer have insufficient experience with Portland cement pervious concrete pavement as outlined above, the placing contractor shall retain an experienced consultant who meets the requirements to monitor production, handling, and placement operations at the contractor's expense.

B. Pervious Concrete Mix Design: Contractor shall furnish a proposed mix design with proportions of materials to the Engineer prior to commencement of work. The data shall include unit weights determined in accordance with ASTM C 29 paragraph 11, jigging procedure.

PART 2 – PRODUCTS

2.01 PERVIOUS CONCRETE

A. Cement: Portland cement Type I or II conforming to ASTM C 150 or Portland cement Type IP or IS conforming to ASTM C 595, or ASTM C 1157.

B. Fly ash and Ground Iron Blast-Furnace Slag: Fly ash conforming to ASTM C 618 may be used in amounts not to exceed 30 percent of total cementitious material. Ground Iron Blast-Furnace Slag conforming to ASTM C 989 may be used in amounts not to exceed 50 percent by weight of total cementitious material. Note: When Class "F" Fly ash is used as part of the minimum cementitious content specified, bond strength development may be delayed and additional curing time is required.

C. Aggregate: Use coarse aggregate (3/8 to No. 16) per ASTM C 33 or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D 448. If other gradation of aggregate is to be used, submit data on proposed material to owner for approval.

D. Air Entraining Agent: Shall comply with ASTM C 260.

E. Admixtures:

1. Type A Water Reducing Admixtures – ASTM C 494.
2. Type B Retarding – ASTM C 494.
3. Type D Water Reducing/Retarding – ASTM C 494.
4. Also, a hydration stabilizer can be utilized and is recommended in the design and production of pervious concrete. This stabilizer suspends cement hydration by forming a protective barrier around the cementitious particles, which delays the particles from achieving initial set. The admixture's primary function should be as a hydration stabilizer, however it must also meet the requirements of ASTM C 494 Type B Retarding or Type D Water Reducing/Retarding admixtures.

F. Water: Comply with ASTM C 94

G. Cement Content: For areas subjected to vehicular traffic loading, the total cementitious material content shall not be less than 600 lbs. per cu. yd.

H. Subgrade Material: Subgrade material is existing. Contractor shall remove existing 3-inch porous asphalt surface and proof roll subgrade to a minimum density of 95% of a maximum dry density as established by ASTM D 1557 or AASHTO T 180 prior to placement of pervious concrete.

PART 3 - EXECUTION

3.01 CURING AND PROTECTION FOR PERVIOUS CONCRETE

A. Curing: Curing procedures shall begin within 20 minutes after the final placement operations. The pavement surface shall be covered with a minimum 6 mil thick polyethylene sheet or other approved covering material. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind and humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions.

B. Cure Time:

1. Portland Cement Type I, II or IS – 7 days minimum.
2. Portland Cement Type I or II with Class F Fly ash (as part of the 600 lbs/cy minimum cementitious) or Type IP – 10 days minimum.
3. No truck traffic shall be allowed for 10 days (no passenger car/light trucks for 7 days).

END OF SECTION

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DIVISION 04 - MASONRY

SECTION 04 01 00

MASONRY RESTORATION AND CLEANING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Protection of adjacent non-masonry surfaces.

B. Cleaning masonry surfaces.

C. Repointing mortar joints.

D. Cleaning up residue.

1.02 REGULATORY REQUIREMENTS

A. Municipal or State regulations governing cleaning, scaffolding and protection of adjacent properties.

1.03 MOCK-UP

A. Repoint a 4 x 4 foot panel of wall using materials and procedures specified herein.

B. Clean a 10 x 10 foot panel of wall, in presence of Architect to obtain the desired degree of cleanliness.

C. Acceptable panels and method of procedure will become the standard for work of this section.

1.04 DELIVERY, STORAGE AND HANDLING

A. Furnish restoration cleaner materials in manufacturer’s packaging, complete with instructions for use.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not re-point, wash down or wet surfaces when temperature may drop below 40 degrees F. within 24 hours.

B. Do not lay masonry when outside air temperature is below 40 degrees F. unless special provision for heating and protection is approved.

C. Do not build on frozen work. Remove and replace work damaged by frost or freezing.

1.06 PROTECTION

A. Protect windows, doorways, trim and other surfaces from damage and immediately remove stains, efflorescence or other unsightly excess resulting from the work of this section.

B. Protect roof membranes and flashings from damage.

C. Build up sand dams to divert flowing water to exterior drains.

D. Block automobile and pedestrian traffic from work areas.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. ProSoCo, Inc. Kansas City, Kansas 66117..

B. Approved substitution.

2.02 MATERIALS

A. Cleaning Agent: Inhibited acidic ingredients and wetting agents. Sure Klean Restoration Cleaner as manufactured by ProSoCo, Inc.

B. Water: Clean, potable.

C. Mortar: ASTM C387 Type N using gray white cement, commercially prepared type.

D. Hydrated Lime: ASTM C207 type.

E. Quicklime: ASTM C5 non-hydraulic type.

PART 3 - EXECUTION

3.01 PREPARATION

A. Carefully remove and store fixtures, fittings, finishing hardware and accessories.

B. Close off, mask and board up areas, materials and surfaces not receiving work of this section to protect from damage.

3.02 RESTORATION CLEANING

A. Clean masonry with restoration cleaner, mixed into solution in strict accordance with manufacturer's instructions and identical to that required for sample area.

B. Provide a second application if required by preliminary test of sample area.

C. Rinse from bottom up with potable water applied at high pressure.

3.03 TUCK POINTING

A. Perform before cleaning.

B. Cut out loose or disintegrated mortar in joints to a ½" depth, by hand.

C. Do not damage masonry units.

D. When cutting is complete, remove dust and loose material by brushing or with water jet.

E. Apply pre-hydrated type mortar packed tightly in thin layers, leaving a smooth, compact joint matching existing.

F. Promptly as work proceeds and upon completion, remove excess mortar, smears and droppings.

G. Clean adjacent and adjoining surface of marks arising out of execution of work of this section.

H. Allow for repair and pointing of 5000 lineal feet of mortar joint.

END OF SECTION

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DIVISION 04 - MASONRY

SECTION 04 01 65

JOINT REINFORCEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Masonry wall joint reinforcement and control joint material.

B. Related Work Specified Elsewhere.

1. Section 04 05 13: Mortars
2. Section 04 20 00: Unit Masonry

1.02 SUBMITTALS

A. Written product list and manufacturer's name intended for use for review.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Hohmann & Barnard, Inc., Columbia, MD.

B. Approved substitution.

2.02 JOINT REINFORCEMENT

A. Wire conforming to ASTM A1064/A1064M for "Cold Drawn Steel Wire for Concrete Reinforcement". Truss type of 3/16 inch deformed side rods with #9 gauge cross rods, 2 inches narrower than width of wall, regular mill galvanized finish.

1. Use single wythe type for single wythe walls.
2. Use H&B 2-Seal Thermal Concrete Wing Nut Anchor for concrete, CMU, or stud cavity wall construction.

2.03 CONTROL JOINTS

A. H&B RS Standard, 2-5/8" flange, designed to fit standard sash block, meeting requirements of ASTM D2000, 80 shore durometer hardness.

2.04 EXPANSION JOINTS

A. One half inch wide closed cell backer rod with silicone sealant unless otherwise noted in the contract documents.

PART 3 - EXECUTION

3.01 JOINT REINFORCEMENT

A. Provide horizontal reinforcing, continuous in masonry wall, 16 inches maximum vertical spacing above grade, 8 inches maximum below grade. The first level of reinforcing shall start at 8 inches above floor slab.

B. Provide prefabricated "T" section horizontal reinforcing at abutting walls and partitions.

C. Corner reinforcing prefabricated. Job forming not permitted. Lapping of reinforcement at corners is not acceptable.

D. Reinforce horizontally above and below openings in first and second bed joints, 8 inches apart a minimum of 2 feet beyond edge of opening.

E. Do not bridge control and expansion joints with horizontal reinforcing.

3.02 CONTROL JOINTS

A. Place where indicated in CMU walls and in accord with the manufacturer's directions. Where not indicated, space joints a maximum of 25-0” on-center.

3.03 EXPANSION JOINTS

A. Place where indicated in brick veneer and in accord with the manufacturer's directions. Where not indicated, space joints a maximum of 20’-0” on-center.

END OF SECTION

DIVISION 04 - MASONRY

SECTION 04 05 13

MASONRY MORTARING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Mortar for brick and concrete masonry units.

1. Use pigmented mortar in decorative split face CMU and exterior brick walls. Allow for one (1) color for each masonry type.

B. Related Work Specified Elsewhere.

1. Section 04 01 65: Joint Reinforcement
2. Section 04 20 00: Unit Masonry

1.02 QUALITY ASSURANCE

A. Comply with applicable provisions of latest edition of:

1. ASTM C 91: Specifications for Masonry Cement.
2. ASTM C 144: Aggregate for Masonry Mortar.
3. ASTM C 270: Specification for Mortar for Unit Masonry.

1.03 SUBMITTALS

A. Furnish list of materials and manufacturers.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store materials off the ground, under cover, and in a dry location.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Masonry Cement: ASTM C 91: Type S, N and M, supplied by one manufacturer.

B. Sand: Clean, well graded per ASTM C 144.

C. Water: Potable.

D. Hydrated Lime: ASTM C 207, Type S.

E. Admixture: Not permitted without written approval.

F. Bond Beam Grout: See Section 03 60 00 - GROUTING.

G. Grout for Setting Bearing Plates and Structural Steel: Non-shrink, cement based, non-metallic, meeting requirements of ASTM C-1107.

1. Sure-Grip Utility Grout by Dayton Superior Corp., Philadelphia, PA, or approved substitution.

PART 3 - EXECUTION

3.01 MIXING MORTARS

A. Measure sand and any part bags of mortar by the use of satisfactory measuring boxes.

B. Concrete Masonry Units: One part natural masonry cement, 2-1/4 to 3 parts sand by volume, ASTM C270, Type S above grade, Type M below grade.

C. Brick: ASTM C270, Type N.

D. Mix mortars thoroughly by machine in accord with the manufacturer's directions to meet the requirements of ASTM C 270.

E. Do not re-temper or use mortar after initial set.

END OF SECTION

DIVISION 04 - MASONRY

SECTION 04 20 00

UNIT MASONRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete masonry units, and bond beams.

B. Related Work Specified Elsewhere.

1. Section 04 05 13: Masonry Mortaring
2. Section 04 01 65: Joint Reinforcement

1.02 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated. (ASTM E 548 withdrawn without replacement.)

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

1.03 SUBMITTALS

A. Furnish list of materials and manufacturers.

B. Provide certifications on all materials used.

C. Submit block samples for approval by the Architect.

D. Sample Wall.

1. Lay up a 4 foot long by approximately 4 foot high wall panel for review and approval, including concrete masonry units, metal reinforcing, plastic flashing and weep holes.
2. Lay up additional panels, if requested by the architect, until written approval is issued.
3. Panel will remain as sample until masonry work is completed, and will serve, after review, as the standard for masonry work.

1.04 STORAGE

A. Stack masonry units carefully to avoid chipping.

B. Protect from wetting and soiling.

1.05 JOB CONDITIONS

A. Protect fresh work from freezing rain, hot sun and quick drying with a strong, waterproof, non-staining cover.

B. Do not lay masonry when outside air temperature is below 40°F unless special provision for heating and protection is provided and approved.

C. Do not build on frozen work. Remove and replace work damaged by frost or freezing.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Units: ASTM C 90. Provide normal weight units with minimum average net-area compressive strength of 1900 psi.

B. Solid Load Bearing Units: ASTM C 90.

C. Size: 8 inches by 16 inches including allowance for joint widths by thickness required, with exposed square external corners.

D. Fine grain uniform face texture, accurate face dimensions and sharp corners and free from impurities that cause stains or pop outs.

E. Bond beams: Provide units of indicated shape and size.

F. Provide half blocks, jamb blocks, end blocks, bull nose blocks, as required to meet job conditions.

G. Split Face CMU: ASTM C90.

1. EP Henry or approved substitution.
2. Select from manufacturer's standard color range.

H. Ground Face CMU: ASTM C90.

1. EP Henry or approved substitution.
2. Select from manufacturer's standard color range.

I. Burnished CMU: ASTM C90.

1. EP Henry or approved substitution.
2. Factory ground and burnished finish.
3. Select from manufacturer's standard color range.

2.02 GROUTS

A. Setting Structural Steel and Base Plates (Non-shrink): See Section 03 60 00 - GROUTING.

B. Bond Beams (Sand/Cement): See Section 03 60 00 – GROUTING.

2.03 REINFORCING BARS

A. See Section 03 20 00 - CONCRETE REINFORCEMENT.

2.04 WATER REPELLANT

A All exterior exposed masonry shall be sealed with VOC-compliant clear water-based silane/siloxane penetrating sealer suited for the specific substrate.

1. MasterProtect H 177.
2. Approved substitution.

2.05 JOINT REINFORCEMENT/MASONRY TIES

A. See Section 04 01 65 –JOINT REINFORCEMENT.

2.06 REINFORCING BAR POSITIONERS

A. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells.

Units are formed from .142 inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Hohmann & Barnard Company, Dur-O-Wal Division; D/A 810 or D/A 812.
2. Approved substitution.

2.07 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Diedrich Technologies, Inc.
2. Approved substitution.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install metal or concealed plastic flashing, anchor bolts, reinforcing and core insulation as work progresses.

B. Saw exposed faces of masonry units where cutting is required.

C. Fill head and bed joints with mortar and make mortar bed joints of hollow units equal to width of face shells.

D. Keep cavities and cores clean of mortar droppings.

E. Do not wet concrete masonry units.

G. Do not use chipped, cracked, scratched or dirty units.

H. Make exposed joints uniform in width. Build masonry level, plumb and true.

I. When necessary to build portions of wall to higher levels than adjacent portions, rack courses back without toothing and carry exterior walls up level where possible.

J. Bond intersecting walls and corners.

1. Except provide butt joints for masonry partitions at exterior walls.
2. Continue horizontal reinforcing thru butt joints, rake out vertical joints 1/2 inch at intersection and caulk.

K. Lay concrete masonry units "Running Bond". Cut joints flush and tool exposed joints in interior masonry unit work slightly concave.

L. Provide weep holes spaced as indicated at bottom of cavity. Form with rope wick left in place and cut off flush with building face. Space weep holes at 24 inches on-center. Trim wicking material flush with outside face of wall after mortar has set.

M. Place cavity drainage material in cavities per manufacturer's recommendations.

N. Bond beam fill: Place and tie reinforcing bars with 24 inch lap. Fill cores and embed reinforcing in grout specified in Section 03 60 00 - GROUT. Mortar joints must cure 24 hours before pouring grout fill.

O. Place control joint material where indicated. Rake out joint and caulk where exposed.

P. Generally extend masonry work 8 inches above ceiling, unless indicated otherwise. Fit block neatly around beams and columns and in other locations as required.

Q. Do not erect masonry walls above the elevation of the slab bearing until after the slabs or tees have been placed.

R. Dovetail Anchors: Insert into slots spaced 1'-4" O.C. Space anchors 1'-4" O.C. vertically in mortar joints.

S. Protect walls from water intrusion at top and/or side of incomplete construction to minimize efflorescence.

T. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

U. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

V. Vertical Reinforcement

1. Construct formwork and shores as needed to support reinforced masonry elements during construction. Brace, tie and support forms to maintain position and shape during construction and curing of reinforced masonry.

Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

2. Place reinforcement in accordance with ACI 530.1. Place reinforcing bar positioners according to manufacturer's recommendations.
3. Comply with requirements in ACI 530.1 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.02 FIELD QUALITY CONTROL

A. Inspectors: Contractor will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports.

1. Payment for these services will be made by Contractor.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Testing Frequency: One set of tests for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

C. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

D. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

E. Prism Test: For each type of construction provided, per ASTM C 1314 at 28 days.

3.03 POINTING

A. Upon completion, point masonry work where necessary.

B. Contractor shall replace, at his expense, work stained or damaged.

C. All efflorescence, if it occurs, shall be removed completely, prior to final acceptance.

3.04 CLEANING

A. Dry brush concrete masonry at end of each day's work.

1. Allow walls to cure for at least three weeks in summer and five weeks in winter months before cleaning.

END OF SECTION

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DIVISION 05 - METALS

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Miscellaneous metal items not covered in other sections.

1.02 REFERENCES

A. ASTM A36: Specification for Structural Steel.

B. ASTM A123: Specification for Zinc Coating (Hot Dip) on Iron and Steel Products.

C. ASTM A307: Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

D. ASTM A879: Specification for steel sheet, Zinc coated by Electrolytic Process.

1.03 QUALITY ASSURANCE

A. Standards: Comply with applicable provisions of the referenced standards.

1.04 SUBMITTALS

A. Submit shop drawings for review. Take field measurements prior to preparation of shop drawings.

B. Manufacturer's name and type of shop paint.

C. Submit sealed design calculations for equipment platforms and platform foundations. Calculations shall be based on applicable building and safety codes. Calculations shall include member sizes, deflections, connections, lateral stability, etc. Design calculations shall be sealed by a professional engineer registered in Delaware. Unless noted otherwise, platforms shall be designed for a 100 psf uniform live load or 2,000 pound concentrated live load in addition to the equipment load.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plates and Bars: ASTM A36, steel.

B. Anchor Bolts: ASTM A307 steel.

C. Shop Paint: Rust inhibiting primer. Remove mill scale and apply to cleaned and degreased steel surfaces at rate to provide a 2.0-mil dry film thickness.

D. Galvanizing: ASTM A123/A123M zinc coating.

2.02 FABRICATION, GENERAL

A. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Smooth exposed edges.

B. Provide zinc–coated fasteners in connection with steel items.

2.03 ITEMS

A. Steel Lintels: Fabricate to sizes shown of ASTM A992 steel. Provide over recesses or openings including openings for mechanical trades, where concrete lintels are not specified. Not less than 8" bearing at each end. Shop paint.

B. Anchor Bolts: Fabricate of ASTM A307 steel, threaded one end with nut and washer, other end as detailed. Shop paint portion not embedded in mortar or concrete.

C. Joist/Beam Bearing Plate: Fabricate of A36 steel to indicated size with welded anchors with bent end. Shop paint.

D. W-Shape Steel Lintels: Fabricate to sizes shown of ASTM A992 steel with a minimum yield stress of 50 ksi. Provide over recesses or openings, including openings for mechanical trades, where concrete lintels are not specified. Not less than 8 inch bearing at each end. Shop paint.

E. Aluminum Equipment Platform: Fabricate to size as required by cooling tower manufacturer. Base of platform shall be minimum 7’-0” above top of sidewalk.

1. Aluminum alloy 6061–T6 fabrication. Mill finish.
2. Provide bearing plates for bolted connection to equipment base with stainless steel bolts.
3. Install equipment per manufacturer recommendations.

F. Overhead Door Sill Angles: Fabricate of A36 steel. Furnish with ½" diameter x 6" long bent (e.g., anchors space 2'–0" O.C. maximum. Weld anchors to inside corner of sill angle. Shop paint.

G. Pipe Bollards: Galvanized steel pipe, Grade 40, to required length. Shop paint.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Perform cutting, drilling, and fitting required.

B. Set work accurately in place, alignment and elevation, measured from established lines and levels. Provide anchorage devices and fasteners where necessary for installation to other work.

C. Set loose items on cleaned bearing surfaces, using wedges or other adjustments as required. Solidly pack open spaces with bedding mortar, using commercial non-shrink grout material specified.

D. Field-weld items where necessary.

E. Pipe Bollards: Set in concrete as specified in Section 03 30 00 - CAST-IN-PLACE CONCRETE. Fill with concrete as specified in Section 03 60 00 - GROUTING. Round off top for drainage.

F. Furnish sill angles or other items to concrete or masonry contractor for setting in place.

G. Touch-up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop.

H. Do not weld, cut or abrade surfaces of hot-dip galvanized items unless indicated otherwise.

I. Paint surfaces of aluminum in contact with other materials with two coats of bituminous paint.

END OF SECTION

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DIVISION 06 - WOOD AND PLASTICS

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preservative and non-treated lumber, fastenings, and other items needed for rough carpentry.

1.02 REFERENCES

A. ASTM A307: Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

B. FS FF-B-561: Bolts, (Screw) Lag.

C. FS FF-N-105: Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.

1.03 QUALITY ASSURANCE

A. Workmen: Provide workmen who are thoroughly familiar with the type of construction involved and the materials and techniques required.

B. Standards: Comply with pertinent codes and regulations, and with the standards listed in this section.

C. Conflicting Requirements: In event of conflict between pertinent codes and regulations and requirements of referenced standards or these Specifications, the provisions of the more stringent shall govern.

1.04 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect lumber materials before, during and after delivery to the job site.
2. Deliver materials to job site and store, in a safe area and shored up off the ground surface.
3. Identify framing lumber as to grades, and store all grades separately from other grades.
4. Protect with adequate waterproof outer wrappings.

5. Use extreme care in the off-loading of lumber to prevent damage, splitting, and breaking of materials.

B. Replacements: In event of damage, immediately make repairs and replacements necessary at no additional cost to Owner.

PART 2 - PRODUCTS

2.01 GRADE STAMPS

A. Framing Lumber: Identify framing lumber by grade stamp of the appropriate lumber Inspection agency.

B. Other: Identify other materials by the appropriate stamp of the agency or association, or by such other means as approved.

C. Each piece of preservative treated lumber must bear stamp or imprint showing treatment and plant identification.

D. Plywood: Identify plywood at to species, grade, and glue type by the stamp of the American Plywood Association.

1. All plywood sheathing shall contain non-urethane waterproof glue.

2.02 MATERIALS

A. Sizes: As shown on the drawings or as required for conditions.

B. All materials shall meet or exceed the following:

ITEM	DESCRIPTION
Structural Framing, KD: 2x6 to 3x12	Southern Pine 1200# Fiber Stress for Exterior, SPF No. 2 for interior (Bending Stress, Fb = 875psi, min.)
Preservative Treated Wood: Pressure impregnated with Alkaline Copper Quaternary (ACQ) conforming to AWPA Standard C2 2. for residential/commercial construction.	1. Air or Kiln dry to 19% content or less after treatment. Treat nailers, sills, furring, stripping and similar items in contact with concrete, masonry, steel.
Minimum Retention Rate:	0.40 lbs. per cubic foot with minimum penetration 2.5” or 85% of the sapwood

Treated Framing Lumber: 2x4 to 3x12	Southern Yellow Pine. SPIB Grade #2
Machine Bolts:	ASTM A307
Lag screws:	Fed. Spec. FF-B-561
Nails:	Fed. Spec. FF-N-105 (Note: Use galvanized or stainless steel 304 or 316 fasteners at exterior locations and with preservative treated lumber).
Plywood Sheathing, APA Trademarked:	APA Rated (C-D Grade) with water-proof glue, Exposure1, square edge unless noted otherwise.
Felt:	No. 15 or No. 30 asphalt saturated felt as indicated.
Framing Anchors:	Fabricated of galvanized steel. Provide framing anchors and hangers of the size and type recommended by the manufacturer for each use, including recommended nails. “Strong-Tie” manufactured by Simpson, San Leandro, CA 94577 or approved substitution.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work.

3.02 WORKMANSHIP

A. General: Rough carpentry shall produce joints true, tight, and well nailed, with all members assembled in accord with drawings and pertinent codes and regulations.

B. Selection of Lumber Pieces:

1. Carefully select members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making connections.
2. Cut out and discard defects which will render a piece unable to serve its intended function. Lumber may be rejected by the Engineer, whether or not

it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

3. Shimming: Do not shim sills, joists, short studs, trimmers, headers, lintels, or other framing components.

3.03 TREATED LUMBER

A. General: Use preservative treated lumber for pads, blocking, nailers and grounds in contact with concrete, masonry or steel, or exposed to weather.

B. Apply brush coat of same chemicals on cuts where cutting is necessary.

3.04 GENERAL FRAMING

A. General:

1. In addition to framing operations normal to fabrication and erection indicated, install backing required for work of other trades.
2. Set horizontal or sloped members with crown up.

B. Bearings:

1. Make bearings full unless otherwise indicated on the Drawings.
2. Finish bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch ends as required to give uniform bearing surface.

C. Plywood Sheathing:

1. Place plywood with face grain perpendicular to supports and continuously over at least two supports. Provide edge support by means of ply-clips, tongue and groove panels or lumber blocking between rafters. Allow 1/8” spacing at panel ends and edges.
2. Center joints accurately over supports. Stagger end joints of plywood panels to achieve a minimum of continuity of joints.
3. Nail 4” O.C. at edges of panels and 6” O.C. at intermediate supports, unless noted otherwise in the contract drawings. Use nail type recommended by the APA.
4. Protection of Plywood: Protect plywood from moisture by use of waterproof coverings until plywood has in turn been covered with the next succeeding component. Refer to roofing specification for felt type.

3.05 FASTENING

A. Nailing:

1. Use common wire nails or spikes.
2. Nail without splitting wood. Pre-bore as required. Replace split members.

B. Bolting: Drill holes 1/16 inch larger in diameter than the bolts being used. Drill straight and true from on side only. Bolt threads shall not bear on wood. Use washers under head and nut where both bear on wood; use washers under all nuts.

C. Screws: Pre-bore holes for lag screws and wood screws, same diameter as root of thread; enlarge holes to shank diameter for length of shank. Screw, do not drive, lag screws and wood screws.

D. Framing Anchors: Install in accord with the manufacturer's instructions. Every nail hole must be used.

3.06 CLEANING UP

A. General: Keep premises in a neat, safe, and orderly condition at all times, free from accumulation of sawdust, cut ends, and debris.

3.07 BLOCKING AND BACKING

A. Furnish and install all blocking and backing necessary to mount fixtures, accessories, equipment and furnishings specified.

END OF SECTION

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DIVISION 06 - WOOD AND PLASTICS

SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Plate connected wood trusses, plant assembled in so far as possible.

1.02 REFERENCES

A. National Design Specifications for Wood Construction (NFPA).

B. Design Specifications for Metal Plate Connected Wood Trusses (TPI).

C. ASTM A446: Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process Structural (Physical) Quality.

D. ASTM A525: Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by Hot-Dip Process.

1.03 SUBMITTALS

A. Shop drawings for review. Drawings must bear the seal of a licensed professional engineer.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Use care in handling to prevent damage, splitting and joint separation.

B. Store off the ground, level and in a manner to avoid strain on joints and warping.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber: Stress-graded kiln dried Douglas Fir or Southern Yellow Pine. Size and grade as dictated by loading requirements.

B. Gusset Plates: Galvanized sheet steel meeting requirements of ASTM A 446 and A 525. Plates have alternating pairs of twisted back to back nail type projections along the length of the plate. Plate sizes as dictated by lumber sizes and loading requirements.

2.02 FABRICATION

A. Fabricate with extended top chord where required for cornice attachment.

B. Conform to TPI Quality Control Manual QCM-77 for tolerances and special requirements.

C. Accurately cut and fabricate wood members so that members have good bearing.

D. Apply connector plates to both faces of truss at each joint, with firm even contact between the plate and the wood.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Lift trusses in accord with the suggestions of the Truss Plate Institute.

B. Install temporary bracing as work progresses.

C. Install permanent continuous bracing where shown. Remove temporary bracing.

D. Fasten to walls using framing anchors.

END OF SECTION

DIVISION 06 – WOOD AND PLASTICS

SECTION 06 80 00

COMPOSITE FABRICATIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish, fabricate (where necessary), and install all fiberglass reinforced plastic (FRP) items, with all appurtenances, accessories and serviceable installation as shown on the Contract Drawings and as specified herein, and in accordance with the requirements of the Project Manual.

1.02 REFERENCES

A. The publications listed below (latest revision applicable) form a part of this specification to the extent referenced herein. The publications are referred to within the text by the designation only.

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) Test Methods:
2. ASTM D 635: Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
3. ASTM E 84: Surface Burning Characteristics of Building Materials

1.03 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish shop drawings of all fabricated gratings and accessories in accordance with the provisions of this Section.

B. The CONTRACTOR shall furnish manufacturer's shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication of and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details.

C. The CONTRACTOR shall submit the manufacturer’s published literature including structural design data, structural properties data, grating load/deflection tables, corrosion resistance tables, certificates of compliance and test reports as applicable, concrete anchor systems and their allowable load tables, and design calculations for systems not sized or designed in the Project Manual.

D. The CONTRACTOR may be requested to submit sample pieces of each item specified herein for acceptance by the ENGINEER as to quality and color. Sample pieces shall be manufactured by the method to be used in the WORK.

1.04 QUALITY ASSURANCE

A. All items to be provided under this Section shall be furnished only by manufacturers having experience in the design and manufacture of similar products and systems. If requested, experience shall be demonstrated by a record of at least five (5) previous, separate, similar successful installations in the last five (5) years.

1.05 PRODUCT DELIVERY AND STORAGE

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.

B. Storage of Products: All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Store items in an enclosed area and free from contact with soil and water. Store adhesives, resins and their catalysts and hardeners in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Molded & pultruded grating shall be Fibergrate or Gatorgrate as manufactured by: **Fibergrate Composite Structures Inc.,** 4285 Kellway Circle, Suite 224, Addison, Texas 75001 USA, (800) 527-4043, (972) 250-1530 Fax, or **Seasafe, Inc.**, 209 Glaser Drive, Lafayette, LA 70508, USA, 800-326-8842, 337-406-8880 Fax, or approved substitution.

2.02 GENERAL

A. All FRP items furnished under this Section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Project Manual.

B. Fiberglass reinforcement shall be continuous roving in sufficient quantities as needed by the application and/or physical properties required.

C. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure to corrosives, wear or weathering.

D. All grating products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test. Gratings shall also have tested burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.

E. All mechanical grating clips shall be manufactured of Type 316SS (stainless steel).

2.03 MOLDED FRP GRATING

A. Fabrication:

1. Grating shall be of a one piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Grating shall have square mesh pattern providing bidirectional strength. Grating shall be reinforced with continuous rovings of equal number of layers in each direction. The top layer of reinforcement shall be no more than 3/16” below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass (by weight) shall not exceed 35% so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements of the contract.
2. After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.

B. Non-slip surfacing: Grating shall be manufactured with a quartz grit slip resistant surface on the top of each bar. The embedded grit shall not penetrate beyond 3/16".

C. Fire rating: Grating shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E 84. Certifications shall be made available to the engineers when requested and shall be dated within the past two years. Test data performed only on the resin shall not be acceptable.

D. Resin System: The resin system used in the manufacture of the grating shall be IFR. Manufacturer may be required to submit corrosion data from tests performed on actual grating products in standard chemical environments. Corrosion resistance data of the base resin from the manufacturer is not a true indicator of grating product corrosion resistance and shall not be accepted.

E. Color: Light Gray

F. Depth: 2" with a tolerance of plus or minus 1/16".

G. Mesh Configuration: 2” x 2” with a tolerance of plus or minus 1/16” mesh centerline to centerline.

H. Load/Deflection:

1. Grating load/deflection requirements at the required span (shown below) shall be less than manufacturers published maximum recommended loads. Maximum recommended loads shall be determined by acoustic emission testing. Load/deflection not to exceed the following:
   a. Uniform distributed load over a 48” span: 100 pounds per square foot, with a maximum deflection of 0.28”.
   b. Concentrated load over a 48” span with a 12” width of grating: 250 pounds located at mid span, with a maximum deflection of 0.28”.
   c. Molded grated shall not be installed with spans greater than 48”.
   d. Where grating is over a trench drain, grating shall be designed to support HS20 traffic for the span indicated.

I. Substitutions: Other products of equal strength, stiffness, corrosion resistance and overall quality are acceptable only with prior approval by the engineer, after review of the proper supporting data.

J. Small Hole Grating: Grating shall consist of 2” molded grating with a 1/8” thick FRP plate affixed to the top. The plate shall be grit covered with 3/16” diameter holes spaced at no more than 3 inches on center. Color shall be gray to match.

2.04 GRATING FABRICATION

A. Measurements: Grating supplied shall meet the dimensional requirements and tolerances as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions, as required by grating manufacturer to complete their fabrication work.

1. When field dimensions are not required, contractor shall determine correct size and locations of required holes or cutouts from field dimensions before field fabricating grating.

B. Layout: Each grating section shall be readily removable, except where indicated on drawings. Manufacturer to provide openings and holes where located on the contract drawings. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable. Gratings shall be fabricated free from

warps, twists, or other defects which affect appearance and serviceability.

C. Sealing: All shop fabricated grating cuts shall be coated with vinyl ester resin to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.

D. Hardware: Two (2) Type 316 stainless steel hold-down clips shall be provided and spaced at each load bar support member, or a maximum of four feet apart, with a minimum of four per piece of grating, or as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Shop inspection shall be authorized as required by the Owner and shall be at Contractor's expense. The fabricator shall give ample notice to Contractor prior to the beginning of any fabrication work so that inspection may be provided. The grating shall be as free, as commercially possible, from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits. The surface shall have a smooth finish (except for grit top surfaces).

3.02 INSTALLATION

A. Contractor shall install gratings in accordance with manufacturer’s assembly drawings. Lock grating panels securely in place with hold-down fasteners as specified herein. Field cuts or drilled holes in reinforced plastic products shall be done with carbide or diamond tipped bits and blades. Cut, drilled or scared surfaces shall be sealed with a compatible resin, in accordance with manufacturer's instructions, to prevent corrosive attack of the glass reinforcements. Follow manufacturer's instructions when cutting or drilling fiberglass products or using resin products; provide adequate ventilation.

END OF SECTION

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DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 11 16

CEMENTITIOUS DAMPPROOFING (PARGING)

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Application of a brushed on cementitious waterproofing placed over existing and new surfaces below grade.

1.02 QUALITY ASSURANCE

A. Comply with the requirements of the following:

1. FS TT-P-0035 (1) Paint, Cementitious, Powder, White and Colors (For Interior and Exterior Use).

1.03 SUBMITTALS

A. Submit 2 copes of manufacturer's specifications, installation instructions and general recommendations.

1.04 JOB CONDITIONS

A. Do not proceed with work until the substrate has been properly patched and sealed to receive the waterproofing.

B. When ambient temperature is 40 degrees Fahrenheit or less and falling, do not proceed with waterproofing. Do not apply materials to frozen substrates or to any substrate in a condition not complying with manufacturer's recommendations.

C. Do not proceed with waterproofing work until unsatisfactory conditions have been corrected.

1.05 GUARANTEE

A. General: Contractor provide his written guarantee as follows, "Waterproofing is guaranteed against defects of workmanship and materials for a period of two years from date of Substantial Completion. Should leaks occur with this period, repairs to the waterproofing and repair of damage to other portions of the building caused by such leaks will be made good without cost to the Owner."

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. BASF Corporation Construction Systems, Southfield, MI 48033.

B. Approved substitution.

2.02 MATERIALS

A. Bonding Agent: Formulation of acrylic polymers and modifiers in liquid form to be added to foundation coating material to improve adhesion and mechanical properties. Type: “MasterEmaco A 660.”

B. Foundation Coating: Cement based, heavy duty waterproof coating. Type: “Masterseal 582 Foundation Coating.”

C. Water: Potable.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrate by washing and scrubbing clean of dirt, loose materials and other substances which interfere with penetration, bond, or performance of materials.

3.02 INSTALLATION

A. Cant strips, Filler and Extension of Coatings: On exterior surfaces, where lower edge of damp proofing terminates at a horizontal projection (including footings under walls), provide a grout cant strip filler of foundation coating mixed to a mortar consistency. Form and compact in place. Provide grout fillers wherever required to close openings in the substrate.

B. Protect other work from spillage of materials. Replace or restore other work which is soiled or otherwise damaged by the installation of the waterproofing materials and associated work.

C. Mix and apply in accord with the manufacturer’s directions including the addition of the bonding agent.

D. Dampen surface thoroughly with clean water. Lay coating on wall and level it out. Do not thin. Apply two evenly distributed applications, each a minimum of 2 lbs. per square yard. Form a minimum 1-1/2” cove at junction of wall and footer. Use a coarse fibered brush for application of coating.

END OF SECTION

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DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 21 13.13

PERIMETER INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Insulation for perimeter areas of on-grade floor slabs.

1.02 QUALITY ASSURANCE

A. ASTM C578: Specification for Pre-Formed, Cellular, Polystyrene Thermal Insulation.

B. Standards:

1. R Value: 50°F. ft^2.h/BTU per inch, min. at 75°F. mean temperature (ASTM C518) and warranted to retain at least 90% of its original R value for 15 years.

1.03 SUBMITTALS

A. Catalog data for review.

1.04 WARRANTY

A. 15-year period. Include printed warranty certificate.

1.05 PRODUCT HANDLING, STORAGE

A. Comply with the manufacturer's instructions. Do not expose to flame or other ignition sources.

B. Protect insulation from exposure to sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Dow Chemical, Midland, Mich. 48674.

1. Styrofoam brand square edge or score board insulation.

B. Approved substitution.

2.02 MATERIALS

A. Insulation: Closed cell extruded polystyrene board. ASTM C578,Type IV. Compressive strength 25 lb/in.^{2} minimum (ASTM D1621). Water absorption 0.1% by volume maximum (ASTM C272).

B. Mastic: Type as recommended by insulation manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set units with tight joints, against inside face of foundation wall with 1/4" to 3/8" continuous beads spaced 16" O.C. or 1-1/2" diameter 1-1/2" high spots in rows 8" apart and spaced 16" on center.

B. Apply insulation to wall within 15 minutes after adhesive is applied.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 21 13.16

WALL INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Rigid insulation applied to existing masonry walls with metal zee furring.

1.02 QUALITY ASSURANCE

A. Standards: Comply with applicable provisions of the following:

1. ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Board, Type 1, Class 2.
2. Class A fire rating.
3. Compressive strength: 25.0 psi minimum per ASTM D1621.
4. Aged thermal conductivity @ 75 degrees F. is K=0.16 (R6.25).

1.03 SUBMITTALS

A. Insulation sample and catalog data for review.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with the manufacturer's instructions.

B. Protect insulation from exposure to sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Dow Chemical Co., Midland, Mich. 48460.

B. Approved substitution.

2.02 MATERIALS

A. Wall Insulation: Glass fiber reinforced polyisocyanurate foam core laminated between 1.0 mil smooth, reflective aluminum foil facers on both sides.

1. THERMAX Sheathing by the Dow Chemical Company, Midland, MI 48674.
2. Approved substitution.

B. Mastic: Type as recommended by insulation manufacturer for specific type of insulation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set units against interior face of wall with small pads of mastic spaced one foot apart.

B. Seal edges per manufacturer’s recommendations.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 21 16

BATT INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Batt and roll-type insulation placed between studs in walls and in attics.

1.02 QUALITY ASSURANCE

A. ASTM C665: Insulation Blankets, Thermal (Mineral Fiber).

1.03 SUBMITTALS

A. Catalog data for review.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Owens Corning, Toledo, OH 43659.

B. Approved substitution.

2.02 MATERIALS

A. Glass fiber building insulation blankets with Kraft paper vapor retarder one face with stapling flange. ASTM C665, Type II, Class C.

B. Un-faced glass fiber building insulation blankets for exposed application in attic areas. ASTM C665, Type I.

1. Consult and comply with manufacturer's recommendations for using vapor barrier facings for attic applications based on climate zone and other factors.

C. Un-faced glass fiber insulation blankets for sound batt insulation. ASTM C665, Type I.

D. Attic stair insulator tent comprised of fiberglass insulation R-10 insulation value. Size shall be selected from manufacturer's standard sizes to cover attic access openings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install insulation in accord with the manufacturer's recommendations for the particular type of insulation.

B. Install attic stair insulator tent over attic access panels as recommended by the manufacturer.

END OF SECTION

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 31 13

FIBERGLASS SHINGLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Self-sealing fiberglass asphalt shingles.

1.02 REFERENCES

A. UL 790 – Test of Fire Resistance of Roof Covering Materials.

B. UL 997 – Wind Resistance of Roof Covering Materials.

C. ASTM D3018 – Type 1, Asphalt Shingles Surfaced with Mineral Granules.

D. ASTM D7158 - Wind Resistance of Asphalt Shingles.

E. ASTM D225 – Specification for Asphalt Shingles.

F. ASTM F1667- Specification for Driven Fasteners.

1.03 SUBMITTALS

A. Manufacturer’s catalog data and full line shingle sample for review and color selection.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Keep shingles completely covered and protected from weather, dry and reasonably cool. Do not store in direct sunlight until applied.

B. Store roll-goods on end.

1.05 GUARANTEE

A. General Contractor shall provide his written guarantee as follows: “Asphalt shingle roofing and related flashing are guaranteed against leaks, defects of workmanship and materials, and defects developing under natural wear and tear for a period of two years from date of Substantial Completion. Should leaks occur within this

period, repairs to the roof and damage to other portions of building caused by such leaks will be made good without cost to the Owner."

B. Submit manufacturer's 40-year limited warranty against manufacturing defects.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. GAF Materials Corp., Wayne, NJ 07470.

B. GCP Applied Technologies, Inc., Cambridge, MA 02140.

C. Approved substitution.

2.02 MATERIALS

A. Shingles: GAF Timberline HD high definition self-sealing, laminated, fiberglass mat, asphalt roof shingles, to carry UL Class-A Fire and 130 mph Wind Resistant Label. Color selected from manufacturer's standard line.

B. Hip and Ridge Shingles: Special blended hip and ridge shingles.

C. Underlayment: Self-adhesive 40 mil thick roofing underlayment composed of rubberized asphalt adhesive backed by a layer of high density cross laminated polyethylene.

1. GCP Applied Technologies Grace Ice & Watershield or approved substitution.

D. Nails: Use barbed hot dipped zinc, or aluminum nails, heads 3/8" minimum diameter, 1-1/4" long.

E. Roof Cement: Comply with FS-SS-C-153, Type I. Fibrated asphalt.

F. Staples (Alternate): 16 gauge zinc coated staples with 1" nominal crown.

PART 3 – EXECUTION

3.01 PREPARATION

A. Deck must be clean and dry.

3.02 APPLICATION OF UNDERLAYMENT

A. Install in accordance with manufacturer's printed instructions.

3.03 APPLICATION OF SHINGLES

A. Follow manufacturer's printed instructions on back of bundles.

B. Use four fasteners per shingle. Fasteners must be of sufficient length to penetrate through plywood sheathing. Drive nails straight, flush with shingle surface. Do not drive into shingles. Fasteners shall comply with ASTM F1667.

C. If staples are used, crown must parallel tab edge and bear tightly against shingle, but not cutting surface.

D. Lay with recommended exposure of 5-5/8".

E. Cement down first course of shingles.

END OF SECTION

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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 46 33.13

VINYL SOFFIT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vinyl soffit and related work shown on drawings or specified herein.

1.02 SUBMITTALS

A. Catalogue data of materials for review.

B. Samples of specified profile for selection.

C. Includes smooth and perforated (vinyl) soffit systems.

1.04 GUARANTEE

A. Furnish certified copy of manufacturer's limited lifetime warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. CertainTEED LLC, Malvern, PA 19355.

B. Approved substitution.

2.02 SOFFIT

A. Extruded Polyvinyl Chloride (PVC) soffit complying with the provisions of ASTM D3679, Rigid Polyvinyl Chloride Plastic Siding. Flame Spread 25, Fuel Contribution 0, Smoke Density 330 per ASTM E-84. Ironmax Double 5" Series. Color and profile to be selected by Architect from manufacturer's standard range.

2.03 ACCESSORIES

A. All accessories used with vinyl soffit shall be siding manufacturer's accessories produced from the same quality PVC compound used for soffit.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to commencing work, verify governing dimensions of building. Examine, clean and repair, if necessary, any adjoining work on which this work is in any way dependent for its proper installation. Sheathing materials must have an acceptable working surface.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. The field application of the soffit and trim members shall be in accordance with the best practice, with all joint members true and plumb.

B. General: Install products in accordance with the latest printed instructions of the manufacturer, with all components true and plumb. Installer should have current Master Craftsman credentials.

C. Nailing: Nail horizontal panels by placing nail in center of slot. Nail vertical panels by placing first nail at top of top slot and remaining nails in center of slots. Drive nails straight, leaving 1/16 inch space between nail head and flange of panel.

D. Spacing: Allow space between both ends of siding panels and trim for thermal movement. Overlap horizontal panel ends one-half the width of factory pre-cut notches.

E. Joints in Horizontal Siding: Stagger lap joints in uniform pattern as successive courses of siding are installed.

3.03 CLEANING

A. At completion of work, remove debris caused by soffit installation from project site.

.

END OF SECTION

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 46 33.19

CORRUGATED PVC CEILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Corrugated PVC ceiling and related work shown on drawings or specified herein.

1.02 SUBMITTALS

A. Catalogue data of materials for review.

B. Samples of specified profile for selection.

1.04 GUARANTEE

A. Contractor to register online at www.trusscore.com/warranty to extend warranty period to 5-years.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Trusscore USA, Inc., Dayton, OH 45414.

B. Approved substitution.

2.02 SOFFIT

A. Extruded Polyvinyl Chloride (PVC) complying with the provisions of ASTM D3679, Rigid Polyvinyl Chloride Plastic Siding. Flame Spread 15, Fuel Contribution 0, Smoke Developed Index 450 per ASTM E-84. Ribcore PVC Corrugated Panel.

2.03 ACCESSORIES

A. All accessories used with PVC ceiling shall be manufacturer's accessories produced from the same quality PVC compound used for ceiling.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to commencing work, verify governing dimensions of building. Examine, clean and repair, if necessary, any adjoining work on which this work is in any way dependent for its proper installation. Sheathing materials must have an acceptable working surface.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. The field application of the ceiling and trim members shall be in accordance with the best practice, with all joint members true and plumb.

B. General: Install products in accordance with the latest printed instructions of the manufacturer, with all components true and plumb.

C. Attachment: Screw horizontal panels at the lowest portion of the profile, where it touches the substrate. Drive screws straight and do not overtighten.

D. Spacing: Panels should overlap one corrugated rib for side lap. Panels should overlap 4” at the end of the panels.

E. Joints in Horizontal Siding: Stagger lap joints in uniform pattern as successive courses of siding are installed.

3.03 CLEANING

A. At completion of work, remove debris caused by ceiling installation from project site.

.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 61 00

SHEET METAL ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnishing and installing a pre-engineered, preformed structural coated metal standing seam roof system over a self-adhesive membrane over a plywood substrate.

B. Gutters, downspouts, fascia members, valleys, flashings and accessory items.

C. Also includes metal soffit system for covered canopies.

1.02 SUBMITTALS

A. Two sample sections of each roofing assembly type 12" long of roofing panels with gutter showing method of seaming and attachment.

B. Color samples for selection.

C. Shop drawings indicating thicknesses, dimensions, layouts, fastenings and anchoring methods, expansion joints, and other provisions necessary to provide for thermal expansion and contraction.

D. Submit engineering calculations, prepared and certified by a civil or structural engineer, registered in the State of Virginia. Include structural members, fasteners and anchorage components for a roof anchoring system. UL 90 rating is required.

E. Review of calculations and shop drawings by the Architect will not relieve the Contractor of responsibility for providing a system to meet performance requirements.

F. Submit calculations with first submittal of shop drawings.

G. Do not change shop drawings and date bearing Architect's final review stamp or deviate from construction details unless changes are submitted to the Architect for review.

H. Begin fabrication only after receiving shop drawings and engineering calculations bearing Architect's final review stamp.

1.03 DELIVERY, HANDLING, AND STORAGE

A. Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the job site. Damaged or permanently stained materials that cannot be restored to like-new condition shall be removed from the site and replaced.

B. Carefully handle sheet metal items to avoid damage to surfaces, edges, and ends.

C. Store material in dry, weather-tight, ventilated areas until immediately before installation.

1.04 QUALITY ASSURANCE

A. Engineering Requirements:

1. The sheet metal manufacturer to prepare and seal shop drawings by licensed structural engineer in the project's jurisdiction for review.

2. Uplift calculations and fasteners spacing must be based on wind load criteria specified by the project and in accordance with the latest version of ASCE 7 or local building codes.

B. The metal roofing installation shall be inspected on a full-time basis by a qualified representative of the roofing manufacturer. Furnish daily inspection reports and a final approval report, certifying the metal roofing system has been installed in strict accordance with the roofing manufacturer's requirements.

1.05 WARRANTY

A. Manufacturer shall extend a standard twenty (20) year warranty on the paint finish, warranted against peeling and blistering, chalk and fade, including material and replacement cost.

B. The installer shall extend a two (2) year weather tightness warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Peterson Aluminum Corporation, Annapolis Junction, MD 20701.

1. Roof Panels: Snap-Clad.
2. Canopy Soffit Panels: Soffit Reveal, unvented.

3. Eave Soffit Panels: PAC-750 Soffit Vented
4. Approved substitution.

2.02 MATERIALS

A. Standing Seam Roofing System:

1. Provide accessories such as clips, back-up plates, hip pans, valley trim, ridge cap, eave trim and other items for a complete installation of same materials as items to which they are applied.
   a. Factory applied sealant bead in seam.
2. Exposed exterior sheet metal items shall be smooth surface aluminum, with a factory-applied fluoropolymer Kynar 500 coating after metal substrate has been properly cleaned and pretreated.
   a. Roof panel: .032” aluminum.
3. System consists of clip anchored metal pan 16" wide by 1.75" high with upturned leg on one side which locks over a hold-down clip and the next adjoining panel leg. Strippable protective coating.
   a. Clips: UL 90 installed simultaneously with bearing plate with two #14 Dekfast fasteners. Fasteners should extend 1/2" below metal deck.
   b. Substrate: As indicated.

B. Ridge Cap: Manufacturers standard type.

C. Gutters: Furnish and install in size and shape indicated. Provide with roof apron. Joints should be lapped, riveted and sealed. Provide with expansion joints, outlet tubes and end caps. Gutter straps spaced 32" O.C. Hang gutters level. Manufacturer is responsible for design of gutter size based on published rainfall intensity projections for 100 year storms by U.S. Weather Bureau.

1. Follow SMACNA design guidelines, latest edition.

D. Outlet Tubes: Size as required to fit downspouts.

E. Expansion Joints: Gutter ends are flanged at the top, riveted and sealed into each section of gutter. Sections are joined and a cap is used to cover the joint. Leave one inch space between end caps. Provide cover plate to cover expansion joint. Maximum length of gutter between expansion joints 60 feet.

F. Downspouts: Rectangular style. Form in 8 to 10 foot lengths with telescoping end joints and locked longitudinal joints. Hangers spaced maximum 5'-0" on center. Provide with offset elbows at top and elbow at bottom for discharge onto splash blocks or connect to existing storm drainage system as shown.

G. Flashings, including valley and step flashings, trims, gutters, downspouts, and accessories, factory formed coated steel in finish and selected color to match panels with strippable protective coating.

H. Sealants and Closures: Type formulated for use with specified roofing systems.

1. Sealants: Closed cell rubber and butyl tape mastic.
2. Sealant: Acrylic gun grade.
3. Closures: Same material and finish as roof panels.

I. Fasteners: Non-corrosive screws and rivets, color coated where exposed, of size and type required for the particular application. Provide screws with self sealing washers where required.

J. Underlayment: Self-adhesive 40 mil thick roofing underlayment composed of rubberized asphalt adhesive backed by a layer of high density cross laminated polyethylene.

1. Grace Ice & Watershield HT.
2. Approved substitution.

K. Snow Guard System: Pre-manufactured snow rail system comprised of mill finished aluminum clips and cross members attached to metal roof panel seams, designed to hold a slide-in continuous color strip fabricated of metal roof panel material of matching color and finish.

1. S-5 ColorGard System.
2. Approved substitution.

2.03 FABRICATION

A. Ensure that finish on panels is hard and dry before passing coils through forming rollers. Surface defects will be cause for rejection of panels.

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Surfaces to receive structural framing members and sheet metal roofing must be plumb and true, clean, even, smooth, dry and free from defects and projections which might affect the application.

3.02 INSTALLATION

A. Install materials in accord with manufacturer’s instructions and approved shop drawings. Allow for expansion and contraction.

B. Install panels so that they are weather-tight, without waves, warps, and buckles, fastening stresses or distortion.

C. Panel anchorage: Space clips as directed by manufacturer. Screw-attach clips to framing members or metal sub-deck as detailed.

D. The upper and lower edge of roof sheets shall be flashed and closed off in accord with manufacturer’s installation details. Apply sealants where necessary at flashing details to achieve a weather-tight system.

E. Surfaces in contact with mortar, concrete, or other masonry materials or dissimilar metals shall be painted with coating such as heavy-bodied bituminous paint.

3.03 CLEANING

A. Clean exposed sheet metal work at completion of installation. Grease and oil films, handling marks, filing and drilling debris and strippable films shall be removed, and the work cleaned. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and weld marks.

3.04 REPAIRS TO FINISH

A. Scratches, abrasions, and minor surface defects may be repaired in accord with manufacturer's printed instructions and as approved. Repaired surfaces shall be uniform and free from scratches, blemishes, and from variations of color and surface texture.

3.05 TESTING

A. Hose test for leaks. Repair leaks, if any and retest until roof is watertight.

END OF SECTION

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DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 92 00

SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Caulking joints around openings in exterior walls, around window and door frames, between finished floor materials and sleeves wherever sleeves pass through concrete floor, under metal thresholds, between masonry and other materials, sidewalk joints, control joints and where otherwise indicated or required.

B. Caulking joints where acoustical sealant is indicated on Drawings, elsewhere in the Specifications or where required to provide the specified STC rating or acoustical barrier. For use wherever through-wall penetrations and recessed fixtures occur in such walls.

C. Foam sealant for use in acoustic- and air-sealing large gaps in interior partitions at duct, pipe, conduit and similar penetrations.

1.02 REFERENCES

A. FS TT-S-230: Sealing Compound, Elastomeric Type, Single Component.

1.03 SUBMITTALS

A. Catalog data and color charts for review. Sealant color will be selected for compatibility with adjoining materials.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, tightly sealed containers or unopened packages with manufacturer's name, labels, product identification, and lot numbers where appropriate.

B. Store materials out of weather in original containers or unopened packages as recommended by manufacturer.

C. Do not use materials that have been stored for a period of time exceeding maximum recommended shelf life.

1.05 GUARANTEE

A. Contractor provide his written guarantee as follows: "Caulking is guaranteed against leaks, defects of workmanship and materials for a period of 5 years from the date of Substantial Completion, and caulking and damage to building caused by such leaks will be repaired without cost to the Owner."

PART 2 - GENERAL

2.01 MANUFACTURER

A. Pecora Corporation, Harleysville, PA 19438.

B. Dow Chemical Company, Midland, MI 48674.

C. Approved substitution.

2.02 MATERIALS

A. General Purpose Urethane Sealant: Dynatrol 1-XL. Moisture-curing single-component non-sag polyurethane sealant, Type II, Class A.

B. Self-Leveling, Traffic Grade Polyurethane Sealant: TT-S-230C, Type I, Class A Urexpan NR-201, one part self-leveling moisture-curing urethane sealant.

C. General Purpose Silicone Sealant: TT-S-230C Pecora 860 one-part acetoxy silicone, high-modulus acid cure, FDA approved.

D. Backer Rod: Polyethylene foam, closed cell, compatible with sealant.

E. Joint Cleaner: Methyl ethyl ketone, toluene, xylene.

F. Joint Primer: Type as recommended by caulking manufacturer.

G. Bond Breaker: Pressure sensitive adhesive polyethylene tape.

H. Masking Tape: Pressure sensitive adhesive paper tape.

I. Glass Block Pointing Sealant: ASTM C834 Pecora AC-20 acrylic Latex Caulking.

J. Foam Sealant: ASTM E84 Great Stuff Insulating Foam Sealant. Closed cell, minimal-expanding single component polyurethane foam sealant for general penetration and building envelope sealing.

K. Acoustical Sealant: AIS-919 acoustical and insulation latex sealant.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine joints for construction defects which would adversely affect execution of work.

B. Ensure that masonry and concrete have cured 28 days minimum.

C. Do not start work until conditions are satisfactory.

3.02 PREPARATION

A. Cleaning: Clean joint surfaces, using joint cleaner as necessary. Joints must be free of dust, dirt, oil, grease, rust, laitance, release agents, moisture, or other matter which might adversely affect adhesion of sealant.

B. Masking: Mask areas adjacent to joints.

C. Primer: Apply if required, following manufacturers instructions.

3.03 APPLICATION

A. Install bond breaker tape where recommended by sealant manufacturer.

B. Install backing material in joints using blunt instrument to avoid puncturing. Do not twist rod while installing. Install backing so that joint depth is 50% of joint width, but a minimum of 3/8 inch deep.

C. Apply sealant in joints using pressure gun with nozzle cut to fit joint width. Make sure sealant is deposited in uniform, continuous beads without gaps or air pockets.

D. Tool joints to required configuration within 10 minutes of sealant application. If masking materials are used, remove immediately after tooling.

E. Install self-leveling sealant in sidewalk joints as recommended by the manufacturer using bond breaker tape at base of joint to prevent bonding of joint filler to sealant.

3.04 CLEANING

A. Remove excess materials adjacent to joints by mechanical means or with MEK, toluene or xylene as work progresses to eliminate evidence of spillage or damage to adjacent surfaces. Note: When using flammable solvents, avoid heat, sparks and open

flames. Always provide adequate ventilation and follow precautions listed on solvent container label.

B. Leave finished work in neat, clean condition with no evidence of spillovers onto adjacent surfaces.

END OF SECTION

DIVISION 08 - DOORS AND WINDOWS

SECTION 08 15 00

FIBERGLASS DOORS AND FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section includes fiberglass doors and frames.

B. Related Work Specified Elsewhere:

1. Section 08 71 00: Door Hardware

1.02 QUALITY ASSURANCE

A. Comply with the latest standards of the National Builders Hardware Association.

B. ASTM D635.

1.03 SUBMITTALS

A. Submit complete Shop Drawings for review in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES. Shop drawings shall include Performance Grade and Design Pressure ratings.

1.04 MANUFACTURER

A. Chem-Pruf Door Co., Brownsville, Texas 78523.

B. Approved substitution.

PART 2 - PRODUCTS

2.01 GENERAL

A. The products described herein include fiberglass doors, doorplates and frames, for submerged and non-submerged use.

2.02 FIBERGLASS DOORS AND FRAMES

A. Doors: Door shall be made of fiberglass reinforced plastic (FRP) using chemically proved resins resistant to contaminants typically found in the environment, and have a fiberglass content of 25% by weight. The doors shall be 1-3/4" thick and of flush construction, having no seams or cracks. All doors up to 4'-0" x 8'-0" shall have equal diagonal measurements with a maximum tolerance of ± 1/32 inch.

1. Door Plates: Shall be 1/8" thick, molded in one continuous piece, starting with a 25 mil gel-coat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass mat and layer of 16 ounce per square yard unidirectional glass roving.
2. Internal Reinforcement: Shall be a fire stop of sufficient amount to adequately support required hardware and function of same.
3. Stiles and Rails: Shall be constructed starting from the outside toward the inside of a 25 mil gel-coat of the color specified followed by a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shape configuration and to the exact dimensions of the door. In this manner there will be no miter joints or disparate materials used to form the one piece stile and rail.
4. Core: Materials shall be 2 psf expanded polyisocyanurate foam which completely fills all voids between the door plates.
5. Finish: Shall be identical in color and texture. At time of manufacture, 25 mil of resin-rich gel-coat must be integrally molded into both the door and frame. Secondary painting to achieve color is not acceptable.
6. Window Openings: Shall be provided for at time of manufacturing and shall be completely sealed so that the interior of the door is not exposed to the environment. Fiberglass retainers that hold the glazing in place shall be resin transfer molded with a profile that drains away from glazing. The retainers must match the color, texture and finish of the doorplates. Glass shall be furnished and installed by door and frame manufacturer.
7. Louver: Openings shall be sealed in the same manner as the window openings. Louvers are to be solid fiberglass inverted ‘V’ vanes and shall match the color, texture, and finish of the door plates.

B. Frames:

1. Frames shall be similar to the doors in construction and materials except the frames up to 3/4" will be solid fiberglass. All frame profiles greater than 3/4" shall have a core material of 2 psf polyurethane foam. The frame will be one-piece construction with a molded stop. The frame shall be integrally gel-coated to the customer's color when molded. The frame will have a minimum 25 mil gel coat and a minimum of two layers of continuous strand fiberglass mat saturated with resin. Metal frames or extruded fiberglass frames will not be accepted.

2. Internal reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Material shall be completely non-organic with a minimum hinge screw holding value of 656 lbs. Frame screw holding value to accommodate screw shall be minimum of 1,000 lbs. per screw. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.
3. The jamb header connection shall be coped for a tight fit. No wood blocks or spacers are permitted.
4. Finish: Shall be identical in color and texture to the door. A 25 mil resin rich coat will be integrally molded into the frame at time of manufacture. Secondary painting to achieve color is not acceptable.
5. Mortises: Shall be accurately machined to hold dimensions to ± 0.010 inch in all three axes.
6. Hinge Pockets: Shall be accurately machined to facilitate heavy-duty hinges at all hinge locations, using spacer when standard weight hinges are used.

C. Color of doors and frames to be selected by the Engineer from manufacturer's full line of standard and custom colors. Provide color chart with submittals.

D. Exterior Doors shall provide an insulated construction with a U-value of at least 0.37 (R-value of 2.72) when tested in accordance with SDI 113.

2.03 HARDWARE

A. Furnish hardware for all doors in accordance with Section 08 71 00 – DOOR HARDWARE.

B. All doors shall be equipped with hardware as shown in the Door Schedule in the Drawings.

2.04 GLASS

A. Furnish doors with glass openings as shown in the Contract Drawings.

B. All door glass shall be tempered safety glass.

C. Shall be furnished and installed by door and frame manufacturer.

PART 3 - EXECUTION

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Each door and frame should be delivered individually crated for protection from damage in cardboard containers, clearly marked with project information, door location,

specific reference number as shown on drawings, and shipping information. Each crate should contain all fasteners necessary for installation as well as complete installation instructions.

B. Protect doors and frames from damage and store upright under cover on wood blocking or suitable platform. Recommendations (for storage) made by the manufacturer shall be followed. Written guarantee shall be provided for doors for a period of one (1) year from date of purchase.

3.02 INSTALLATION

A. Set frames in position, align and brace securely. Use stainless steel epoxy-type anchors to secure frames to jambs and to secure thresholds to floor.

3.03 ADJUSTING AND CLEANING

A. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.

B. Adjust door hardware to operate correctly in accordance with manufacturer's maintenance instructions.

C. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions.

*** END OF SECTION ***

DIVISION 08 – DOORS AND WINDOWS

SECTION 08 31 16

STEEL ACCESS PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Recessed steel access panels for installation in drywall ceilings.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's standard details and catalog data demonstrating compliance with referenced standards; installation instructions.

B. Certificates:

1. Provide manufacturer's certification that products comply with referenced standards.

C. Shop Drawings: Submit for approval of the following:

1. Shop drawings showing all openings in the door schedule and/ or drawings; provide details of door design, door construction and methods of assembling sections, hardware locations, anchorage and fastening methods, door frame types, and finish requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect products from moisture, construction traffic, and damage.

B. Store vertically under cover. Do not use non-vented plastic or canvas shelters. Should wrappers become wet, remove immediately.

C. Place units on 4 inch (100 mm) high wood sills or in a manner that will prevent rust or damage. Provide 1/4 inch (6 mm) space between doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Milcor LP, Holland, Ohio 43528.

B. Approved substitution.

2.02 MATERIALS

A. Attic Access: Recessed Panel Metal Access Door for Drywall Ceilings: Style UFR-DW.

1. Frame and Door: 16 gauge steel frame with recessed 16-gauge steel door panel for installation of 5/8-inch drywall.
2. Finish: Gray prime painted steel.
3. Hinge: Continuous type, steel with stainless steel pin.
4. Locking Device: Screwdriver cam latch.
5. Size: 22” x 30”.

B. Draft Stop Access: Recessed Panel Metal Access Door for Drywall Ceilings: Style UFR-DW.

1. Frame and Door: 16 gauge steel frame with recessed 16-gauge steel door panel for installation of 5/8-inch drywall.
2. Finish: Gray prime painted steel.
3. Hinge: Continuous type, steel with stainless steel pin.
4. Locking Device: Screwdriver cam latch.
5. Size: 24” x 48”.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set frame into framed opening and secure in place by anchors recommended by access door manufacturer.

B. Check for smooth operation. Adjust as necessary.

3.02 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces. Remove scraps and debris, and leave site and a clean condition.

END OF SECTION

DIVISION 08 – DOORS AND WINDOWS

SECTION 08 33 00

COILING DOORS AND GRILLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling service and insulated service doors.

B. Motor operators.

C. Accessories.

1.02 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications.

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1997.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 1996.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard details and catalog data. Provide installation instructions.

B. Shop drawings for the fabrication and installation of curtains and frames.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products indoors and protect from moisture, construction traffic, and damage.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Cornell Iron Works, Inc.

B. Approved substitution.

2.02 OVERHEAD COILING SERVICE DOORS

A. Provide Model "ESD10" Series Rolling Service Doors.

1. Operation: Chain hoist.

B. Curtain and Bottom Bar:

1. Slat Material: Aluminum, cold roll formed in continuous lengths to form curtains.
2. Slat Finish: Powder coat colored finish on both sides of slat. Color: To be selected.
3. Slat Shape: Flat slat.
4. Slat Gage: As required by width of opening and wind loading of 20 psf (958 Pa) or 87 mph (140 km/h) in the fully closed position.
5. End Locks:
   a. Each end of alternate slats to be fitted with end locks to act as a wearing surface in the guides and to maintain slat alignment.
   b. Material: Stamped steel.
6. Bottom Bar: Reinforce curtain bottom with angles, material to match curtain material.
   a. Provide astragal weather seal.

C. Hood:

1. Material: Aluminum.
2. Shape: Round.
3. Finish: Mill finish.

D. Locking:

1. Chain Hoist Doors: Locking bracket mounted on guide angle, suitable for padlock.

2.03 OVERHEAD COILING INSULATED SERVICE DOORS

A. Provide Model "ESD20" Series Thermal Doors.

1. Operation: Motor operator.
2. Mounting: Interior face mounted on prepared opening.

B. Curtain and Bottom Bar:

1. Slats: Type "ESD20" insulated slats; 2-5/8 inches (66 mm) high x 7/8 inch (22 mm) thick; U-value of 0.16 (0.91); cold roll formed interlocking front and back slats, assembled in continuous lengths to form curtains.
2. Slat Material: ASTM A 653/A 653M galvanized steel; zinc coated.
3. Slat Finish: Powder coat colored finish on both sides of slat. Color: To be selected.
4. Slat Gage: As required by width of opening and wind loading of 20 psf (958 Pa) or 87 mph (140 km/h) in the fully closed position.
5. Insulation: Environmentally safe CFC-free polyurethane foam injected to fill all voids and to provide continuous insulation protection the full height of the slat, including slat interlocks. Self-bonding to interior slat surfaces. R-value of 6.25.
6. End Locks:
   a. Each end of alternate slats to be fitted with end locks to act as a wearing surface in the guides and to maintain slat alignment.
7. Bottom Bar: Reinforce curtain bottom with angles, material to match curtain material.

C. Weather-stripping: Replaceable vinyl guide weather-stripping on both sides. Neoprene/rayon baffle to impede air flow above coil. Nylon brush seal fitted at door header to impede air flow.

D. Hood:

1. Material: 24 gage (0.6 mm) galvanized steel.
2. Shape: Round.
3. Finish: Powder coat colored finish. Color: To be selected.

2.04 COMPONENTS

A. Overhead Counterbalances:

1. Counterbalance: Housed in a steel pipe of diameter and wall thickness to restrict maximum deflection to 0.03 inch per foot (2.5 mm per meter) of width.
2. Springs: Helical torsion springs designed to include an overload factor of 25 percent and for optimum ease of operation; grease packed and mounted on a cold rolled steel inner shaft.
3. Spring Tension: Adjustable from outside of end bracket plate, except on integral frame construction and smaller shutters.
4. Ball Bearings: Sealed to minimize wear of pipe shaft rotation around inner shaft.
5. Motorized Doors: Very high cycle springs to satisfy in excess of 100,000 cycles.

B. Overhead Coiling Door/Grille Bracket Plates:

1. Bracket Plates Carrying Pipe Counterbalancing Shaft: Not less than 1/4 inch (6 mm) thickness, square in shape; house ends of door coil.
2. Drive End Bracket Plate: Fitted with a sealed ball bearing.

C. Overhead Coiling Door Guide and Wall Angle Assemblies, unless otherwise indicated:

1. Structural steel angles; 3/16 inch (5 mm) minimum thickness.
2. Depth to provide adequate slat penetration to satisfy specified wind-loading or fire rating, as applicable.

D. Overhead Hoods:

1. Laterally reinforced to prevent sag.
2. Intermediate Hood Supports: Furnish where door width exceeds 16 feet (4875 mm).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Ensure that units are installed plumb and true, free of warp or twist, and within tolerances specified by manufacturer for smooth operation.

3.03 ADJUST AND CLEAN

A. Clean units in accordance with manufacturer's instructions.

B. Restore slight blemishes in finishes in accordance with manufacturer's instructions to match original finish. Remove and provide new units where repairs are not acceptable to the Architect.

END OF SECTION

DIVISION 08 – DOORS AND WINDOWS

SECTION 08 36 13

SECTIONAL DOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Complete electrically or chain operated door assemblies as scheduled including panel sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit openings and head room.

B. Wood pads provided under Lumber and Carpentry Sections of the specifications.

C. When door is in the raised position, bottom edge must completely clear opening.

1.02 REFERENCES

A. ASTM A446: Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process Structural (physical) Quality.

B. ASTM A525: General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process.

C. ASTM A526: Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process.

1.03 SUBMITTALS

A. Manufacturer's specifications and installation instructions for each type and size of overhead door. Field measure openings.

B. Submit shop drawings for review.

1.05 QUALITY ASSURANCE

A. Units to be supplied by one manufacturer for entire project.

B. Contractor warranty materials and labor for 2 years from date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Wayne-Dalton Corp., Mt. Hope, OH 44660.

B. Approved substitution.

2.02 DOORS

A. Sections:

1. Construct from galvanized structural quality carbon steel sheets complying with ASTM A 446, grade A or ASTM A 526, with a minimum yield strength of 33,000 psi. Provide a minimum zinc coating of 1.25 oz. psf complying with ASTM A 525.
   a. Steel Sheet Thickness: Model 150 - Min. 28 gauge, Model 200 - Min. 26 gauge.
2. Fabricate to provide insulated sections. Roll horizontal meeting edges to a continuous keyed weather seal, with thermal break to separate inner and outer skins at top and bottom. Fill void with polyurethane foam. Roll form two integral deep struts into the inside surface of each section. Galvanized steel end caps.
3. Reinforce bottom section with a continuous formed joint seal.
4. Reinforce at fastener points with hardware plates.
5. Weather Seals: Provide continuous, vinyl or neoprene, adjustable weather-strip gasket at the top and a "U" shaped compressible astragal on the bottom of each overhead door with side jamb weather-stripping.
6. Apply manufacturer's standard polyester prime and finish coats of white baked on enamel applied to interior and exterior door faces. Outer skin has non-repeating random stucco finish with embossed pin-striping grooves.

B. Tracks, Supports and Accessories:

1. Tracks: Provide manufacturer's standard galvanized single incline types, steel track system, sized for door size and weight, and designed for clearances shown. Provide complete track assembly including brackets, bracing and reinforcing. Slope tracks at proper angle from vertical plane, or otherwise design to ensure tight closure at jambs when door unit is closed.

2. Support and attach tracks at opening jambs with angle welded to tracks and attached to jambs. Support horizontal (ceiling tracks) with angle welded to track and supported by laterally-braced attachments to overhead structural members at curve and end of tracks. Mount on treated wood pad members.

C. Hardware:

1. Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated fasteners.
2. Hinges: Heavy wrought steel hinges located per manufacturer's recommendations for size of door. Hinges hot-dip galvanized.
3. Rollers: Heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Provide case-hardened steel tires to suit size of track.

D. Counterbalancing Mechanisms:

1. Torsion Spring: Hang door assembly for operation by torsion spring counterbalance mechanism, consisting of adjustable tension tempered steel torsion springs mounted on a case-hardened steel shaft, and connected to door with galvanized aircraft type lift cable.
2. Provide cast aluminum or grey iron casting cable drums, grooved to receive cable. Mount counter-balance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft with one additional mid-point bracket for shafts up to 16' long unless closer spacing recommended by door manufacturer.

E. Glass Openings:

1. Sealed tinted insulated glass units containing desiccant for moisture absorption, mounted in molded high impact polymer frames.

F. Electric Door Operations:

1. Furnish operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory pre-wired motor controls, gear reduction unit, solenoid operated brake, clutch, remote control stations and control devices.
2. Provide hand-operated disconnect or mechanism for automatically engaging a sprocket chain operator and releasing brake for emergency manual operation. Include interlock device to automatically prevent motor from operating when emergency sprocket is engaged.

3. Design operator so that motor may be removed without disturbing the limit-switch adjustment and without affecting the emergency auxiliary operator.
4. Operator Type:
   a. Provide drawbar type, chain drive, auxiliary chain hoist and disconnect switch.
5. Electric Motors:
   a. Provide high-starting torque, reversible, constant-duty, Class A insulated electric motors with over-load protection, sized to move door in either direction, from any position.
   b. Coordinate wiring requirements and current characteristics or motors with electrical system of building; see Division 16 Electrical sections of these specifications.
6. Indoor Control Station: Standard 24 volt circuit. Provide momentary-contact, 3-button control station with push button controls labeled "open", "close", and "stop".
7. Provide with external terminal for universal radio controls.
8. Provide electrically activated bottom astragal at each power operated door. Sensor bar automatically returns door to open position when door encounters an obstacle in its downward closing motion.

G. Door Types:

1. OPG 12'-0" X 11'-4" - Wayne Dalton Thermospan 150, glazed per detail. Power operator, 1/2 HP, 2" track.

PART 3 - EXECUTION

3.01 INSPECTION

A. Installer must examine the conditions under which the doors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install door, track, and operating equipment including motor and controls complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangar and equipment supports in accord with final shop drawings, manufacturer's instructions and as specified herein.

B. Fasten vertical track assembly to framing at not less than 24" o.c. Hang horizontal track from structural overhead framing with angle or channel hangers, welded or bolt-fastened in place. Provide sway bracing, diagonal bracing, and reinforcing as required for a rigid installation of the track and door operating equipment.

C. Upon completion of installation, including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist, or distortion and fitting weather-tight for the entire perimeter.

D. Touch up damaged painted areas.

END OF SECTION

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DIVISION 08 – DOORS AND WINDOWS

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section covers door hardware.

1.02 REFERENCES

A. The publications listed below form a part of this section to the extent referenced:

1. ALUMINUM ASSOCIATION (AA)
    a. AA DAF-45, Designation System for Aluminum Finishes
2. BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
    a. BHMA A156.1, Butts and Hinges
    b. BHMA A156.13, Mortise Locks and Latches
    c. BHMA A156.16, Auxiliary Hardware
    d. BHMA A156.18, Materials and Finishes
    e. BHMA A156.2, Thresholds
    f. BHMA A156.4, Door Controls - Closers
    g. BHMA A156.5, Auxiliary Locks & Associated Products
    h. BHMA A156.6, Architectural Door Trim
3. STEEL DOOR INSTITUTE (SDOI)
    a. SDI-100, Standard Steel Doors and Frames

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01300, "Submittals," in sufficient detail to show full compliance with the specification:

1. Manufacturer's Catalog Data shall be submitted for the following items, as scheduled:
    a. Fasteners.
    b. Hinges.
    c. Locksets.
    d. Pulls and push plates.
    e. Thresholds.
    f. Lever extension flush bolts.
    g. Closers.
    h. Astragals.

i. Coordinating device.
j. Door holders.
k. Door stops.
l. Door silencers.
m. Metal kick plates.
n. Door sill weather-stripping.
o. Panic Exit Devices.

2. Hardware Schedule indicating the door and frame location, type, size, swing, bevel, material, hardware type by Builders' Hardware Manufacturers Association (BHMA) numbers, and the respective manufacturer's type, name, number, finish, and design, Material, Equipment and Fixture Lists shall be provided prior to the hardware schedule, showing a list of the proposed Finish Hardware by manufacturer, type, name, series, material and finish.

PART 2 - PRODUCTS

2.01 FASTENERS

A. Fasteners of the proper type, size, quantity, and finish for each hardware item shall be provided. All visible fasteners shall be Phillips-head, bronze or stainless steel finished to match specified hardware.

2.02 HINGES

A. Hinges shall be full mortise, heavy weight, anti-friction bearing, button tip, template type conforming to BHMA A156.1, Grade 1. Size shall be 4-1/2 by 4-1/2 inches.

2.03 LOCKSETS

A. Mortise locksets and latch-sets shall conform to BHMA A156.13.

B. Locksets and latch-sets shall have standardized fronts, cases, and strikes so that varying functions will be interchangeable and will require only one mortise for their installation. Locks and latches shall have beveled bronze fronts, bronze bolts and strikes, brass hubs, and cases with specified finish. Locks shall have cylinders conforming to BHMA A156.5.

C. Locksets and lock cylinders shall be master keyed to the key system established for the installation.

D. Heavy duty usage mortise locksets and latch-sets shall be Series 1000, Grade 1.

2.04 PULLS AND PUSH PLATES

A. Pulls and push plates shall conform to BHMA A156.6, types and material specified herein.

1. Door pulls on plates shall be Type J405, specified finish, with the wrought plate not less than 14 by 3-1/2 inches by 0.050-inch thick, grip center to center, 6 inches, with cutouts for cylinders and thumb turns as required.
2. Push plates shall be stainless steel, specified finish, Type J301 or J302, not less than 3-1/2 by 14 inches by 0.050-inch thick, with cutouts for cylinders and thumb turns as required.

2.05 THRESHOLDS

A. Thresholds shall be extruded aluminum 6063-alloy mill finish conforming to BHMA A156.21, Type J601 (corrugated).

B. Thresholds shall be provided for the full width of the opening at exterior doors.

2.06 LEVER EXTENSION FLUSH BOLTS

A. Flush bolts shall be cast or extruded aluminum, specified finish, conforming to BHMA A156.16, with 12-inch lever extensions.

2.07 CLOSERS

A. Closers shall conform to BHMA A156.4.

B. Closers shall be the surface mounted heavy duty, parallel arm type, Grade

1. Style shall be modern.

C. Brackets, reinforcing plates, and accessory fittings shall be provided as required.

2.08 ASTRAGALS

A. Astragals shall be prime steel, 13-gage minimum by 1-5/8-inch minimum.

2.09 COORDINATING DEVICE

A. A coordinating device shall be provided for each pair of doors with an overlapping astragal or with rabbeted stiles.

B. Coordinating devices shall conform to BHMA A156.3, bronze or stainless steel, finish to match the locksets.

2.10 MISCELLANEOUS HARDWARE

A. General: Miscellaneous hardware shall conform to BHMA A156.16, except as noted, and shall match or have the same finish as lockset finish.

B. Door Stops:

1. Door stops and bumpers shall conform to BHMA A156.16.
2. Wall mounted stops shall be Type L02251 (wall bumper). Where impossible to install wall-mounted stops, floor mounted stops, Type L02141 (dome type) or Type L02161 (dome type for door with thresholds) shall be provided.

C. Door Silencers:

1. Door silencers conforming to BHMA A156.16 shall be provided except on fire-rated door frames.
2. Door silencers shall be Type L03011 for metal frames and Type L03021 for wood frames.

D. Metal Kick Plates:

1. Plates shall be 0.050-inch thick stainless steel, bevel edge, Type J102 (Kick), conforming to BHMA A156.6, finish as specified herein. Width of kick plates shall be 2 inches less than the door width. Height of kick plates shall be 8 inches.

2.11 WEATHERSTRIPPING MATERIALS

A. Door Sill Weather-stripping:

1. Weather-stripping shall consist of a 1/8-inch thick by 1-3/8-inch-high neoprene strip housed in an extruded, anodized aluminum housing approximately 0.070-inch thick by 1-1/4-inches high by the full width of the door and attached to the door with countersunk screws.

2.12 FINISHES

A. Hardware shall receive the following finishes conforming to BHMA A156.18, as follows:

1. Hinges, Locksets and Latch Sets: Satin stainless steel, BHMA Code 630
2. Closers, sprayed, matching locksets and latch sets.

B. Aluminum hardware items shall be anodized to an Architectural Class I natural finish not less than 0.70” thick conforming to AA DAF-45 (designation AA M21 C22 A31).

2.13 PANIC EXIT DEVICES

A. Panic bar exit devices shall conform to BHMA a156.3, Grade 1.

B. All exit devices shall be touch bar design with smooth operation and be operative over 2/3 of the door’s clear opening.

C. All springs shall be stainless steel throughout.

D. Chassis shall be mounted unit construction.

E. Rail assembly shall be heavy gauge steel.

F. Latchbolt shall be stainless steel with a 3/4-inch throw,

G. Non-handed, center hub.

H. Finish to match the balance of the door hardware.

PART 3 - EXECUTION

3.01 GENERAL

A. Hardware shall be installed and adjusted in accordance with the hardware manufacturer's printed instructions and to template dimensions.

B. Temporary-construction cores shall be furnished, installed, and maintained in locks during construction and removed when directed.

3.02 HARDWARE LOCATION

A. Hardware shall be located in accordance with SDOI SDI-100, Table V, except when template dimensions and multiple-item installations require alternate locations.

3.03 HARDWARE SCHEDULE

As noted on drawings.

END OF SECTION

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DIVISION 08 – DOORS AND WINDOWS

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass, glazing accessories and glazing for openings where shown.

1.02 REFERENCES

A. ASTM C1036: Standard Specification for Flat Glass.

B. ANSI Z97.1: Safety Glazing Material Used in Buildings.

1.03 SUBMITTALS

A. Submit manufacturer’s data for review.

1.04 QUALITY ASSURANCE

A. Manufacturer's label showing name, strength, thickness, and quality must appear on each piece of glass.

1. Remove labels at time of glazing from insulating glass units.

1.05 WARRANTY

A. Provide manufacturers 10 year warranty for insulating glass units.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Vitro Glass Industries, Carlisle, PA 17013.

B. Approved substitution.

2.02 MATERIALS

A. Tempered Glass: Clear float, 1/4" thick, meeting requirements of ASTM C 1036 and ANSI Z 97.1-1975.

B. Clear Glass: 1/4" thick float glass meeting requirements of ASTM C 1036.

C. Insulating Glass Units: Shall consist of one light of 1/4" thick tinted glass on the exterior and one light of 1/4" clear glass with Low-E coating on the interior, separated by a 1/2" spacer filled with moisture absorbing desiccant space between lights hermetically sealed using double sealed organic sealants. Corners fused.

1. Exterior glass layer: Bronze tinted glass.
2. Interior glass layer: Clear glass. Solarban 60 Solar Control Low-E.

D. Glazing Compounds, Setting Blocks, Gaskets: As recommended by frame and glass manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's recommendations for glazing in materials and installation.

B. Replace sheets which are damaged prior to time of acceptance.

3.02 CLEANING

A. Clean, wash, and polish both surfaces upon completion of the building.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Gypsum wallboard over ceilings.

B. Only gypsum wall board products manufactured in North America shall be used on this project.

1.02 SYSTEM DESCRIPTION

A. Partition Configurations:

1. Single-Layer Partitions:
   a. Single-layer drywall partitions shall be gypsum wallboard, thickness as indicated.

1.03 SUBMITTALS

A. The following manufacturer’s catalog data shall be submitted in accordance with Section 01 33 00 – SUBMITTAL PROCEDCURES in sufficient detail to show full compliance with the specification:

1. Gypsum Wallboard.
2. Joint Tapes.
3. Compounds.
4. Accessories, Trims and Control Joint Materials.

1.04 DELIVERY, HANDLING, AND STORAGE

A. Materials shall be protected from weather, soil, and damage during delivery, while stored, and during construction.

B. Materials shall be delivered in the manufacturer's original packages; containers or bundles shall bear the brand name and the name of the manufacturer.

C. Materials shall be stored in dry, weather-tight, and properly ventilated areas.

D. Gypsum wallboard shall be neatly stacked flat, with care taken to avoid sagging or damage to edges, ends, and surfaces.

E. Wallboard delivered to the building shall be kept protected and banded with midpoint slat spaces of 2 by 1/2-inch (50 by 13 millimeter) material extended full width between each layer of gypsum wallboard.

1.05 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Temperature- A temperature of not less than 55 degrees F (13 degrees C) shall be provided in areas of work during the application of the materials and shall be maintained until the joint treatment compounds are dry.

B. Ventilation: Ventilation shall be provided to eliminate moisture within the building.

C. Moisture Control:

1. Gypsum wallboard installation and joint treatment shall be accomplished in a uniform temperature with sufficient ventilation to ensure that throughout the application period the wallboard moisture does not exceed 8 percent.
2. Wallboard that has moisture content in excess of 8 percent shall not be installed.

D. Field Measurements: Field measurements shall be taken before installation of materials to verify the indicated dimensions and to ensure proper fit of the work.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. United States Gypsum Corporation, Chicago, IL 60661.

B. Approved substitution.

2.02 WALLBOARD MATERIALS

A. General Requirements for Wallboard: Conform to ASTM C 1396 of grade and form as specified for each type of board. Wallboard shall be 48-inches (1200 millimeter) wide, shall have thickness as indicated, and a maximum practical length for end use.

B. Water-Resistant Wall Board: Conform to ASTM C 1396 water-repellent-treated core, mold resistant, tapered edge, at least 5/8-inch thick, Type-X.

1. Fiberock AR Interior Panel or approved substitution.
2. Install in all shower rooms, janitorial rooms and in walls containing plumbing and wet services.

C. Joint Materials:

1. Joint tape shall be plain or perforated material conforming to ASTM C 475, Type II, Styles 1 and 2.
2. Joint compound shall be an adhesive, with fillers, conforming to ASTM C 475, Type I, Style 3.

D. Metal Fasteners: Screws shall be steel, self-tapping drywall type, bugle head, self-drilling point; the length shall be as recommended by the drywall manufacturer for the type of system being installed.

E. Metal Accessories and Trim:

1. Corner beads shall be formed to an angle of 90 degrees and shall be zinc-coated steel not lighter than 30-gage (0.40 millimeter) before coating with wings not less than 7/8-inch (23 millimeter) wide and perforated for nails and cement treatment. Zinc-coated steel shall conform to SMACNA-02, SMACNA-02A, and AASHTO M 111, Type I, Class C.
2. Casing trim shall be 28-gage (0.47 millimeter) nominal thickness, hot-dip galvanized steel channel, depth as required for wallboard, with attached tape flange.

F. Control Joint Material:

1. Control joint material shall be one piece, 29-gage, (0.44 millimeter,) roll-formed zinc, formed 7/16-inch deep by 1/4-inch(11.1 millimeter deep by 6.4 millimeter) wide with a perforated flange 7/8-inch (22.2 millimeter) wide on each side of the joint opening, with a protective plastic strip.
2. Caulking shall be as recommended by the drywall manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Defective wall and ceiling surfaces shall be corrected prior to application of drywall materials.

3.02 ERECTION, INSTALLATION AND APPLICATION

A. Framing members to receive gypsum wallboard shall be straight, plumb, and true and spaced not to exceed the maximum spacing for the board thickness.

B. Boards of maximum practical length shall be used to minimize the number of end joints. Edges of boards shall be butted together but shall not be forced.

C. Joints shall be staggered and shall not be aligned with the edge of an opening nor positioned so that the corners of four boards will meet at a common point.

D. All abutting ends or edge joints shall occur over solid bearing and shall be fitted neatly and accurately, with all end joints staggered. Wallboard shall be supported as recommended by the manufacturer, with additional framing at all cutouts and openings.

E. Perimeter of ceilings shall be finished with an edge bead trim where ceiling abuts dissimilar wall materials.

F. Wall Trim shall be applied to wall and accurately aligned with the finished ceiling. Ceiling board edges that adjoin walls shall be laid on the horizontal leg of the trim strip, and the space behind the junction shall be closed with a dust membrane. Membrane shall be applied in advance of the wallboard application.

G. Exposed corners and edges and the perimeter of door, window, and borrowed-light frames shall be finished with the specified metal trim.

H. Tolerance and Alignment: Finished wallboard application shall be plumb and true, with all joints aligned to within a 1/16-inch (1.6 millimeter) tolerance and with all surfaces shimmed and aligned to a plane and even surface having a maximum variation of 1/8 inch in 8 feet (3 millimeter in 2438 millimeter.)

I. Fastening: Board shall be fastened with [power-driven, phillips-head screws at a maximum spacing of 12 inches (300 millimeter) on center in the field of the board and at 8 inches (200 millimeter) on center at edges and along abutting ends.

J. Ceiling and wall control joints fastened securely in place shall be provided at spacing not to exceed 30 feet in each direction.

K. Trim: Edges of exposed drywall shall be trimmed with the specified metal bead.

L. Framed Openings: Support members shall be provided at ceiling openings as required for access panels, recessed lighting fixtures, and heating and ventilating ducts.

M. Joint Finishing:

1. Joints between wallboard panels and joints at metal trim shall be reinforced with joint tape and embedding-type joint compound and concealed with at least two applications of finishing compound in accordance with the printed instructions of the manufacturer of the gypsum wallboard. Screw depressions shall be filled with at least three coats of joint compound. Flanges at corner beads, edge trim, and control joints shall be concealed with at least two applications of joint compound, feathered and sanded smooth.
2. Joint and screw-depression treatment shall be accomplished after wallboard is in place. A minimum of 24 hours' drying time shall be allowed between each coat. Where necessary, the last coating shall be sanded lightly with 2/0 sandpaper to leave a smooth finish flush with the paper face of the wallboard.
3. Control joints shall be concealed with three coats of joint cement. After the second coating has dried, a third coating shall be applied very thin to a smooth surface and feathered out 12 to 16 inches (300 to 400 millimeters) on both sides of the joint. If necessary, the joints, when dry, shall be sanded lightly with 2/0 sandpaper to leave a smooth, flush surface. Care shall be taken not to scuff the paper surface of the wallboard when sandpapering the cement. Water content of the finish bedding cement coat shall be in strict accordance with the manufacturer's specifications.

N. Installation of Gypsum Drywall Ceilings: Steel Framed Drywall Ceilings: Wallboard shall be applied and finished as specified and in accordance with the drywall manufacturer's written instructions for contact application.

O. Fixture Attachment: Provide wood mounting strips for cabinets and shelving as indicated. Mounting strip shall be braced and secured between studs; attachment bolts that extend through bracing, studs, and drywall shall be provided.

P. Steel Framed Drywall Partitions: Gypsum wallboard shall be applied and finished as specified and in accordance with the drywall manufacturer's written instructions.

Q. Surface Finishing:

1. Surface defects and damage shall be corrected to leave wallboard smooth, uniform in appearance, and ready to receive finish as specified in other sections of these specifications.
2. All control joints shall be properly and completely filled with the specified sealant.
3. Joints shall be sanded when dry after each application of joint compound. Final finish shall be uniformly smooth and flush with the paper face of the wallboard.

4. Surfaces of the work, and adjacent surfaces soiled as a result of this work shall be cleaned.

END OF SECTION

DIVISION 09 - FINISHES

SECTION 09 22 16.13

NON-STRUCTURAL METAL STUD FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal stud framing for support of gypsum wall panels.

1.02 REFERENCES

A. ASTM A525: General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dipped Process.

B. ASTM C645: Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

1.03 SUBMITTALS

A. Manufacturer's specifications and installation instructions.

1.04 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Comply with the fire-resistance ratings as required by governing authorities and codes. Provide materials, accessories and application procedures which have been listed by UL or tested in accord with ASTM E 119 for the type of construction shown.

B. Installer must have in his possession a copy of the latest edition of USG Gypsum Construction Handbook or equivalent.

1.05 PRODUCT HANDLING

A. Coordinate delivery with installation to minimize storage periods at project site. Deliver in manufacturer's unopened containers, bundles or packages, fully identified with manufacturer's name, brand, type and grade. Protect from weather, soiling and damage using handling equipment and storage techniques recommended by manufacturer.

1.06 JOB CONDITIONS

A. Installer must examine the spaces and the conditions under which the framing systems are to be installed. Do not proceed with the installation until unsatisfactory conditions have been corrected.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Dietrich Metal Framing, Inc., Pittsburgh, PA 15219.

B. Approved substitution.

2.02 MATERIALS

A. Metal Furring: Zee type. Provide units of the size indicated and suitable gauge to fit the intended application. Fabricate with manufacturer's standard zinc protective coating. Materials must comply with ASTM A525 and C645.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Manufacturer's Instructions: Install metal framing and accessories in accord with manufacturer's printed instructions.

B. Provide rough framing at openings consisting of full-length studs adjacent to jambs and horizontal header and sill tracks. Cut horizontal tracks to length and split flanges and bend webs at ends for flange overlap and screw to jamb studs. Install cut-to-length intermediate studs above and below openings, at same spacing as full-length studs.

1. At door frames, comply with stud manufacturer's recommendations for the types of frames and weights of doors used in the project. Provide double studs at jambs.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 09 91 00

PAINTS

PART 1 - GENERAL

1.01 SUMMARY

A. Paints and coatings for exterior and interior applications.

1. Material, labor, equipment and services necessary for, and incidental to, finishing and application complete of field painting and staining systems.
2. Paint includes paints, enamels, stains, varnishes, lacquers, sealers, fillers and other types of coatings whether used as primers or intermediate and finish coats.
3. Paint to completion items and surfaces left unfinished by requirements of other sections and normally requiring painting for protection, identification and decoration.
4. Unfinished surfaces shall be painted and finished, e.g., roof top equipment, fans, duct work.
5. Specialty items delivered with a prime coat shall be finished.
6. Exposed uncovered pipe, exposed covered pipe, pipe hangers, connectors, grilles and other mechanical work, also exposed electric conduit, panel board, pull boxes and other electrical work requiring paint.
7. Ferrous metal roof top mechanical units, duct work, goose necks, supports, hangers and brackets shall be included.
8. Touch-up painting of prime coats which have become damaged or otherwise abraded or removed during construction.
9. Items generally not to receive paint coatings, are specifically detailed below, however, may not be limited to the following:
    a. Stainless steel, anodized aluminum, bronze and other nonferrous metals, exclusive of shop primed stainless steel.
    b. Ceramic tile.
    c. Resilient flooring.
    d. Those surfaces which cannot be put into proper condition to receive paint or finish coatings.
    e. Concealed ductwork, piping and conduit.
    f. Shop finished items.
    g. Acoustical materials.
    h. Mechanical and electrical equipment, unless specifically designated.

B. Related Sections: Sections related to this section include the following:

1. Shop Primed Items: Certain items are specified in other Sections to be shop primed with finish painting specified in this Section.
2. Shop Finished Items: Certain items of work are specified in other Sections to be shop finished and do not require finish painting in field.
3. Sealants: Refer to Division 7 Caulking and Sealants.

1.02 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI/ASTM D16: Definition of terms relating to paint, varnish, lacquer and related products.
2. ANSI/CODE Z53.1: Color and pipeline identification.

1.03 SUBMITTALS

A. Manufacturer's Data: Submit copies of manufacturer's specifications and installation instructions for paint materials required, including certifications and laboratory reports to show compliance with specifications.

B. Samples: Match Owner's color chips on 5' x 7' (127 x 178 mm) primed cardboard, with color, texture and sheen duplicated to simulate actual conditions. Resubmit sample boards as necessary for selection by Owner.

C. Quality Assurance Submittals:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions.
4. Manufacturer's Field Reports: Manufacturer's field reports.

D. Closeout Submittals: Warranty documents specified herein.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in commercial painting and finishing with three years experience documented and approved by product manufacturer.

B. Regulatory Requirements: Conform to applicable county, city codes for flame/fuel/smoke rating requirements for finishes.

1.05 DELIVERY, STORAGE & HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Materials should be delivered to job site in original, unopened containers and packages bearing manufacturer's labels, indicating name, type and brand. Unless directed otherwise, paints are to be delivered ready mixed.
2. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
3. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, clean up, color designation and instructions for mixing and reducing.

B. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Store paint materials at a minimum ambient temperature of 45ºF (7ºC.) and a maximum of 90ºF (32ºC) in a well ventilated area, unless required otherwise by manufacturer's instructions.
2. Place paint or solvent soaked rags, waste, or other materials which might constitute a fire hazard in a sealed, water filled meal container and remove from premises at close of each day's work. Take every precaution to avoid damage by fire.
3. Protect other work against damage, marking or injury by suitable covering during progress of painting and finishing work. Repair any damage done.

1.06 PROJECT CONDITIONS

A. Environmental Requirements/Conditions:

1. Provide continuous ventilation and heated facilities to maintain surface and ambient temperatures above 45ºF (7ºC) for 24 hours before, during and 24 hours after application of finishes, unless required otherwise by manufacturer's instructions.
2. Minimum Application Temperature for Latex Paints: 50ºF (10ºC) for interiors; 50ºF (10ºC) for exterior; unless required otherwise by manufacturer's instructions.
3. Paint shall not be applied in rain, snow, fog or mist, or when relative humidity exceeds 85%. Paints, other than water-thinned coatings, shall be applied only to surfaces that are completely free of surface moisture as determined by sight, touch and moisture meter, as specified. In no case shall paint be applied to a surface upon which there is visible ice or frost.
4. Minimum Application Temperature for Varnish Finishes: For best results, apply when surface and air temperature is between 65ºF and 90ºF (18ºC and 32ºC) Do not apply below 50ºF (10ºC).

5. Where paint manufacturer's specifications or instructions differ from above specifications, more stringent requirements shall apply.
6. Adequate lighting must be available prior to application of any paint coating to approximate 80 foot-candles measured mid-height at substrate surface.

1.07 WARRANTY

A. Manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under the Contract Documents.

1. Warranty Period: One year commencing on Date of Substantial Completion.

1.08 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.

1. Quantity: Provide 1 gal (3.8 L) of each color and texture to owner at completion
2. Labels: Label each container with color, texture, room locations and product description in addition to manufacturer's label.
3. Formulation: Provide owner with paint color formula and availability information on any custom product.
4. Delivery, Storage and Protection: Comply with owner's requirements for delivery, storage and protection of extra materials.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Sherwin Williams Paints, Inc.

B. Tnemec Company, Inc.

C. Or Equal

2.02 MATERIALS

A. General:

1. All items of painting materials shall be proprietary products of specified manufacturers. Such material shall be used without alterations and only with such thinning as called for in manufacturer's directions. Colors scheduled shall be factory mixed and exactly match approved samples.
2. Materials selected for a coating system for each type of surface shall be products of a single manufacturer, except where otherwise required by contract documents. Where shop primed materials are to be finish painted or prime coat materials are by a different manufacturer than finish coat materials, confirm compatibility of primers with manufacturer of finish coat paints.
3. Use only primers and under-coaters that are suitable for each surface to be covered and that are compatible with finish coat required.
4. Shellac and spot prime with industry accepted stain killers any marks which may bleed through surface finishes.

B. Accessories:

1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials and clean-up material required, per manufacturer's specifications.

2.03 MIXES

A. Mix proprietary materials in accordance with manufacturer's instructions, including product data and product technical bulletins.

2.04 SOURCE QUALITY

A. Obtain paint and coating products from a single manufacturer.

2.05 GLOSS AND SHEEN LEVELS

A. Comply with Master Painters Institute "MPI Gloss and Sheen Levels" seven level standard. The generic levels specified in the paint schedule following are based on the MPI standard levels and not to individual manufacturers' proprietary names, and shall apply the same to gloss levels for all paint types.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

1. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into acceptable condition through preparatory work.
2. Beginning of application of any paint or primer coating means acceptance of existing surfaces or substrate.

B. Surface Conditions:

1. Do not proceed with surface preparation or coating application until conditions are suitable.
2. Report any conditions that can potentially affect proper application. Measure moisture content of surfaces using an electronic moisture meter.
3. Do not apply finishes unless moisture content of surface is acceptable to receive specified paint coating material.
4. Cover or otherwise protect finishes of other trades and surfaces not being painted concurrently or not to be painted.

3.03 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

B. Lead Paint Verification:

1. Verify with the existence of lead based paints on the project. If lead based paints are suspected on the project, all removal must be done in accordance with the EPA Renovation, Repair and Painting rule and all applicable state and local regulations. State and local regulations may be stricter than those set under the federal regulations. Verify that Owner has completed a Hazardous Material Assessment Report for the project prior to issuing of Drawings.

C. Surface Preparation:

1. Remove or protect hardware, plates, trim for mechanical work, lighting fixtures and similar items placed prior to painting. Disconnect equipment adjacent to walls, where necessary and move to permit painting of wall surfaces. Following completion of painting, replace and reconnect.
2. Clean surfaces to be painted as required to remove dust, dirt or other surface contamination then properly prepare surfaces to receive paint or natural finish.
3. Before applying succeeding coats, primers and undercoats shall be completely integral and shall perform function for which they are specified. Properly prepare and touch up scratches, abrasions or other disfigurements and remove any foreign matter before proceeding with following coat. Spot priming or spot coating shall be featheredged into adjacent coatings to produce a smooth and level surface.
4. Do not apply final coats until after other work with operations that would be detrimental to finish painting have been finished in area to be painted and areas have been released for panning.
5. Shellac and spot prime with industry accepted stain killers any marks which can bleed through surface finishes. Ink markings of PVC piping can be removed with denatured alcohol.
6. Remove mildew by scrubbing surface with a solution of 4 ounces (118 mL) of pure tri-sodium phosphate, 3 quarts (2.8 L) of water and 1 quart (.95 L) of bleach. Allow this solution to remain on surface for 10 - 15 minutes, then rinse with clean water and allow surface to dry. Wear protective glasses and waterproof gloves when using this solution. Quickly wash off mixture that touches skin.
7. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply a latex based, compatible sealer or primer.
8. Insulated Coverings: Remove dirt, grease and oil from canvas and cotton using high pressure air and solvent cleaner as required to obtain a sealing coat.
9. Galvanized Surfaces: Remove surface contamination and then wash with clean, lint free cloths saturated with mineral spirits or lacquer thinner. Wipe dry with clean, lint free cloths. Apply coating of applicable primer.
10. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Clean surfaces with solvent. Prime bare steel surfaces. Featheredge to make touchup patches inconspicuous.
11. Interior Wood Items Scheduled to Receive Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
12. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt and rust where heavy coatings of scale are evident, and remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of

phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Spot prime weld repairs with a rust inhibitive metal primer.

13. Concrete & Concrete Masonry Units: Thoroughly clean concrete surfaces of loose particles sand, efflorescence, laitance, form oil, curing compounds or other contaminants by appropriate methods and be sure surface is dry before any paint is applied. Methods of surface preparation and cleaning shall be determined by Contractor as required in each case to ensure satisfactory paint application and performance.
14. Gypsum Drywall: Repair surface defects in gypsum drywall with drywall joint finishing compound or spackling compound filled out flush and sanded smooth. Clean surfaces and taped joints of dust, dirt and other contaminants.
15. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit and foreign matter. Seal knots, pitch streaks and sappy sections. Fill nail holes with exterior caulking compound after prime coat has been applied. Sand any mill glaze areas to paintable wood.
16. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.
17. Piping, Tanks and Equipment:
    1. Ferrous Metal:
        1. Shop Primed: Immediately before paint application, clean sand, dust, mud, dirt, and other foreign matter from shop coat. Touch up damaged or destroyed shop paint. Surface preparation of surfaces to be touched up must be as effective as those specified for shop painting.
        2. Not Shop Primed and Submerged or Intermittently Submerged in Liquid: Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter. Except for insides of pipes, sandblast in accordance with SSPC SP–10 or pickle in accordance with SSPC SP–8. After sandblasting, remove dust and spent sand from surface by brushing or vacuum cleaning. Apply prime coat before surface starts to rust. Do not allow sandblasted surface to stand overnight before coating.
        3. Not Shop Primed and Non–Submerged: Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter. Sandblast in accordance with SSPC SP–6. After sandblasting, remove dust and spent sand from surface by brushing or vacuum cleaning. Apply prime coat before surface starts to rust. Do not allow sandblasted surface to stand overnight before coating.
    2. Galvanized Metal Including Pipes and Conduits: Solvent clean in accordance with SSPC SP–1. Sand clean and spot prime abraded areas Etch metal using Clean N'Etch by Great Lakes Laboratories, Inc. or equal product. Follow manufacturer's written procedures. Allow to dry before application of paint.

3. Copper Pipe: Clean surface by pressurized steam, pressurized water, or solvent washing. Allow to dry before application of paint.
4. Shop Bituminous Coated Pipe: Hand tool clean in accordance with SSPC SP–2.
5. Polyvinyl Chloride Pipe: Solvent clean using bio-degradable cleaner such as Extra Muscle by Great Lakes Laboratories or equal and thoroughly rinse clean. Sand manually or mechanically with 60-80 grit aluminum oxide sandpaper and wipe off dust residue.

3.04 INSTALLATION

A. Paint and Coatings Installation:

1. Do not apply coating until moisture content of surface is within limitations recommended by paint manufacturer. For best accuracy, test with an electronic moisture meter.
2. Apply paint, enamel, stains and varnishes with suitable brushes, rollers or spray equipment which has been kept clean, free from contamination and suitable for finish required.
3. Rate of application of coating shall not exceed that as recommended by paint manufacturer for purpose and surface involved.
4. Comply with required drying time between coats as directed by manufacturer.
5. Sand between each coat to remove defects visible from 5' (1524 mm). Finish coats shall be smooth, free from brush marks, streaks, laps, sags, skips and holidays.
6. Do not apply additional coats until completed coat has been inspected and approved by Architect. Only inspected coats of paint will be considered in determining number of coats applied.
7. Make edges of paint adjoining other material or colors clean and sharp with no overlapping.
   a. Apply primer on Work before glazing or caulking. Paint must overlap glass 1/16" (1.6 mm) on coats.
8. Change colors at door stop corner where colors differ between adjoining spaces or rooms and where door frames match wall colors.
9. Refinish whole wall where portion of finish has been damaged or is not acceptable.
10. Back prime interior wood trim.
11. Stained and natural finishes shall be adjusted to obtain identical appearance.

B. Finishing Mechanical and Electrical Equipment

1. Refer to ANSI Code Z53.1 and A13.1 for color coding and identification banding of equipment, ductwork, piping and conduit

2. Access panels, electrical panels, air diffusing outlets, supply and exhaust grilles, louvers, exposed conduit, primed outlet covers, primed wall and ceiling plates and other items in painted areas shall be painted to match areas in which they occur unless specified otherwise in schedules. a. Paint backsides of access panels, removable or hinged covers. Do not paint nameplates on equipment.
3. Replace identification markings on mechanical or electrical equipment when painted accidentally.
4. Paint interior surfaces of air ducts and connector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sightline. Paint dampers exposed behind louvers, grilles and connector and baseboard cabinets to match face panels.
5. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
6. Replace electrical plates, hardware, light fixture trim and fittings upon completion.

C. Pipe Line Identification:

1. Pipe Color: Paint exposed piping and valves in accordance with the following schedule:

Service	Pipe Color	Lettering Color
Low Pressure Air	Light Green	White
Potable Water	Light Blue	Black
Nonpotable Water	Purple	White
Sludge	Dark Brown	White
Sanitary Drain/Vents	Dark Gray	White

2. After finish painting, mark exposed, non–submerged piping with stenciled name of contents and flow direction arrow at valves and fittings, on piping at both sides of walls and floors where pipes pass through, and on long runs approximately every 30 feet or closer when directed. Specifically mark lines according to their size (diameter) and specific contents as directed by the Engineer or noted in the legend herein. Place legends and flow arrows where they can be easily read from the floor. Where pipes are adjacent to each other, arrange legends neatly in line. Use gothic style lettering with letter size as follows:

Pipe or Covering Outside Diameter	Letter Size
Under 3/4 inch	Do not paint
3/4 inch to 1–1/4 inch	1/2 inch
1–1/2 inch to 2 inch	3/4 inch
2–1/2 inch to 6 inch	1–1/4 inch
8 inch to 10 inch	2–1/2 inch
Over 10 inch	3–1/2 inch

3. Identify pipes less than 3/4 inches outside diameter with brass or phenolic tags.
4. Paint valves and operators same color as connected piping.
5. PVC Piping should be labeled using vinyl – adhesive lettering. Lettering shall be heavy-duty and affixed to the piping in accordance with the lettering requirements outlined in this specification. Lettering material and details shall be submitted to the Engineer for review.

3.05 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions, prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

1. As work proceeds, promptly remove paint where spilled, splashed or spattered.
2. During progress of work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
3. Collect cotton waste, cloths and material which can constitute a fire hazard and place in closed water filled metal containers and remove daily from site.

3.06 PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction.

1. Protect Work of other trades against damage or injury by use of suitable covering during progress of painting and finishing work.
2. Repair damage to other surfaces caused by work of this section.
3. Remove empty paint containers from project site.
4. Post No Smoking and Wet Paint signs as required or directed.
5. Provide sand, extinguishers and other protective equipment in event of a fire created by any paint related rags or materials.
6. Touch-up damaged coatings after substantial completion, following manufacturer's recommendations for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

3.07 SCHEDULES

A. Schedules: Refer to schedules attached herewith.

3.08 SCHEDULE - SHOP PRIMED ITEMS PAINT SCHEDULE

A. Shop Primed Items for Site (Field) Finishing:

1. Metal fabrications including exposed surfaces.
2. Metal stairs and rails.
3. Air conditioning, roof structures.

3.09 SCHEDULE - EXTERIOR SURFACES PAINT SCHEDULE

A. Wood (Painted):

1. Semi-Gloss Finish (**Gloss Level 5**):
   a. One Coat: Exterior Latex Wood Primer.
   b. Two Coats: Duration Exterior Latex Coating.

B. Concrete Masonry Units (Painted):

1. Semi-Gloss Finish (**Gloss Level 5**):
   a. One Coat: Loxon Acrylic Primer.
   b. Two Coats: Sherlastic Elastomeric Coating.

C. Steel (Unprimed):

1. Semi-Gloss Finish (**Gloss Level 5**):
   a. One Coat: ProCryl Universal Metal Primer
   b. Two Coats: DTM Acrylic Coating.

D. Steel (Shop Primed):

1. Semi-Gloss Finish (**Gloss Level 5**):
   a. Touch up with Kem Kromick Universal Primer.
   b. Two Coats: DTM Acrylic Coating.

E. Steel (Galvanized):

1. Semi-Gloss Finish (**Gloss Level 5**):
   a. One Coat: ProCryl Universal Metal Primer
   b. Two Coats: DTM Acrylic Coating.

F. PVC, Plastic, Fiberglass (Painted):

1. Semi-Gloss Finish (**Gloss Level 5**):
   a. One Coat: Extreme Bond Primer
   b. Two Coats: Solo Acrylic Semi-Gloss

G. Trim, Columns, Soffit, Fascia, Railings: High Reflective White (SW 7757).

3.10 SCHEDULE - INTERIOR SURFACES PAINT SCHEDULE

A. Concrete Masonry Units (Painted):
   1. Low Sheen Finish (**Gloss Level 2**):
      a. One Coat: Loxon Concrete & Masonry Primer/Sealer.
      b. Two Coats: Pro Industrial Waterbased Acrylic Coating.

B. Wood (Stained):

   1. Satin Finish (Polyurethane):
      a. One Coat: Minwax Interior Stain.
      b. Two Coats: Minwax Polyurethane Varnish.

C. Wood (Painted):

   1. Semi-Gloss Finish (**Gloss Level 5**):
      a. One Coat: Promar 200 Primer
      b. Two Coats: Pro Industrial Waterbased Alkyd Urethane

D. Steel (Unprimed):

   1. Semi-Gloss Finish (**Gloss Level 5**):
      a. One Coat: ProCryl Universal Metal Primer.
      b. Two Coats: DTM Acrylic Coating.

E. Steel (Pre-primed):

   1. Semi-Gloss Finish (**Gloss Level 5**):
      a. Two Coats: DTM Acrylic Coating.

F. Steel (Galvanized):

   1. Semi-Gloss Finish (**Gloss Level 5**):
      a. One Coat: ProCryl Universal Metal Primer
      b. Two Coats: DTM Acrylic Coating.

G. Gypsum Board (Painted):

   1. Satin Finish (**Gloss Level 4**):
      a. One Coat: Promar 200 Primer
      b. Two Coats: Promar 200 Interior Latex

H. Plywood (Painted):
   Satin Finish (**Gloss Level 4**):
      a. One Coat: Promar 200 Primer
      b. Two Coats: Promar 200 Interior Latex.

3.11 SCHEDULE – TANK SURFACES, EQUIPMENT AND PIPING

A. General: The following paint systems are specified by their application type. The acceptable Tnemec coating systems are listed. The following paint systems are intended to include all items to be painted at the job site which do not fall under the scope of architectural/structural building materials and components. Any item not specifically named herein but obviously required to be painted, shall be painted in accordance with the system selected by the Engineer, or otherwise painted as directed by the Engineer.

B. Schedule:

1. Concrete - Submerged and Non–Submerged:
   a. Poured-In-Place Concrete Tanks/Wet Wells/Sumps (interior of structure, non-chemical exposure), specifically the Belt Filter Press Sump.
      (1) Surface Preparation: See Section 3.01.F and follow manufacturer's instructions.
      (2) Fill Coat: Tnemec Series 218 MortarClad – Trowel apply to entire interiors of tanks, filling all holes and voids up to ½" depth and 2" diameter and to provide pinhole and void free surface.
      (3) Finishing: Apply one coat of Tnemec Series 141 Coating at 18 mils total dry thickness.
2. Ferrous Metal Surfaces – Non–Submerged:
   a. Interior exposed, iron or steel (includes pumps, piping and valves).
      (1) Priming – Shop: One coat of Tnemec Series V69 Hi-Build Epoxoline II at 3.0 – 5.0 mils dry film thickness.
      (2) Priming – Field: Touch–up with Series V69 Hi-Build Epoxoline II or if not shop primed, sandblast and prime with N69 at 3.0 – 5.0 mils dry thickness.
      (3) Finishing: One coat of Tnemec Series V69 Hi-Build Epoxoline II at 4.0 – 6.0 mils dry film thickness.
      (4) Total Dry Mil Thickness: 7.0 – 11.0 mils dry film thickness.
   b. Exterior exposed iron or steel (includes pumps, piping and valves)
      (1) Priming – Shop: Tnemec Series V69 Hi-Build Epoxoline II at 3.0 – 5.0 mils dry film thickness.
      (2) Priming – Field: Touch–up with Tnemec Series V69 Hi-Build Epoxoline II or if not shop primed, sandblast and prime with above.
      (3) Intermediate: Tnemec Series V69 Hi-Build Epoxoline II at 4.0 – 6.0 mils dry film thickness.
      (4) Finish: Tnemec Series 1095 Endura-Shield at 2.0 – 3.0 mils dry thickness.
      (5) Total Dry Mil Thickness: 9.0 – 14.0 mils dry film thickness.

3. Ferrous Metal Surfaces – Submerged:
   a. Interior and exterior submerged or intermittently submerged iron or steel moving parts where drying coatings cannot obtain effective film thickness because of sharp edges (i.e., chains, sprockets, gears, etc.).
      (1) Priming – Shop: One coat of Tnemec Series V69 Hi-Build Epoxoline II at 4.0 – 6.0 mils dry thickness.
      (2) Priming – Field: Touch up with above or, if not shop primed, sandblast and prime with V69 Hi-Build Epoxoline II at 4.0 – 6.0 mils dry thickness.
      (3) Finishing: Two coats of Series V69 Hi-Build Epoxoline II at 7.0 – 9.0 mils dry thickness.
      (4) Dry Mil Thickness: Priming – 14.0 – 18.0 excluding shop prime.
   b. Interior and exterior submerged or intermittently submerged iron or steel (includes pumps, piping and valves).
      (1) Shop Prime: One coat Tnemec Series V69 Hi-Build Epoxoline II at 3.0 – 5.0 mils dry thickness.
      (2) Field Prime: Touch up with Tnemec Series V69 Hi-Build Epoxoline II at 3.0 – 5.0 mils dry thickness. If not shop primed, sandblast near white and apply V69 at 7.0 – 9.0 mils dry thickness.
      (3) Finishing: Two coats of Tnemec Series V69 Hi-Build Epoxoline II at 7.0 – 9.0 mils dry film thickness per coat over sandblasted surface. (To achieve recommended dry film thickness, spraying is required.)
      (4) Total Dry Mil Thickness excluding shop prime: 14.0 – 18.0 mils dry film thickness
4. Galvanized and Non-Ferrous Metal Surfaces:
   a. Interior Exposed (Includes piping and miscellaneous fabrications).
      (1) Priming – Tnemec Series V69 Hi-Build Epoxoline II at 2.0 - 3.0 mils dry film thickness.
      (2) Finish – Tnemec Series V69 Hi-Build Epoxoline II at 2.0 - 3.0 mils dry film thickness.
      (3) Total Dry Mil Thickness: 4.0 – 6.0 mils dry film thickness.
   b. Exterior Exposed (Includes piping and miscellaneous fabrications).
      (1) Priming – Tnemec Series V69 Hi-Build Epoxoline II at 2.0 - 3.0 mils dry film thickness.
      (2) Finish – Tnemec Series 1095 Endura-Shield at 2.0 - 3.0 mils dry film thickness.
      (3) Total Dry Mil Thickness: 4.0 – 6.0 mils dry film thickness.

   c. Submerged or intermittently submerged (Includes piping and miscellaneous fabrications).
      (1) Priming – Tnemec Series V69 Hi-Build Epoxoline II at 3.0 - 5.0 mils dry film thickness.

(2) Finish – Tnemec Series V69 Hi-Build Epoxoline II at 4.0 - 6.0 mils dry film thickness.
(3) Total Dry Mil Thickness: 7.0 – 11.0 mils dry film thickness.

5. Polyvinyl Chloride Piping and All Piping Insulation:
   a. Interior Exposed
      (1) Priming – Tnemec Series V69 Hi-Build Epoxoline II at 2.0 - 3.0 mils dry film thickness.
      (2) Finish – Tnemec Series V69 Hi-Build Epoxoline II at 2.0 - 3.0 mils dry film thickness.
      (3) Total Dry Mil Thickness: 4.0 – 6.0 mils dry film thickness.
   b. Exterior Exposed
      (1) Priming – Tnemec Series V69 Hi-Build Epoxoline II at 2.0 - 3.0 mils dry film thickness.
      (2) Finish – Tnemec Series 1095 Endura-Shield at 2.0 - 3.0 mils dry film thickness.
      (3) Total Dry Mil Thickness: 4.0 – 6.0 mils dry film thickness.

END OF SECTION

DIVISION 09 - FINISHES

SECTION 09 97 26

LIQUID TYPE CONCRETE FLOOR HARDENER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water-based, VOC compliant liquid chemical-hardener to be applied over new concrete floors scheduled to receive no other finish.

1.02 SUBMITTALS

A. Manufacturer's data for review.

1.03 JOB CONDITIONS

A. Allow sufficient concrete slab curing time as directed by manufacturer. Floor must be dry.

B. Air and slab temperatures for application shall be as directed by the manufacturer.

C. Application shall be performed by or supervised by a company representative.

1.04 GUARANTEE

A. Provide manufacturer's guarantee that floors coated with this product will not dust as a result of abrasion and wear within one year from date of application.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. "Day-Chem Sure Hard (J-17)", manufactured by Dayton Superior Specialty Chemical Corporation, Kansas City, KS 66106.

B. Approved substitution.

2.02 WATER

A. Potable.

PART 3 – EXECUTION

3.01 PREPARATION

A. Remove grease, oil, wax, curing compound if used and other foreign matter.

B. Rinse thoroughly with clear water to remove residue.

3.02 PRECAUTIONS

A. Keep away from heat, sparks, and flames. Provide good ventilation. Refer to manufacturer's Material Safety Data Sheet (MSDS) for information.

3.03 APPLICATION

A. Apply only when temperatures are above 40 F.

B. After finishing is complete and surface water has disappeared, cure with Day-Chem Sil-Cure (J-13), water, or properly used sheet material, in strict accordance with manufacturer's instructions.

C. Spreading Rate: Comply with manufacturer's recommendations.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior and exterior wall-mounted fiberglass signs.

B. Safety warning signs.

C. Instructional signs.

1.02 RELATED SECTIONS

A. Section 01 33 00: Submittals Procedures.

B. Section 08 71 00: Door Hardware

1.03 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Manufacturer's Data – Submit descriptive literature and specifications, including color chart.

C. Submit shop drawings depicting sign styles, lettering font, foreground and background colors, locations above finished floor and adjacent to doors, a list of all signs to be provided indicating sign location and text, and overall dimension of each sign and method of attachment.

D. Submit manufacturer's standard warranty information.

1.04 REGULATORY REQUIREMENTS

A. Conform to Americans with Disabilities Act (ADA) requirements as they pertain to areas of access for visually-impaired persons.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in accordance with Section 01 60 00.

B. Store and protect products in accordance with Section 01 60 00.

C. Sign packages shall have exterior labels indicating the name of the building or buildings where they are to be installed.

D. Store adhesive or tape materials at temperatures within the manufacturer's recommended installation temperature range.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. For Interior and Exterior Wall-Mounted Fiberglass Signs:

1. Best Sign Systems, Inc., Montrose, CO.
   www.bestsigns.com (800) 235-2378
2. Apco Signs, Atlanta, GA.
   www.apcosigns.com (877) 988-2726
3. Approved substitution.

B. Exterior Post-Mounted Signs:

1. Emed Co. Inc., Chicago, IL.
   www.emedco.com (800) 442-3633
2. Brimar Industries, Inc., Garfield, NJ.
   www.safetysign.com (800) 274-6271
3. Approved substitution.

C. Safety Warning Signs:

1. Seton Identification Products, Branford, CT.
   www.seton.com (800) 571-2596
2. Emed Co., Inc., Chicago, IL.
   www.emedco.com (800) 442-3633
3. Approved substitution.

D. Instructional Signs:

1. Interior and exterior wall-mounted fiberglass signs.
2. Best Sign Systems, Inc., Montrose, CO.
   www.bestsigns.com (800) 235-2378

3. Apco Signs, Atlanta, GA.
   www.apcosigns.com (877) 988-2726
4. Approved substitution.

2.02 SIGNS

A. Interior Room Designation Signs:

1. Etched fiberglass with non-glare, UV-resistant painted surface.
2. Base material thickness to be 0.125 inch.
3. Minimum Width: 10 inches; minimum height: 3 inches.
4. Room name lettering and Braille as required by ICC/ANSI A 117.1 – 1998.
5. Raised white letters on black background.
6. Vinyl foam tape mounting.
7. Best Sign System HC300, equal series by Apco Signs, or approved substitution.

B. Exterior Room Designation Signs:

1. Etched fiberglass with non-glare, UV-resistant painted surface.
2. Base material thickness to be 0.25 inch.
3. Minimum Width: 10 inches; minimum height: 3 inches.
4. Room name lettering and Braille as required by ICC/ANSI A 117.1 – 1998.
5. Raised white letters on black background.
6. Mounting by countersunk stainless steel screws in pre-drilled holes with expansion sleeves. Plastic spacing sleeves behind signs as required to attain plumb and true alignment.
7. Best Sign Systems HC300, equal series by Apco Signs, or approved substitution.

C. Mounting Posts for Exterior Signs:

1. Hot-dipped G90 galvanized steel U-channel.
2. Stainless steel bolts for attaching the sign.
3. Minimum Length – Size so that the bottom edge of the sign is 5 feet minimum above the adjacent pavement or walking surface.
4. Minimum Post Embedment – 3 feet.

D. Safety Warning Signs/Equipment Signs:

1. Where self-adhesive application is possible: flexible vinyl with a clear polyester coating or high-performance polyester.
2. Where it is necessary to mount the sign on railings or other framework near the hazard: 0.063 inch aluminum secured with stainless steel U-bolts or other appropriate stainless steel fasteners.

3. Rectangular signs are to be a minimum size of 10 inches wide by 7 inches high.
4. Chemical hazard diamonds are to be vinyl decals or rigid plastic depending on mounting conditions. 11 inches by 11 inches minimum size, with hazard numbers intended for use on the sign material. Signs shall be supplied by manufacturer of chemical.

E. Interior and Exterior Instructional Signs:

1. Etched fiberglass with non-glare, UV-resistant painted surface.
2. Base material thickness to be 0.25 inch.
3. Minimum Width: 10 inches; minimum height: 3 inches.
4. Room name lettering and Braille as required by ICC/ANSI A 117.1 – 1998.
5. Raised white letters on black background.
6. Mounting by countersunk stainless steel screws in pre-drilled holes with expansion sleeves. Plastic spacing sleeves behind signs as required to attain plumb and true alignment.
7. Best Sign Systems HC300, equal product by Apco Signs, or approved substitution.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install signs after doors and surfaces are finished.

C. Room identification signs shall be mounted:

1. So that the baseline of characters shall be no less than 48 inches above, and no more than 60 inches above, the adjacent floor or ground surface.
2. Outside the room on the wall next to the door on the latch side. For double doors, the sign shall be mounted to the right of the right-hand door.
3. Where there is no wall space on the latch side of a single door, or to the right side of double doors, signs shall be mounted on the nearest adjacent wall.
4. If wall space is not available in any of the locations designated in items 1 through 3 above, signs may be mounted on the push side of doors

provided that the doors are equipped with closers but do not have hold-open devices.

5. The same location specifications apply to signs associated with doors whether at the interior or at the exterior of buildings.

D. Safety warning signs shall be mounted so as to be clearly visible to the person approaching the equipment or area referenced by the sign. Sign locations shall be in compliance with OSHA regulations. Where possible, signs are to be mounted directly on the tanks, cabinets, or equipment referenced by the safety message. Coordinate mounting locations with Engineer.

E. Instructional Signs Shall Be Mounted:

1. So that the baseline of characters shall be no less than 48 inches above, and no more than 60 inches above, the adjacent floor or ground surface.
2. Outside and the room on the wall next to the operating hardware of the overhead door.

3.03 REQUIRED SIGNS

A. Room Designation Signs – Provide sign with room name on doorway or entrance to each room of each building. Room names are shown on the Drawings. Exterior doors are also to be labeled, on the exterior side of the wall, with the name of the room to which the door gives access.

B. Provide red “EXIT” signs above inside face of all exterior doors in new buildings.

C. Provide red “NON-POTABLE WATER – DO NOT DRINK” safety signs at the following locations:

1. Hose bibs.
2. All other locations providing non-potable (plant water).

D. Vault Designation Signs – Provide name of each vault engraved in the access hatch to the vault/piping gallery.

E. Equipment Designation Signs – Provide wall– or handrail– mounted equipment designation sign adjacent to each major equipment item as listed on Drawings. Sign shall have full name of equipment and equipment I.D. both stated.

F. Provide “EAR PROTECTION REQUIRED” red safety signs at the following locations:

1. Entrances to Electrical Room of the Dewatering Building.

G. Provide “CAUTION – EQUIPMENT STARTS AUTOMATICALLY” red safety signs at the following equipment:

1. Headworks Screen
2. Sludge Transfer Pumps
3. Sludge Mixing Blowers
4. Belt Filter Press

H. Provide “SAFETY GLASSES REQUIRED” safety signs at the following locations:

1. All chemical feed areas.

I. Provide “NO SMOKING” signs inside all entrances to the following buildings:

1. Dewatering Building

J. Emergency Safety Shower/Eyewash – Provide OSHA approved identification sign at each unit.

K. Fire Extinguisher – Provide identifying sign at each unit.

Ld. Chemical Health Hazard Designation Signs – Provide colored signs with chemical name, concentration, and four-component NFPA rating system at each chemical storage and feed area. Signs shall also be at each access to the room or area and at each exterior wall with a means of access.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10 26 00

WALL AND CORNER GUARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Mechanically fastened stainless steel corner guards.

1.02 SUBMITTALS

A. 12” long sample of selected model and finish.

B. Details, location schedules and installation instructions.

1.03 QUALITY ASSURANCE

A. Not less than 5 years’ experience in the production of specified products and a record of successful in-service performance.

1.04 PROJECT CONDITIONS

A. Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Construction Specialties, Inc. Munch, PA 17756.

B. Approved substitution.

2.02 MATERIALS

A. Stainless Steel: To be type 304 with #4 satin finish

B. All necessary fasteners to be supplied by the manufacturer.

2.03 MANUFACTURED UNITS

A. Corner Guard: Model CO-8 90 degree steel corner guard with 3½" standard legs. Mounted with stainless steel screws.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Conform to manufacturer's recommendations and approved details.

B. Corner Guards: Use only manufacturer's mounting hardware

C. Install straight and true over entire length

3.02 CLEANING

A. Clean material in accordance with manufacturer's recommended cleaning method.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnishing and installing fire extinguishers and brackets where indicated.

1.02 REFERENCES

A. ANSI/UL Standard 299.

B. NFPA 10: Portable Fire Extinguisher.

1.03 SUBMITTALS

A. Catalog data for review.

B. Materials by a single company throughout project.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Package, handle, deliver and store at job site in a manner to avoid damage. Damaged equipment will be rejected.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. J.L. Industries, Bloomington, Minnesota, 55435.

B. Approved substitution.

2.02 MATERIALS

A. Fire Extinguisher: UL rating 4A-80BC, 10 lb. capacity, for Class ABC fires, with steel cylinder. Cosmic 10E, Multi-Purpose Dry Chemical. Bracket mounted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. In accord with manufacturer's instructions for type of mounting required. Maximum height to top of cabinet above floor shall be 4'-8". Meet ADA criteria for projection from wall (4” maximum) including handle.

B. Fasten securely to structure using type of fastener or anchor as required by wall construction.

C. Check extinguisher for proper charge.

D. Remove and replace damaged, defective or under charged units.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13 34 13.13

GREENHOUSES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide the mill finish aluminum greenhouse structures and included equipment listed herein, of the size and dimensions indicated on the drawings. Finished size of greenhouses may vary slightly, as needed and approved by Architect, to accommodate manufacturer's standard dimensions, but shall not be less than the area indicated.

B. Manufacturer to furnish materials and equipment necessary for the greenhouse system described in this section and contract drawings. Equipment to be hung in place only; no hook-ups of any kind.

C. No fabrication of the structure or ordering of equipment shall be done until drawings and equipment have been approved. Foundation dimensions shall conform to approved greenhouse drawings.

D. This portion of the specifications does not cover the furnishing of labor or materials for the greenhouse concrete, grouting, masonry work of any description, plumbing, electrical (either power supply or control wiring), utility connections, flashing or counter-flashing to dissimilar surfaces; however, these items all should be coordinated with the Greenhouse Manufacturer. All the work called out in this paragraph shall be performed under other sections of the specifications and drawings by other trades other than the greenhouse contractor.

1.02 QUALITY ASSURANCE

A. Standards: Comply with National Greenhouse Manufacturer's associated standards, latest edition and the requirements set forth in these specifications of these specifications.

B. The greenhouse shall be erected by the greenhouse manufacturer or by a qualified contractor approved in writing by the manufacturer. The greenhouse erection contractor shall have at least five years' experience in building glazed structurers of the type specified. The General Contractor shall have all site conditions correct and ready prior to greenhouse erection. No masonry, foundation, or footer installation shall be made prior to approval of greenhouse plans.

1.03 SUBMITTALS

A. Product data: Within 30 days after award of the Contract, submit: manufacturer's product specifications, technical product data, and standard data and installation recommendations for each component in full size PDF.

B. Shop Drawings: A complete set of shop drawings including details shall be submitted by the greenhouse manufacturer for approval prior to fabrication. Submittals shall also include structural calculations and data on all equipment, glazing and doors supplied by greenhouse manufacturer. A project-specific wiring diagram complete with a control diagram, load schedule, equipment sequencing chart, and conduit and wiring layout, will also be required submittal.

C. Project Data: Accessories: Submit manufacturer's product specifications, shop drawings, and rough in diagrams, details, installation instructions and general product recommendations, Contractor shall submit a materials list for all manufactured products and/or materials proposed to use in the work. List shall include:

1. Name of the item.
2. Manufacturer of the item.
3. Manufacturer's catalog number.
4. Hardware.
5. Accessories

D. Submit samples of the following:

1. Glazing panels.
2. Aluminum framing members.
3. Gaskets.

E. Fastening materials, screws, bolts, adhesives, etc. shall be included as part of the greenhouse package.

F. O&M Manuals: Provide the facility operating and maintenance manuals on all equipment. O&M manuals shall be full size PDF.

G. Warranty: Provide warranty to the original Customer of the products set forth in the Purchase Agreement that all products manufactured will be free from material defects in materials and workmanship for a period of twelve (12) months after the date of substantial completion.

1.04 DESIGN CRITERIA

A. Submit structural calculations for greenhouse signed and sealed by a Professional Engineer in the State of Maryland for review.

B. Structural Performance: Except as noted, and as minimum, conform to the requirements and recommendations of both the “Standard for Design Loads in Greenhouse Structures” and its “Commentary” published by the National Greenhouse Manufacturers Association, 1998 Edition (NGMA Standards). Aluminum members shall be designed in accordance with the Aluminum Association’s design manual “Specifications of Aluminum Structures.”

C. Design Loads:

1. Snow Load – 40 PSF
2. Wind Loads -130 mph
3. Exposure - "C"
4. Seismic Zone – I=1

D. Applicable building code is uniform building code as adopted by local jurisdiction.

E. Load Combinations:

1. D.L. + S.L.
2. D.L + W.L.
3. D.L. + ½ S.L +W.L. OR (½ W.L +S.L.)

F. Engineering Certification: Submittals shall meet structural requirements as well as all other applicable local or state building codes for building permits as indicated on the drawings. Foundation design shall be by others. Plans and calculations shall be signed and sealed by a licensed engineer in the state of project code jurisdiction.

1.05 DELIVERY STORAGE AND HANDLING

A. Product materials during delivery, storage and handling to comply with manufacturer’s directions and as required to prevent damage or deterioration.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Winandy Greenhouse Company

B. Approved equals as per substitution criteria and architect review.

2.02 MATERIALS

A. Aluminum

B. Extrusions:

1. Primary Framing: Alloy 6061-T6 or 6005-T5 Aluminum
2. Secondary Framing: Alloy 6063-T6 or 6005-T5 Aluminum

C. Sheet: Alloy 3003-H14 Aluminum

D. Plates: Alloy 6061-T6 or 6005T5 Aluminum

E. Finish: mill aluminum

2.03 ALUMINUM STRUCTURE

A. Greenhouse manufacturer's extruded aluminum posts (side, gable, partition, end and corner) truss framing, rafters and purlins. All frame members and fasteners will be visible. Design shall provide for uniform and set pattern, conforming to spacing indicated. Where design requirements can be met through use of manufacturer's standard components, such components shall be utilized. Gabled Clear Span Truss Frame (STEEL FRAMING MEMBERS NOT PERMITTED)

B. Connections shall be made with hot dipped galvanized grade 5 bolts and aluminum plates with all field connections to be bolted.

C. Post-Aluminum posts shall be furnished and placed through the length of the greenhouses and across all partitions and gables. Posts shall be properly punched or drilled to receive fittings for attaching aluminum sills, purlins, gutters and rafters.

D. Anchor Bolts: Provided stainless steel expandable type anchor bolts or epoxy type anchors. Provide complete with nuts and washers.

E. Rafters: Provide aluminum rafters extending from eaves or gutters to ridges.

F. Trusses: Where trusses occur, the rafters described above shall be the top chord of the truss. All other truss members and connecting plates shall be aluminum shear will be allowed. Truss members and connecting plates shall be sized to meet required design criteria.

G. Aluminum knee bracing in the plan of the truss and column line is to be allowed in order to meet loading criteria.

H. Roof Purlins: Provide purlins for roof, bolted to top chord as required for load distribution. Vertical framework girts: provide girts for sidewalls, gable and partitions if applicable. Prefabricate all purlins and girts for attachment of glazing bars and connecting lugs.

I. Wall Sills: Seat an extruded aluminum wall sill on all foundations. Sill shall be capable of receiving either side sash or fixed glazing as required.

J. Condensation System: Provide system of integral gutters in roof framing and glazing bars designed to collect condensation and weep moisture to the exterior. Under gutter drip channel shall collect gutter condensate.

K. Glazing Members: Provide extruded aluminum glazing bars held in place with stainless self-tapping screws. Place extruded aluminum glazing bars in the roof of sufficient size and mechanical properties to carry design loads specified. Bars shall be spaced to properly receive glazing. Bars shall extend in one piece from gutter to ridge (on slopes without roof vents) and shall be supported by purlins. Extruded aluminum glazing bars of sufficient size and section modulus to carry design loads specified shall be placed in gables, extending from the wall sill to gable rafter. Provide camber on both top and bottom of bar for fastening purposes.

L. Gables and Partitions: Gables and partitions with fixed glazing from sill to gable rafter, except at door openings, shall be constructed using extruded aluminum shape as indicated on the drawings. Partition systems (if present) shall be designed and detailed to provide for different movement of greenhouse frames and supports anticipated under specified loading conditions.

2.04 GLAZING MATERIALS:

1. Roof: 16mm multi wall clear polycarbonate
2. Vertical Exterior Walls: 16mm multi wall clear polycarbonate
3. Partitions: None Present

2.05 FINISH: mill ALUMINUM

2.06 MOTORIZED SHUTTERS

A. Provide Acme motorized shutters (or approved equal as shown on plans) for air with 480/1PH motors.

2.07 FRESH AIR SUPPLY FANS

A. Provide Acme WindMaster Fresh Air Supply Fans, 480/3PH, 3 HP wall housing, inlet and outlet guard, and back draft damper (or equal as shown on plans).

PART 3 - EXECUTION

3.01 MANUFACTURERS RECOMMENDATION

A. This contract will require that given work or materials shall be installed in accordance with the manufacturer’s printed instructions.

B. The Contractor will obtain for his use at the site in executing the copies of all bulletins, circulars, catalogs, or other publications of the manufacturer of the latest

application or installation instructions and details. Furnish one copy of the manufacturer's brochures to the Owner.

3.02 PREPARATION

A. Examine areas and conditions under which greenhouse work is to be installed. Notify contractor in writing of conditions detrimental to proper and timely installation of work.

B. Coordinate and furnish anchorages, setting diagrams, templates and directions for installation of anchorages. Coordinated delivery of such items to project.

3.03 ERECTION

A. Erect greenhouse and related components in accordance with manufacturer's written instructions and final shop and erection drawings, and as directed by manufacturer.

B. Erector shall be an experienced crew at installing that manufacturer's product.

3.04 INSTALLATION EQUIPMENT

A. General: Install equipment in accordance with manufacturer's installation instruction instructions and recognized industry practices to insure intended function. Equipment will be installed in place by the Greenhouse Contractor. All mechanical, electrical and plumbing connection will be performed by electrical, plumbing or mechanical contractor; no hook-ups by greenhouse contractor.

3.05 INSTALLATION

A. Install the greenhouse with experienced crews of the greenhouse manufacturer, or by independent contract installers approved by the greenhouse manufacturer.

B. Coordinate the greenhouse skinning with the work of other trades. All service lines to equipment installed under this section shall be by other trades. All permits where required shall be by others.

C. Grouting: After the greenhouse contractor has placed the wall glazing framing, the masonry contractor shall provide the necessary materials and labor to grout between the wall and the sill to eliminate any discrepancies between the two and produce a finished joint.

D. Provide all appropriate caulking and sealant materials for a complete installation as required for a weather tight enclosure.

3.06 FLASHING

A. All flashing and counter-flashing shall be furnished and placed by the Sheet Metal Contractor. All flashing and counter-flashing shall be aluminum. Provide all other materials necessary for complete installation.

END OF SECTION

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DIVISION 22 - PLUMBING

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Beam clamps.

B. Pipe hangers.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
3. Stainless steel for Filter Press Room.

2.02 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.

C. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).

D. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.

E. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

F. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.03 PIPE HANGERS

A. Band Hangers, Adjustable:

1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. Stainless steel for Filter Press Room.

B. J-Hangers, Adjustable:

1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
2. Stainless steel for Filter Press Room.

C. Clevis Hangers, Adjustable:

1. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
2. Stainless steel for Filter Press Room.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Secure fasteners according to manufacturer's recommended torque settings.

G. Remove temporary supports.

END OF SECTION

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DIVISION 22 - PLUMBING

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.

1. Letter Color: White.
2. Letter Height: 1/4 inch.

2.02 PIPE MARKERS

A. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

B. Identification Scheme, ASME A13.1:

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

END OF SECTION

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DIVISION 22 - PLUMBING

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass fiber insulation.

B. Jacketing and accessories

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

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. CertainTeed Corporation.
2. Johns Manville Corporation.
3. Knauf Insulation.
4. Owens Corning Corporation.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.

1. K Value: ASTM C177, 0.23 at 75 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    a. Minimum Service Temperature: 0 degrees F.
    b. Maximum Service Temperature: 150 degrees F.
    c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    d. Thickness: 10 mil, 0.010 inch.
    e. Connections: Brush on welding adhesive.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 SCHEDULES

A. Plumbing Systems:

1. Domestic Cold and Hot Water Supply:
    a. Glass Fiber Insulation:
        1) Thickness: 1 inch.
        2) Jacket: PVC Plastic Jacket.

END OF SECTION

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DIVISION 22 - PLUMBING

SECTION 22 10 05

PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste and vent piping, buried within 5 feet of building.

B. Sanitary waste and vent piping, above grade.

C. Domestic water piping, buried within 5 feet of building.

D. Domestic water piping, above grade.

E. Pipe flanges, unions, and couplings.

F. Ball valves.

G. Strainers.

1.02 RELATED REQUIREMENTS

A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 22 07 19 - Plumbing Piping Insulation.

1.03 SUBMITTALS

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.

2.06 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:

1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

2.07 BALL VALVES

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. Anvil International.
2. Apollo Valves.
3. Uponor, Inc.

B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.08 STRAINERS

A. Size 1/2 inch to 3 inch:

1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi, 250 deg F WOG service.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

1. See Section 22 07 19.

C. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

D. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

END OF SECTION

DIVISION 22 - PLUMBING

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Backflow preventers.

B. Strainers.

C. Hose bibbs.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Pipe, fittings, and joints.

1.03 REFERENCE STANDARDS

A. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

B. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies; 2021.

C. AWWA C510 - Double Check-Valve Backflow Prevention Assembly; 2017 (Reaffirmed 2021).

D. NSF 61 - Drinking Water System Components - Health Effects; 2024.

E. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on materials of fabrication, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Store products under cover and protected from weather and dirt. Elevate above grade.

D. Protect end connections, flanges, threads, and grooves from dirt and damage.

E. Protect product interiors against rust and corrosion.

F. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products complying with NSF 61 and NSF 372.

B. Source Limitations: Furnish domestic water piping specialties of same kind by same manufacturer.

C. Provide brass-bodied domestic water piping specialties in DZR brass.

2.02 BACKFLOW PREVENTERS

A. Double-Check Valve Backflow Preventers:

1. Manufacturers:
    a. Watts
    b. MIFAB, Inc.
    c. Zurn Industries, LLC.
2. NPS 2 and Smaller:
    a. Assembly: ASSE 1015 and AWWA C510.
    b. Check Valves: Manufactured from bronze, copper silicon alloy, or stainless steel.
    c. Isolation Valves: Ball valves on inlet and outlet.
    d. Maximum Working Pressure: 175 psi.
    e. Working Temperature Range: 33 to 180 degrees F.
    f. Accessories:
        1) Inlet strainer.

2.03 STRAINERS

A. NPS 2 and Smaller:

1. Body: Wye-pattern in brass, bronze, or copper silicon alloy.
2. Screen: Stainless steel mesh.
3. Pressure Rating: 200 psi.

2.04 HOSE BIBBS

A. Hose Bibbs:

1. Valve: Bronze or brass body with mounting flange, replaceable seat, hose thread spout, and integral or add-on vacuum breaker complying with ASSE 1011.

2. Operation:
    a. Mechanical and Equipment Rooms: Handwheel, T-handle, or lever.
3. Finishes:
    a. Mechanical and Equipment Rooms: Provide in polished chrome, polished brass, rough chrome, or rough brass.
4. Maximum Working Pressure: 125 psi.
5. Working Temperature Range: 33 to 120 degrees F.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Discard packing materials and verify product interiors are free from debris, damage, and corrosion.

B. Verify end connections, flanges, threads, and grooves are completely clean without signs of damage or degradation that could result in leakage.

C. For products containing isolation or shutoff valves, verify isolation and shutoff valves operate smoothly from fully closed to fully open.

3.02 INSTALLATION

A. Prior to installation of domestic water piping specialties, flush domestic water piping of foreign material.

B. Install products in accordance with manufacturer's instructions.

C. Install products level and plumb.

D. Install products with clearance for access and maintenance.

E. For products containing isolation or shutoff valves, locate valves in horizontal piping with stems at or above center of piping, maintaining unimpeded stem movement.

F. Backflow Preventers:

1. Install backflow preventers in accordance with requirements of local authorities having jurisdiction, including requirements of local water utility.

3.03 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Repair or replace damaged products.

C. Replace defective products.

D. For products containing isolation or shutoff valves, exercise isolation and shutoff valves from fully closed to fully open. Confirm smooth operation.

E. Backflow Preventers:

1. Test in accordance with manufacturer's instructions.
2. Test in accordance with requirements of authorities having jurisdiction.
3. Test in accordance with ASSE listing of backflow preventer.
4. Replace backflow preventers that fail testing.

END OF SECTION

DIVISION 22 - PLUMBING

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Floor drains.

B. Floor sinks.

C. Cleanouts.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 11 19 - Domestic Water Piping Specialties: Trap primers.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.

B. ASME A112.6.7 - Sanitary Floor Sinks; 2022.

C. ASME A112.36.2 - Cleanouts; 2022.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on fabrication materials, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Store products under cover and protected from weather and dirt. Elevate above grade.

PART 2 - PRODUCTS

2.01 FLOOR DRAINS

A. Cast Iron Floor Drains:

1. Manufacturers:

a. JR Smith
b. MIFAB, Inc.
c. Zurn Industries, LLC.

2. Assembly: ASME A112.6.3.
3. Body: Lacquered cast iron with anchor flange and membrane clamping collar with weepholes.
4. Strainer: Adjustable, removable, with vandal-proof screws.
   a. Round:
      1) Material: Nickel bronze.
      2) Diameter: 7 inches.
5. Accessories:
   a. Trap seal insert.

2.02 FLOOR SINKS

A. Cast Iron Floor Sinks:

1. Manufacturers:
   a. J R Smith
   b. MIFAB, Inc.
   c. Zurn Industries, LLC.
2. Assembly: ASME A112.6.7.
3. Body: Cast iron with white acid-resistant enameled interior and interior anti-splash dome strainer.
   a. Square:
      1) Size: 12 by 12 inches.
4. Grate: Loose set.
   a. Material: White acid-resistant enameled cast iron.
5. Accessories:
   a. Sediment bucket.

2.03 CLEANOUTS

A. Manufacturers:

1. JR Smith
2. MIFAB, Inc.
3. Zurn Industries, LLC.

B. Floor Cleanouts:

1. Assembly: ASME A112.36.2.
2. Body: Lacquered cast iron.
3. Closure Plug: PVC or ABS, threaded, gastight and watertight.
4. Top: Adjustable, with vandal-proof screws.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars and bonding flanges.

C. Install drains so strainers and grates are level and are at design elevation.

D. Install floor sinks so grates are flush with finished floor unless noted otherwise or unless directed otherwise by adopted code.

E. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding or jetting of drainage system.

F. Install floor cleanouts to allow for floor finishes.

G. Locate, provide, and install cleanouts in piping in accordance with adopted code.

3.03 CLEANING

A. Clean debris from drains.

B. Clean grates and strainers prior to mm-dd-yyyy.

3.04 PROTECTION

A. Protect installed drains from accumulating dirt and debris through remainder of construction.

B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

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DIVISION 22 - PLUMBING

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tankless electric water heaters.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data:

1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
2. Provide electrical characteristics and connection requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Certifications:

1. Water Heaters: NSF approved.
2. Electric Water Heaters: UL listed and labeled to UL 174.
3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 - PRODUCTS

2.01 WATER HEATERS

A. Tankless Electric Water Heater:

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. Bradford White Corporation
   b. Bosch Thermotechnology.
   c. Chronomite, Inc.
2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
3. Water Inlet Pressure: From 30 psi to 150 psi.
4. Heater Type: Self-contained, wall-mounted unit capable of handling listed capacity, water-inlet strainer, removable thermally-insulated front panel, and threaded water pipe-end connections.
5. Heater-Heat Exchanger: Stainless steel, thermally insulated and encased assembly in corrosion-resistant steel jacket; baked-on enamel finish.
6. Safeties: Provide internal safeties for water flow, electrical load, and thermal load.
7. Controls: Color touchscreen interface for internal controls; temperature range adjustable from 120 to 170 degrees F using flanged or screw-in nichrome elements. Wire double-element units so elements do not operate simultaneously.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Coordinate system, equipment, and piping work with applicable electrical support interconnections as included or provided by other trades.

C. Domestic Water Heat Exchangers:

1. Install domestic water heat exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping.

END OF SECTION

DIVISION 22 - PLUMBING

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Service sinks.

B. Emergency eye and face wash.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 30 00 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

D. NSF 61 - Drinking Water System Components - Health Effects; 2024.

E. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

2.03 SERVICE SINKS

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. Elkay Manufacturing Company
2. Gerber Plumbing Fixtures LLC.
3. Just Manufacturing Company.
4. PROFLO.

B. Self-Standing, Double-Bowl, Laundry Sink: Four-hole, stainless steel finished, stainless steel bowl, stainless steel legs.

C. Two-Lever Handle Service Faucet:

1. Type: Wall-mount spout faucet with union inlets and mounting plate.
2. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
3. Materials: Ceramic disc cartridge valve on brass body with polished chrome finish.

2.04 EMERGENCY EYE WASH

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. Guardian
2. Haws Corporation.
3. Therm-Omega-Tech, Inc.

B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, nonclogging eye wash with quick opening, full-flow valves, stainless steel eye wash receptor, twin eye wash heads, stainless steel dust cover, copper alloy control valve and fittings.

C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

3.04 CLEANING

A. Clean plumbing fixtures and equipment.

3.05 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

1.02 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators; 2024.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:

1. Open drip-proof type except where specifically noted otherwise.
2. Design for continuous operation in 104 degrees F environment.
3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

B. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

D. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.03 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

J. FM (AG) - FM Approval Guide; Current Edition.

K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

L. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of HVAC work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 15% . Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Strut Channels:

1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
3. Stainless steel for Filter Press Room.

C. Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring.
2. Stainless steel for Filter Press Room.

D. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.
2. Stainless steel for Filter Press Room.

E. Beam Clamps:

1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
9. Stainless steel for Filter Press Room.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

D. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

E. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

F. Secure fasteners according to manufacturer's recommended torque settings.

G. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch.

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

END OF SECTION

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DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024.

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.03 SUBMITTALS

A. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
2. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
3. Units of Measure: Report data in I-P (inch-pound) units only.
4. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Engineer.
    g. Project Contractor.
    h. Report date.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of three years documented experience.
3. Certified by one of the following:
   a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
   b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
   c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Fans are rotating correctly.
5. Air outlets are installed and connected.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities _____.

B. Measure air quantities at air inlets and outlets.

C. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

D. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

3.06 SCOPE

A. Test, adjust, and balance the following:

1. Fans.

3.07 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.

5. RPM.
6. Service factor.

B. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Fan RPM.

END OF SECTION

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 09 13

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Thermostats:

1. Line voltage thermostats.

1.02 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

B. Section 26 27 26 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 THERMOSTATS

A. Line Voltage Thermostats:

1. Dead Band: Maximum 3 degrees F.
2. Rating: Motor load.
3. Explosion proof where indicated on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats; see Section 26 27 26.

C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

D. Provide conduit and electrical wiring in accordance with Section 26 05 83. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 34 13

AXIAL HVAC FANS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Propeller fans.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

C. Section 23 33 00 - Air Duct Accessories: Backdraft dampers - metal.

D. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.

B. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

1.04 SUBMITTALS

A. Product Data: Provide data on axial fans and accessories, including fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.07 FIELD CONDITIONS

A. Do not use permanent fans for ventilation during construction.

PART 2 - PRODUCTS

2.01 PROPELLER FANS

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. Greenheck
2. Loren Cook Company
3. PennBarry, Division of Air Systems Components

B. Impeller: Shaped steel or steel-reinforced aluminum blade with heavy hubs, statically and dynamically balanced, keyed and locked to shaft, directly connected to motor or provided with V-belt drive.

C. Frame: One-piece, square steel with die-formed venturi orifice, mounting flanges, and supports, with baked enamel finish.

D. Accessories:

1. Backdraft Damper: Multiple blades with offset hinge pin, blades linked; see Section
2. Safety Screens: Expanded galvanized metal over inlet, motor, drive; to comply with 29 CFR 1910.
3. Hood: Weathershield, to exclude rain and snow.

E. Performance Ratings: As indicated on drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with resilient mountings and flexible electrical leads; see Sections 23 05 48 and 26 05 83.

C. Provide safety screen where inlet or outlet is exposed.

D. Provide backdraft dampers on discharge of exhaust fans and as indicated.

E. Provide access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 34 23

HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall exhausters.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2025.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

H. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

G. Enclosed Safety Switches: Comply with NEMA EN 10250.

2.02 WALL EXHAUSTERS

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. Carnes, a division of Carnes Company Inc.
2. Greenheck Fan Corporation.
3. PennBarry, Division of Air System Components.
4. Twin City Fan & Blower; WPB.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor, and wall mounted multiple speed switch.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Louvers:

1. Combination louvers.

1.02 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 QUALITY ASSURANCE

A. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 - PRODUCTS

2.01 COMBINATION LOUVERS

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. Greenheck
2. Ruskin Company: www.ruskin.com/#sle.
3. NCA, a brand of Metal Industries Inc..

B. Damper-combined, drainable louver:

C. Size: As indicated on the drawings.

D. Material: Extruded galvanized steel.

E. Paint Finish and Color: To be selected by Architect from manufacturer's standard range.

F. Coating: Kynar, 2 coat.

G. Sleeve or Flange: Factory-mounted standard.

H. Linkage: Concealed in frame.

I. Custom Features: Include bird screen.

J. Mounting: Furnish with exterior flat flange for installation.

K. Actuator - NEMA 4x or NEMA 7 as indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 CLOSEOUT ACTIVITIES

A. Demonstrate operational system to Owner's representative.

B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 23 82 00

CONVECTION HEATING AND COOLING UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electric unit heaters.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.03 REFERENCE STANDARDS

A. AHRI 440 - Performance Rating of Room Fan-Coils; 2008.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.01 ELECTRIC UNIT HEATERS

A. Manufacturers:

1. Reznor
2. INDEECO (Industrial Engineering and Equipment Company)
3. Modine Manufacturing Company
4. Qmark

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.

C. Provide products that meet explosion proof requirements where indicated on the drawings.

D. Heating Element Assembly:

1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.
2. Horizontal Projection Units:
    a. Steel fins copper brazed to steel sheath and epoxy sealed for moisture resistance.
    b. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
    c. High-mass, all steel tubular type, copper brazed, centrally located and installed in fixed element banks.

E. Housing:

1. Suitable for ceiling or high altitude mount using provided hardware appendages.
2. Horizontal Projection Units:
    a. Construction materials to consist of heavy gauge steel with galvanized, polyester powder coat, or high gloss baked enamel finish.
    b. Provide with threaded holes for threaded rod suspension.
    c. Provisions for access to internal components for maintenance, adjustments, and repair.
    d. Watertight construction for high moisture, corrosive prone washdown spaces.

F. Air Inlets and Outlets:

1. Inlets: Provide protective grilles with fan blade guard.
2. Outlets: Provide diffuser cones, directional louvers, or radial diffusers.

G. Fan: Factory balanced, direct drive, axial type with fan guard.

H. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.

I. Controls:

1. Wall mounted thermostat - refer to drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are suitable for installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Do not damage equipment or finishes.

C. Unit Heaters:

1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

D. Units with Electric Heating Elements:

1. Install as indicated including electrical devices furnished by manufacturer but not factory installed.
2. Install wiring in accordance with the manufacturer's wiring diagram submittal and Section 26 05 83.

3.03 CLEANING

A. After construction and painting is completed, clean exposed surfaces of units.

B. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

3.04 PROTECTION

A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 00 10

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Electrical equipment coordination and installation.
2. Common electrical installation requirements.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2026.

B. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2026.

1.04 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

1.05 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.06 FIELD CONDITIONS

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

E. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than five days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Incidentals: The Contactor shall provide materials and incidentals require for a complete and operable system, even if not required explicitly by the Contract Documents. Typical incidents are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

B. Where conduit development drawings or “home runs” are indicated, the Contractor shall route the conduits in accordance with those requirements. Routings shall be exposed or encased as indicated, except that conduit in finished areas shall be concealed unless specifically indicated otherwise. Conduits encased in a slab shall be sized for conduit OD to not exceed one-third of the slab thickness and be laid out and spaced to not impede concrete flow.

C. Conduit and equipment shall be installed in such a manner as to avoid obstructions, to preserve headroom, and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms as indicated. Where the Drawings do not indicate exact locations, such locations will be determined by the Engineer. If equipment is installed without instruction and must be moved, it shall be adjusted slightly to avoid obstructions and to minimize shadows.

D. Wherever conduits and wiring for lighting and receptacles are not indicated, it shall be the Contractor's responsibility to provide lighting and receptacle-related conduits and wiring as required, based on the actual installed fixture layout and the circuit designations as indicated. Wring shall be #12 AWG minimum (encased). Where circuits are combined in the same raceway, the Contractor shall derate conductor ampacities in accordance with NEC requirements.

E. Comply with NECA 1.

F. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

G. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

H. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

I. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

B. Examine roughing-in for other trades to verify actual locations of equipment connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where equipment will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until equipment is ready to be energized and placed into service.

B. Replace equipment whose interiors have been exposed to a buildup of dust or debris, water or other liquids prior to Substantial Completion.

3.04 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.05 ADJUSTING

A. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer.

B. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 05 05

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 SUBMITTALS

A. Submit temporary power plan and sequencing plan to maintain required operations as outlined on the Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Refer to 26 00 10 - Basic Electrical Materials and Methods for additional outage information and limitations.
2. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

A. Maintain site clear of debris during and after demolition activities.

3.05 PROTECTION

A. Protect all existing equipment not scheduled to be demolished.

B. Remove and replace equipment that are physically damaged, wet or moisture damaged, or mold damaged as a result of demolition activity under this contract.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Variable-frequency drive cable.

C. Wiring connectors.

D. Electrical tape.

E. Heat shrink tubing.

F. Oxide inhibiting compound.

G. Wire pulling lubricant.

H. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

I. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 79 - Electrical Standard for Industrial Machinery; 2021.

L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

B. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

C. Wire Pulling Lubricant: Certification of compatibility with conductors/cables.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 ºF, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer and obtain direction before proceeding with work.

PART 2 - PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

1. Exceptions:
    a. Use variable-frequency drive cable for connection between variable-frequency motor controllers and associated motors.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

H. Manufactured wiring systems are not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Comply with NEMA WC 70.

E. Comply with FS A-A-59544 where applicable.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

I. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:
   a. 480Y/277 V, 3 Phase, 4 Wire System:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   c. Equipment Ground, All Systems: Green.
   d. Travelers for 3-Way and 4-Way Switching: Pink.
   e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

f. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

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. Copper Building Wire:
   a. General Cable Technologies Corporation.
   b. Service Wire Co.
   c. Southwire Company.
   d. Approved Equal.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:
   a. Size 10 AWG and Smaller: Solid.
   b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN-2 or XHHW-2, as indicated below.
   a. Size 4 AWG and Larger: Type XHHW-2.
   b. Installed Underground: Type XHHW-2.
   c. Installed as Service Entrance: Type XHHW-2
   d. Installed as Exposed Feeders and Branch Circuits: Type XHWW-2.
   e. Installed as Interior Above Grade Feeders or Branch Circuits: Type THHN/THWN-2.

2.04 VARIABLE-FREQUENCY DRIVE CONDUCTORS

A. Description: Variable-Frequency Drive conductors shall be type XHHW-2.

B. Acceptable manufacturers as specified under paragraph 2.03 in this specification section.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Mechanical Connectors: Provide bolted type or set-screw type.

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. Burndy LLC.
   b. nVent ILSCO.
   c. Thomas & Betts Corporation.
   d. Approved Equal.

G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

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. Burndy LLC.
    b. nVent ILSCO.
    c. Thomas & Betts Corporation.
    d. Approved Equal.

H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

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. Burndy LLC.
    b. Ilsco.
    c. Thomas & Betts Corporation.
    d. Approved Equal.

2.06 ACCESSORIES

A. Electrical 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. 3M.
    b. Plymouth Rubber Europa.
    c. Approved Equal.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 105 ºC.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 ºF and suitable for continuous temperature environment up to 105 ºC.

4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 90 ºC and short-term 130 ºC overload service.

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

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. 3M.
   b. Burndy LLC.
   c. Thomas & Betts Corporation.
   d. Approved Equal.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

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. Burndy LLC.
   b. Ideal Industries, Inc.
   c. Ilsco.
   d. Approved Equal.

D. Wire Pulling Lubricant:

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. 3M.
   b. American Polywater Corporation.
   c. Ideal Industries, Inc.
   d. Approved Equal.
2. Listed and labeled as complying with UL 267.
3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
4. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

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. Burndy LLC.
   b. Ideal Electrical.

c. Thamos & Betts.
d. Approved Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within10 feet of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated or required by code, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
   a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
   b. Increase size of conductors as required to account for ampacity derating.
   c. Size raceways, boxes, etc. to accommodate conductors.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Direct Burial Cable Installation:

1. Provide trenching and backfilling in accordance with Drawing details.
2. Install cable with minimum cover of 24 inches unless otherwise indicated or required.
3. Protect cables from damage in accordance with NFPA 70.
4. Provide underground warning tape in accordance with Section 26 05 53 along entire cable length.

F. Parallel Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Install conductors with a minimum of 12 inches of slack at each outlet.

I. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
   b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
   b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Identify conductors and cables in accordance with Section 26 05 53.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 05 23

CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.

B. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2026.

C. IEC 60603-7 - Connectors for Electronic Equipment - Part 7: Detail Specification for 8-Way, Unshielded, Free and Fixed Connectors; 2026.

D. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2026.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2026.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. TIA-232 - Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange; 2026.

H. TIA-569 - Telecommunications Pathways and Spaces; 2026.

I. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2026.

J. TIA-607 - Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2026.

K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

N. UL 1581 - Reference Standard for Electrical Wires, Cables, and Flexible Cords; Current Edition, Including All Revisions.

O. UL 1685 - Standard for Safety Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables; Current Edition, Including All Revisions.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. Section Includes:

1. Category 5e balanced twisted pair cable.
2. Balanced twisted pair cabling hardware.
3. RS-485 cabling.
4. Low-voltage control cabling.
5. Control-circuit conductors.
6. Identification products.

1.04 RELATED REQUIREMENTS:

A. Section 40 95 33 “Process Control Networks”.

1. Fiber Optic Cable.

B. Section 40 94 43 “Programmable Logic Process Controllers”.

1.05 DEFINITIONS

A. EMI: Electromagnetic interference.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.07 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

C. RoHS compliant.

2.02 CATEGORY 5E BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.

B. 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. Belden Inc.
2. General Cable; Prysmian Group North America.
3. Monoprice, Inc.
4. Approved Equal.

C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.

D. Conductors: 100-ohm, 24 AWG solid copper.

E. Shielding/Screening: Unshielded twisted pairs (UTP).

F. Cable Rating: Riser.

G. Jacket: White thermoplastic.

2.03 BALANCED TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.

B. 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. AMP NETCONNECT; a TE Connectivity Ltd. company.

2. Belden CDT Networking Division/NORDX.
3. Molex Premise Networks.
4. Approved Equal.

C. General Requirements for Balanced Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 5e.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Source Limitations: Obtain balanced twisted pair cable hardware from single source from single manufacturer.

E. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
3. Marked to indicate transmission performance.

2.04 SHIELDED TWISTED PAIR CONTROL CABLE

A. Description: Shielded Twisted Pair (STP) cables shall be used for all analog signal wiring installed under this contract.

B. 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. Belden Electronic Wire and Cable Company.
2. General Cable; Prysmian Group North America.
3. Okonite Company.
4. Approved Equal.

C. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation, 600 V.

3. Cable shield shall be aluminum-polyester tape overlapped to provide 100% coverage, and a 7-strand tinned copper drain wire, size 18 AWG.
4. PVC jacket, 80 C temperature rating.
5. Flame Resistance: Comply with UL 1685.
6. Suitable for both indoor dry and outdoor wet locations.

2.05 CONTROL-CIRCUIT CONDUCTORS

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. General Cable; Prysmian Group North America.
2. Service Wire Co.
3. Southwire Company.
4. Approved Equal.

B. Class 1 Control Circuits: Stranded copper, Type XHHW-2, complying with UL 44 in raceway.

C. Class 2 Control Circuits: Stranded copper, Type XHHW-2, complying with UL 44 in raceway.

D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type XHHW-2, complying with UL 44 in raceway.

2.06 SOURCE QUALITY CONTROL

A. Factory test twisted pair cables according to TIA-568-C.2.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Test cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.
2. Reject failed cables.

B. Comply with requirements in Sections 26 05 33.16 "Boxes for Electrical Systems" and 26 05 33.23 "Surface Raceways for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

1. Outlet boxes for cables shall be no smaller than 4 inches square by 1-1/2 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
2. Flexible metal conduit shall not be used.

C. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

D. Install manufactured conduit sweeps and long-radius elbows if possible.

3.02 RACEWAY INSTALLATION IN EQUIPMENT ROOMS

A. Extend conduits 3 inches above finished floor.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
3. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points. Make taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
5. Furnish a separate raceway system for shielded signal cable. Do not run in the same conduit with power cable.
6. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
12. Provide strain relief.
13. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
14. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Install UTP cables using techniques, practices, and methods that are consistent with the Category rating of components and that ensure required Category performance of completed and linked signal paths, end to end.
3. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.
4. All terminators required to interface the new cables to the various devices shall be furnished, installed, connected and tested as part of this contract.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.
3. Comply with requirements specified in Sections 26 05 33.16 "Boxes for Electrical Systems" and 26 05 33.23 "Surface Raceways for Electrical Systems"

4. Control wiring may be pulled in the power conduits and wireways providing the highest voltage of the adjacent wires is not more than 120 volts.
5. All terminators required to interface the new cables to the various devices shall be furnished, installed, connected and tested as part of this contract.

E. Power Control Systems

1. The wiring of this category (single conductor, or multiple conductor) is to be installed in accordance with the NEC.

F. Telemetry and Instrumentation Signal Systems

1. Separate conduit and wireway runs are required for this category. All wiring is to be isolated from all power systems.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.

3.04 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.05 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.06 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

1. Ground cable shield at termination of instrumentation cabinet only. Ground connection should be visible.

B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.07 IDENTIFICATION

A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.08 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. General Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test cables after termination, but not after cross-connection.
    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Balanced Twisted Pair Cable Testing

1. Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, split pairs, and improper terminations.
2. Channel and permanent link tests for cable length, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal-level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with minimum criteria in TIA/EIA-568-B.2.

D. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.

E. Document data for each measurement. Print data for submittals in a summary report that is formatted using the data, save as text files, print, and submit.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

1. Remove and replace cabling where test results indicate that they do not comply with specified requirements. Retest until satisfactory.

G. Prepare test and inspection reports.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground access wells.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

1. Includes oxide inhibiting compound.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.
2. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

B. Shop Drawings:

1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field quality control test reports.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1. Submit plans showing as-built, dimensioned locations of system, including the following:
   a. Ground rods.
   b. Ground access wells.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal In-Ground Support Structure:
   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
3. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   d. Provide ground access well for each electrode.
4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
5. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4" by 4” by As Required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
   d. Install bus horizontally, on insulated spacers 2 inches minimum from wall, unless otherwise indicated.
   e. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
6. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
   b. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

I. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    b. Metal process piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.

J. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.
    a. Exceptions:
        1) Use bare copper conductors where installed underground in direct contact with earth.
2. Install solid conductor for 12 AWG and smaller, and stranded conductors for 10 AWG and larger unless otherwise indicated.

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
    a. Exceptions:
        1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
    a. Exceptions:
        1) Use exothermic welded connections for connections to metal building frame.
4. 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. Burndy LLC.
    b. nVent ERICO.
    c. Thomas & Betts Corporation.
    d. Approved Equal.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

4. 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. allG Fabrication.
    b. Harger Lightning & Grounding.
    c. nVent ERICO.
    d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
    e. Approved Equal.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
5. 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. Galvan Industries, Inc.
    b. Harger Lightning & Grounding.
    c. nVent ERICO.
    d. Approved Equal.

F. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
    a. Areas Exposed to Vehicular Traffic: Rated for not less than H-20 Loading (32,000 lbs) vertical design load.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
    a. Round Wells: Not less than 8 inches in diameter.
    b. Rectangular Wells: Not less than 12 by 12 inches.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".

5. 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. Harger Lightning & Grounding.
    b. nVent ERICO.
    c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
    d. Approved Equal.

G. Oxide Inhibiting Compound: Comply with Section 26 05 19.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches deep in accordance with NFPA 70.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements. Notify the Engineer promptly and include recommendations to reduce ground resistance.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

B. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

C. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

D. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. MFMA-4 - Metal Framing Standards Publication; 2004.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

D. Installer's qualification statement.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

B. Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

C. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
   a. NFPA 70.
   b. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 1.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Components: Use corrosion-resistant materials suitable for environment where installed.
   a. Indoor or Non-Corrosive Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor or Corrosive Locations: Stainless Steel or Aluminum.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

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. ABB.
   b. Eaton Corporation.
   c. Emerson Electric Co; O-Z/Gedney.
   d. Approved Equal.
2. Conduit Straps: One-hole or two-hole type; Galvanized steel, malleable iron, or stainless steel.

3. Conduit Clamps: Bolted type unless otherwise indicated.

C. Metal Channel/Strut Framing Systems:

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. Atkore International Inc; Unistrut.
   b. Custom Strut and Roll Forming, LLC.
   c. Eaton Corporation.
   d. Elgen Manufacturing Company, Inc.
   e. Approved Equal.
   f. Source Limitations: Furnish channel/strut and associated fittings, accessories, and hardware produced by single manufacturer.
2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
3. Comply with MFMA-4.
4. Channel Material:
   a. Indoor Dry Locations: Zinc coated.
   b. Outdoor and Damp or Wet Indoor or Corrosive Locations: Stainless Steel or aluminum.

D. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2-inch diameter.
   b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
   c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
   d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
   e. Luminaires: 1/4-inch diameter.
2. Rod Material:
   a. Indoor, dry, non-corrosive locations: Galvanized.
   b. Outdoor, damp, wet, or corrosive locations: Stainless Steel or Aluminum.
   c. Note: Aluminum provides less strength than equally sized steel rods.

E. Anchors and Fasteners:

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. Dewalt.
   b. Hilti, Inc.
   c. Inninois Tool Works, Inc.
   d. Approved Equal.
2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
5. Sheet Metal: Use sheet metal screws.
6. Plastic and lead anchors are not permitted.
7. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
   b. Comply with MFMA-4.
   c. Channel Material: Use galvanized steel.
8. Material:
   a. Indoor, dry, non-corrosive locations: Galvanized.
   b. Outdoor, damp, wet, or corrosive locations: Stainless Steel.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

E. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

F. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

G. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

H. Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

I. Exterior Luminaire Support and Attachment: See Section 26 56 00 for additional requirements.

J. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

K. Secure fasteners in accordance with manufacturer's recommended torque settings.

L. Remove temporary supports.

3.03 CONCRETE BASES

A. Provide housekeeping pad, concrete bases for all floor mounted equipment.

B. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

C. Use 3000-psi, 28-day compressive-strength concrete.

D. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

3.05 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 05 33.13

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Aluminum rigid metal conduit (ARC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

E. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

M. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

N. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

O. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

P. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

R. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch trade size and larger.

1.06 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.
2. Exterior, Direct-Buried: Use PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.

4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to PVC-coated galvanized steel rigid metal conduit (RMC) where emerging from underground.
5. Where rigid polyvinyl (PVC) conduit larger than 2-inch trade size is provided, use PVC-coated galvanized steel rigid metal conduit (RMC) elbows for bends.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.
2. Within Slab Above Ground: Not permitted.

E. Interior, Damp or Wet Locations: Use PVC-coated galvanized steel rigid metal conduit (RMC).

F. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), aluminum rigid metal conduit (RMC), or rigid PVC conduit.

G. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or aluminum rigid metal conduit (RMC).

H. Exposed, Exterior: Use galvanized steel rigid metal conduit (RMC) or aluminum rigid metal conduit (RMC).

I. Hazardous/Classified Locations: Use PVC-coated galvanized steel rigid metal conduit (RMC).

J. Flexible Connections to Vibrating Equipment: liquidtight flexible metal conduit (LFMC).

1. Maximum Length: 6 feet unless otherwise indicated.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch trade size.
2. Underground, Exterior: 1 inch trade size. (Minimum)
3. Concrete encased, duct bank: 2 inch trade size. (Minimum)
4. PVC-Coated Steel Conduit stub-ups shall be minimum 12-inches long with 6-inches above grade and 6-inches below grade.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

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. Allied Tube & Conduit, a division of Atkore International.
2. Nucor Tubular Products.
3. Wheatland Tube, a division of Zekelman Industries.
4. Approved Equal.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

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. ABB; T&B.
   b. Bridgeport Fittings Inc.
   c. Emerson Electric Co; O-Z/Gedney.
   d. Approved Equal.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 ALUMINUM RIGID METAL CONDUIT (ARC)

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. Allied Tube & Conduit, a division of Atkore International.
2. Nucor Tubular Products.
3. Wheatland Tube, a division of Zekelman Industries.
4. Approved Equal.

B. Description: NFPA 70, Type ARC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

C. Fittings:

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. ABB; T&B.
   b. Allied Tube & Conduit, a division of Atkore International.
   c. Emerson Electric Co; O-Z/Gedney.
   d. Approved Equal.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use aluminum.
5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

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. ABB; Ocal.
2. Calbond, a division of Atkore International.
3. Robroy Industries.
4. Approved Equal.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

D. Interior Coating: Urethane, minimum thickness of 2 mil, 0.002 inch.

E. PVC-Coated Boxes and Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.
6. Interior Coating: Urethane, minimum thickness of 2 mil, 0.002 inch.

F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

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. AFC Cable Systems, a division of Atkore International.
2. Electri-Flex Company.
3. International Metal Hose.
4. Approved Equal.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

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. ABB; T&B.

b. Bridgeport Fittings, LLC.
c. Emerson Electric Co; O-Z/Gedney.
d. Approved Equal.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

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. ABB; Carlon.
2. Cantex Inc.
3. JM Eagle.
4. Approved Equal.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.08 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

D. Foam Conduit Sealant:

1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Rated to hold minimum of 10 ft water head pressure.

E. Conduit Mechanical Seals:

1. Listed as complying with UL 514B.
2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
3. Suitable for sealing around conductors/cables to be installed.

F. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Aluminum Rigid Metal Conduit (ARC): Install in accordance with NECA 102.

E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

F. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

G. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of three 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
14. Group parallel conduits in same area on common rack.

H. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
4. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
6. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
7. Use of spring steel conduit clips for support of conduits is not permitted.
8. Use of wire for support of conduits is not permitted.
9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

I. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Install firestopping to preserve fire resistance rating of partitions and other elements.

K. Underground Installation:

1. Provide trenching and backfilling as shown on the Drawings.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 4 inches to bottom of slab.
3. Provide underground warning tape along entire conduit length; see Section 26 05 53.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated.

M. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 24 inches at each end.

O. Provide grounding and bonding; see Section 26 05 26.

P. Identify conduits; see Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 05 33.16

BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.13 - Conduit for Electrical Systems:

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 27 26 - Wiring Devices.

1. Wall plates.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Project Record Documents: Record actual locations for pull boxes, cabinets and enclosures, and underground boxes/enclosures.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast aluminum boxes where aluminum rigid metal conduit is used.
4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
5. Use suitable masonry type boxes where flush-mounted in masonry walls.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
13. Wall Plates: Comply with Section 26 27 26.
14. 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. Cooper Crouse-Hinds, a division of Eaton Corporation.
    b. Hubbell Incorporated; RACO Products.
    c. Thomas & Betts Corporation.
    d. Approved Equal.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 12, painted steel.
    b. Outdoor Locations: Type 4X, stainless steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
5. 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. Cooper B-Line, a division of Eaton Corporation.
    b. Hoffman, a brand of Pentair Technical Products.
    c. Hubbell Incorporated; Wiegmann Products.
    d. Approved Equal.

D. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Provide logo on cover to indicate type of service.
5. Applications:
    a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
    b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 22 load rating.
    c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
    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) Hubbell Incorporated; Quazite Products.
        2) MacLean Highline.
        3) Oldcastle Precast, Inc.
        4) Approved Equal.
    b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

G. Box Locations:

1. Locate boxes to be accessible. Provide access panels where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
4. Locate boxes so that wall plates do not span different building finishes.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
7. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.

H. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.
2. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
3. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Install firestopping to preserve fire resistance rating of partitions and other elements.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 26 05 26.

R. Identify boxes in accordance with Section 26 05 53.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 05 73 - Power System Studies.

C. Section 26 27 26 - Wiring Devices.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 - PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    a. Panelboards:
        1) Identify voltage and phase.
        2) Identify power source and circuit number. Include location when not within sight of equipment.
        3) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
        4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
    b. Transformers:
        1) Identify kVA rating.
        2) Identify voltage and phase for primary and secondary.
        3) Identify power source and circuit number. Include location when not within sight of equipment.
        4) Identify load(s) served. Include location when not within sight of equipment.

c. Enclosed switches, circuit breakers, and motor controllers:
    1) Identify voltage and phase.
    2) Identify power source and circuit number. Include location when not within sight of equipment.

2. Emergency System Equipment:
    a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
4. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.
5. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    a. At each source and load connection.
4. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
2. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:

1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

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. Brimar Industries, Inc.
    b. Kolbi Pipe Marker Co.
    c. Seton Identification Products.
    d. Approved Equal.
2. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

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. Brady Corporation.
   b. Brother International Corporation.
   c. Panduit Corp.
   d. Approved Equal.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. Equipment Designation: 1/2 inch.
5. Color:
   a. White text on black background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Control Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on white background.

2.03 WIRE AND CABLE MARKERS

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. Brady Corporation.
2. HellermannTyton.
3. Panduit Corp.
4. Approved Equal.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

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. Brady Corporation.
2. Brimar Industries, Inc.
3. Seton Identification Products.
4. Approved Equal.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

E. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

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. Brady Corporation.
2. Brimar Industries, Inc.
3. Seton Identification Products.
4. Approved Equal.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:

1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 WARNING SIGNS AND LABELS

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. Brimar Industries, Inc.
2. Clarion Safety Systems, LLC.
3. Insite Solutions, LLC.
4. Approved Equal.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:

1. Materials:
   a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
   b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   a. Do not use labels designed to be completed using handwritten text.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Elevated Equipment: Legible from the floor or working platform.
4. Interior Components: Legible from the point of access.
5. Conduits: Legible from the floor.
6. Boxes: Outside face of cover.
7. Conductors and Cables: Legible from the point of access.
8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

3.03 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 05 73

POWER SYSTEM STUDIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.

1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

1.03 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Existing Installations: Coordinate with equipment manufacturer(s) to obtain data necessary for completion of studies.
2. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Pre-Study Meeting: Conduct meeting with Owner to discuss system operating modes and conditions to be considered in studies.

C. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.
2. Do not order equipment until matching study reports and product submittals have both been evaluated by Engineer.
3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.05 SUBMITTALS

A. Study preparer's qualifications.

B. Study reports, stamped or sealed and signed by study preparer.

C. Field quality control reports.

D. Project Record Documents: Revise studies as required to reflect as-built conditions.

1. Include hard copies with operation and maintenance data submittals.
2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.06 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Perform analysis of new electrical distribution system as indicated on drawings.
    a. Include portions of electrical distribution system designated as "future."
2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
    a. Known Operating Modes:
        1) Utility as source.
        2) Generator as source.

B. General Study Requirements:

1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
    a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
        1) Obtain up-to-date information from Utility Company.
        2) Utility Company: See Section 26 21 00 for Utility Company contact information.
    b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
    c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
    d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
    e. Protective Devices:

1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

f. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
   a. Maximum utility fault currents.
   b. Maximum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:

1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.

F. Load-Flow and Voltage-Drop Study:

1. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
   a. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
   b. Determine load flow and voltage drop based on 80 percent of the design capacity of load buses.

c. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

G. Motor-Starting Study:

1. Perform a motor-starting study to analyze the transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of motor starting on the power system stability.
2. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect operation of other utilization equipment on system supplying the motor.

H. Arc Flash and Shock Risk Assessment:

1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
   a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
   a. Maximum and minimum utility fault currents.
   b. Maximum and minimum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

I. Study Reports:

1. General Requirements:
   a. Identify date of study and study preparer.
   b. Identify study methodology and software product(s) used.
   c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
   d. Identify base used for per unit values.
   e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
   f. Include conclusions and recommendations.

2. Short-Circuit Study:
    a. For each scenario, identify at each bus location:
        1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
        2) Fault point X/R ratio.
        3) Associated equipment short circuit current ratings.
    b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
    a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
    b. For each graph include (where applicable):
        1) Partial single-line diagram identifying the portion of the system illustrated.
        2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
        3) Conductors: Damage curves.
        4) Transformers: Inrush points and damage curves.
        5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
        6) Motors: Full load current, starting curves, and damage curves.
        7) Capacitors: Full load current and damage curves.
    c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
        1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
        2) Include ground fault pickup and delay.
        3) Include fuse ratings.
        4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
    d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
    a. For the worst case for each scenario, identify at each bus location:
        1) Calculated incident energy and associated working distance.
        2) Calculated arc flash boundary.
        3) Bolted fault current.
        4) Arcing fault current.
        5) Clearing time.
        6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 12 calories per sq cm.

1.07 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in PA and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

1. Products:
   a. SKM Systems Analysis, Inc.
   b. Approved Equal.

PART 2 - PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.

1. Materials: Comply with Section 26 05 53.
2. Minimum Size: 4 by 6 inches.
3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
   a. Include orange header that reads "WARNING" unless otherwise indicated.
   b. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
   c. Include the following information:
      1) Arc flash boundary.
      2) Available incident energy and corresponding working distance.
      3) Nominal system voltage.
      4) Limited approach boundary.
      5) Restricted approach boundary.
      6) Equipment identification.
      7) Study preparer, report reference, and date calculations were performed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 05 53.

3.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Adjust equipment and protective devices for compliance with studies and recommended settings.

C. Notify Engineer of any conflicts with or deviations from studies. Obtain direction before proceeding.

D. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.03 CLOSEOUT ACTIVITIES

A. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.

1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training.
3. Instructor: Representative of entity performing study.
4. Location: At project site.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

B. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

C. Maintenance Data: Include recommended maintenance procedures and intervals.

D. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.

1. Greater than 10 kVA: 104 degrees F maximum.
2. Less than 10 kVA: 77 degrees F maximum.

1.09 WARRANTY

A. Provide a one-year manufacturer's warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Eaton Corporation.
2. Schneider Electric.
3. Siemens Industry, Inc.
4. Approved Equal.
5. Source Limitations: Provide transformers produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet.
2. Ambient Temperature:
    a. Greater than 10 kVA: Not exceeding 104 degrees F.
    b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Transformers Rated 15 kVA and Larger:

1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.

D. Marked as compliant with DOE 2016 efficiency levels by an NRTL.

E. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

F. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

G. Basic Impulse Level: 10 kV.

H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

I. Isolate core and coil from enclosure using vibration-absorbing mounts.

J. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

D. Winding Taps:

1. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Sound Levels: Standard sound levels complying with NEMA ST 20

G. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.

H. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA EN 10250: As indicated on the drawings.
2. Construction: Steel.
   a. Less than 15 kVA: Totally enclosed, non-ventilated.
   b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

I. Accessories:

1. Mounting Brackets: Provide manufacturer's standard brackets.
2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA EN 10250, type 3R assembly.
3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.04 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:

1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.

L. Identify transformers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

3.04 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

C. Do not use compressed air to assist in cleaning.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Distribution panelboards.

B. Power panelboards

C. Lighting panelboards.

D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 43 00 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA PB 1 - Panelboards; 2011.

E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

F. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 67 - Panelboards; Current Edition, Including All Revisions.

K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

L. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation of listed series ratings.

C. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

B. Panelboard Warranty Period: Panelboards shall be under warranty for 18 months from the date of shipment or 12 months from the date of installation, whichever occurs first.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Schneider Electric.
2. Eaton Corporation.
3. Siemens Industry, Inc.
4. Approved Equal.

B. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:
    a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
2. Boxes: Galvanized steel unless otherwise indicated.
   a. Provide wiring gutters sized to accommodate the conductors to be installed.
3. Fronts:
   a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
   b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

M. Load centers are not acceptable.

N. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

2.03 DISTRIBUTION PANELBOARDS (DP)

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Basis of Design Products:

1. Square D; I-Line.
2. Eaton; PRL4X.
3. Siemens; P1.
4. Approved Equal.

C. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

D. Bussing:

1. Phase and Neutral Bus Material: Aluminum.
2. Ground Bus Material: Aluminum.

E. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

F. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 POWER PANELBOARDS (PP)

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Basis of Design Products:

1. Square D; NF.
2. Eaton; PRL2X.
3. Siemens; P-Series.
4. Approved Equal.

C. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

D. Bussing:

1. Phase and Neutral Bus Material: Aluminum.
2. Ground Bus Material: Aluminum.

E. Circuit Breakers:

1. Provide thermal magnetic circuit breakers unless otherwise indicated.

F. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 LIGHTING PANELBOARDS (LP)

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Basis of Design Products:

1. Square D; NQ.
2. Eaton; PRL1X.
3. Siemens; P1.
4. Approved Equal.

C. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

D. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

E. Circuit Breakers: Thermal magnetic bolt-on or plug-in type unless otherwise indicated.

F. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.06 OVERCURRENT PROTECTIVE DEVICES

A. Single Source: Obtain overcurrent protective devices from same manufacturer of panelboards.

2.07 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

1. Mount adjacent panelboards and equipment with the tops lined up.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed branch devices, components, and accessories.

J. Set field-adjustable circuit breaker tripping function settings as indicated.

K. Provide filler plates to cover unused spaces in panelboards.

L. Identify panelboards in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

C. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 33.16 - Boxes for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

D. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

B. Operation and Maintenance Data:

1. GFCI Receptacles: Include information on status indicators.

C. Project Record Documents: Record actual installed locations of wiring devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 - PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Except where explicitly permitted, substitution of combination switch-and-receptacle devices for separate switches and receptacles is not permitted.

C. Wiring Device Applications:

1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
2. Provide GFCI protection for:
   a. Receptacles installed within 6 feet of sinks.
   b. All other areas required by NFPA 70.

D. Wiring Device Finishes:

1. Provide wiring device finishes as described below, unless otherwise indicated.
2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
3. Wiring Devices Installed in Wet or Damp Locations: Gray with weatherproof cover.

E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 WALL SWITCHES

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. Hubbell Incorporated.
2. Leviton Manufacturing Company, Inc.
3. Pass & Seymour, a brand of Legrand North America, Inc.
4. Approved Equal.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 RECEPTACLES

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. Hubbell Incorporated.
2. Leviton Manufacturing Company, Inc.
3. Pass & Seymour, a brand of Legrand North America, Inc.
4. Approved Equal.

B. Receptacles - General Requirements: Heavy-duty, self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
2. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.04 CORD AND PLUG SETS

A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.

B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.05 WALL PLATES AND COVERS

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. Hubbell Incorporated.
2. Leviton Manufacturing Company, Inc.
3. Pass & Seymour, a brand of Legrand North America, Inc.
4. Approved Equal.
5. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

F. Weatherproof Switch Covers for Wet or Damp Locations: Gasketed, metallic, with externally operable actuating means and corrosion-resistant screws; listed as suitable for use in wet locations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Engineer to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

N. Identify wiring devices in accordance with Section 26 05 53.

3.04 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 28 16.13

ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of circuit breaker .

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.

C. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Schneider Electric.
2. Eaton Corporation.
3. Siemens Industry, Inc.
4. Approved Equal.
5. Source Limitations: Provide enclosed circuit breakers and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:

1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.

E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Provide thermal magnetic circuit breakers unless otherwise indicated.

H. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 4X, stainless steel.
2. Provide surface-mounted enclosures unless otherwise indicated.

J. Provide externally operable handle with means for locking in the OFF position.

K. Enclosures shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:

1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:

1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance. Tests listed as optional are not required.

C. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 28 16.16

ENCLOSED SWITCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

C. Project Record Documents: Record actual locations of enclosed switches.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Schneider Electric.
2. Eaton Corporation.
3. Siemens Industry, Inc.
4. Approved Equal.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
2. Minimum Ratings:
    a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 4X, stainless steel.
2. NEMA EN 10250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:

1. Comply with NEMA BS 31047.
2. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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DIVISION 26 - ELECTRICAL

SECTION 26 29 23

VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Variable-frequency motor controllers for low-voltage (600 V and less) AC motor applications.

B. Overcurrent protective devices for motor controllers, including overload relays.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.

E. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

F. NEMA IS 10033 - Industrial Control and Systems: Adjustable-Speed Drives; 2026.

G. NEMA IS 10034 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems; 2022 (Reapproved 2025).

H. NEMA IS 10035 - Application Guide for AC Adjustable Speed Drive Systems; 2021 (Reaffirmed 2025).

I. NEMA ICS 61800-2 - Adjustable Speed Electrical Power Drive Systems, Part 2: General Requirements-Rating Specifications for Low Voltage Adjustable Frequency AC Power Drive Systems; 2005.

J. NEMA MG 00001 - Motors and Generators; 2024.

K. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

N. UL 61800-5-1 - Standard for Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements – Electrical, Thermal, and Energy (Ed. 2); Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work to avoid placement of ductwork, piping, equipment, and other obstructions within dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate work to provide motor controllers suitable for use with motors.
3. Coordinate work to provide controllers and associated wiring suitable for interface with control devices.
4. Coordinate arrangement of electrical equipment with dimensions and clearance requirements.
5. Verify with manufacturer that conductor terminations are suitable for use with conductors.
6. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device.

B. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of controllers and adjacent equipment with required clearances indicated.
2. Include wiring diagrams showing factory and field connections.

C. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

D. Project Record Documents: Record actual installed locations of controllers and final equipment settings.

1. Include nameplate data of actual installed motors and associated overload relay selections and settings.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

1.09 WARRANTY

A. Provide minimum 18-month manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Schneider Electric.
2. Eaton Corporation.
3. Rockwell Automation, Inc.
4. Approved Equal.

2.02 VARIABLE-FREQUENCY MOTOR CONTROLLERS

A. Provide variable-frequency motor control system consisting of required controller assemblies, operator interfaces, control power transformers, instrumentation and control wiring, sensors, accessories, system programming, etc. as necessary for complete operating system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Controller Assemblies: Comply with NEMA IS 10033, NEMA IS 10034, and NEMA ICS 61800-2; list and label as complying with UL 61800-5-1 or UL 508A as applicable.

D. Provide controllers selected for actual installed motors and coupled mechanical loads in accordance with NEMA IS 10035, NEMA MG 00001 Part 30, and recommendations of manufacturers of both controller and load, where not in conflict with specified requirements; considerations include, but are not limited to:

1. Motor type (e.g., induction, reluctance, and permanent magnet); consider NEMA MG 00001 design letter or inverter duty rating for induction motors.
2. Motor load type (e.g., constant torque, variable torque, and constant horsepower); consider duty cycle, impact loads, and high inertia loads.
3. Motor nameplate data.
4. Requirements for speed control range, speed regulation, and braking.
5. Motor suitability for bypass starting method, where applicable.

E. Devices on Load Side of Controller: Suitable for application across full controller output frequency range.

F. Operating Requirements:

1. Input Voltage Tolerance: Plus/minus 10 percent of nominal.
2. Input Frequency Tolerance: Plus/minus 5 percent of nominal.
3. Efficiency: Minimum of 96 percent at full speed and load.

4. Input Displacement Power Factor: Minimum of 0.96 throughout speed and load range.
5. Overload Rating:
    a. Constant Torque Loads: Minimum of 150 percent of nominal for 60 seconds.

G. Power Conversion System: Microprocessor-based, pulse width modulation type.

H. Control System:

1. Provide microprocessor-based control system for automatic control, monitoring, and protection of motors. Include sensors, wiring, and connections necessary for functions and status/alarm indications specified.
2. Provide integral operator interface for controller programming, display of status/alarm indications, fault reset, and local control functions including motor run/stop, motor forward/reverse selection, motor speed increase/decrease, and local/remote control selection.
3. Control Functions:
    a. Control Method: Selectable vector and scalar/volts per hertz unless otherwise indicated.
        1) Scalar/Volts per Hertz Control: Provide IR compensation for improved low-speed torque.
        2) Vector Control: Provide selectable autotuning function.
    b. Adjustable acceleration and deceleration time; linear and S-curve ramps; selectable coast to stop.
    c. Selectable braking control; DC injection or flux braking.
    d. Adjustable minimum/maximum speed limits.
    e. Adjustable pulse width modulation switching carrier frequency.
    f. Adjustable motor slip compensation.
    g. Selectable autorestart after noncritical fault; programmable number of time delay between restart attempts.
4. Status Indications:
    a. Motor run/stop status.
    b. Motor forward/reverse status.
    c. Local/remote control status.
    d. Output voltage.
    e. Output current.
    f. Output frequency.
    g. DC bus voltage.
    h. Motor speed.

5. Protective Functions/Alarm Indications:
    a. Overcurrent.
    b. Motor overload.
    c. Undervoltage.
    d. Overvoltage.
    e. Controller overtemperature.
    f. Input/output phase loss.
    g. Output short circuit protection.
    h. Output ground fault protection.
6. Inputs:
    a. Refer to contract drawings.
7. Outputs:
    a. Refer to contract drawings.
8. Communications: Compatible with connected systems. Provide accessories necessary for proper interface.
    a. Ethernet Communications: Support for Modbus TCP/IP protocol.
    b. Remote Monitoring Capabilities:
        1) Motor run/stop status.
        2) Hand-off-auto status.
        3) Fault information.
        4) Discrete input/output status.
        5) Analog input/output values.
    c. Remote Control Capabilities:
        1) Motor run/stop command.
        2) Speed adjustment.
        3) Fault reset.
9. Features:
    a. Password-protected security access.
    b. Event log.

I. Power Conditioning/Filtering:

1. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering, as required, to limit total demand (harmonic current) distortion and total harmonic voltage demand at the defined point of common coupling to meet IEEE 519 recommendations.
2. Provide DC link choke or input/line reactor for each controller unless otherwise indicated or required.
3. Reactor Impedance: 5 percent, unless otherwise indicated or required.

J. Service Conditions:

1. Provide controllers and associated components suitable for operation under following service conditions without derating:
   a. Altitude: Less than 200 feet.
   b. Ambient Temperature: VFD shall be rated for 50 Deg C.
2. Provide controllers and associated components suitable for operation at indicated ratings under service conditions at installed location.

K. Short Circuit Current Rating:

1. Provide controllers with listed short circuit current rating not less than available fault current at installed location as indicated on drawings.

L. Conductor Terminations: Suitable for use with conductors to be installed.

M. Enclosures:

1. Comply with NEMA IA 10030.
2. NEMA EN 10250 Environment Type or Equivalent IEC 60529
   Rating: Unless otherwise indicated, as specified for following installation locations:
   a. Indoor Clean, Dry Locations: Type 12.
3. Finish: Manufacturer's standard unless otherwise indicated.
4. Cooling: Forced air or natural convection as determined by manufacturer.
5. Enclosure Space Heaters:
   a. Provide in each controller enclosure installed outdoors and in unconditioned indoor spaces.
   b. Size according to manufacturer's recommendations for worst case ambient temperature to prevent condensation.
   c. Heater Control: Thermostat.
   d. Heater Power Source: Provide connection to transformer factory-installed in enclosure or suitable external branch circuit as indicated or as required.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:

1. Motor Circuit Protectors:
    a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of listed combination motor controller with overload protection; ratings, configurations, and features as indicated or as required.
    b. Provide field-adjustable magnetic instantaneous trip setting.

2.04 ACCESSORIES

A. Auxiliary Contacts:

1. Comply with NEMA IA 10039.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each bypass motor starter, minimum.

B. Pilot Devices:

1. Comply with NEMA IA 10039; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, nonilluminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control Power Transformers:

1. Size to accommodate burden of contactor coil(s) and connected auxiliary devices, plus 200 VA spare capacity.
2. Include primary and secondary fuses.

D. Control Terminal Blocks: Include 25 percent spare terminals.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of controllers are consistent with indicated requirements.

C. Verify that mounting surfaces are ready to accept controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Install in accordance with NEMA IS 10034 and manufacturer's instructions.

D. Do not exceed manufacturer's recommended maximum cable length between controller and motor.

E. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Install controllers plumb and level.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable settings of controllers and associated components according to installed motor requirements, in accordance with recommendations of manufacturers of controller and load.

L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

M. Identify controllers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.17. Insulation-resistance test on control wiring listed as optional is not required.

C. Correct deficiencies and replace damaged or defective controllers or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of controllers and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.07 PROTECTION

A. Protect installed controllers from subsequent construction operations.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 43 00

SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 24 16 - Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.06 SUBMITTALS

A. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

B. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

C. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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. Schneider Electric.
2. Eaton.
3. ASCO.
4. Approved Equal.

B. Externally mounted surge protective devices:

1. Manufacturer shall match panelboard manufacturer.
2. Surge protective devices shall be mounted as close as possible to panelboard being served.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Delta Systems: L-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):

1. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

D. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS Section 7.19.1.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

B. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:

1. Provide photometric calculations where luminaires are proposed for substitution.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: One year from date of substantial completion.

PART 2 - PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

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 products scheduled on the drawings.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 EMERGENCY LIGHTING UNITS

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 products scheduled on the drawings.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

2.04 EXIT SIGNS

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 products scheduled on the drawings.

B. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.
2. Directional Arrows: As indicated or as required for installed location.

C. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

1. Self-Powered Exit Signs:
   a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.05 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames are installed where required.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Emergency Lighting Units:

I. Exit Signs:

J. Install lamps in each luminaire.

3.03 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.04 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer or authority having jurisdiction.

3.05 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

A. Warranty: Manufacturer and installer agree to repair or replace component of luminaires that fail in materials or worksmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Manufacturers: Subject to compliance with requirements, available manufacterers offering products that may be incorporated into the work include, but are not limited to, the products scheduled on the drawings.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Install lamps in each luminaire.

3.03 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.04 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

3.05 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 60 00

HEAT TRACING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes plumbing piping heat tracing for freeze prevention, domestic hot-water-temperature maintenance, and snow and ice melting on roofs and in gutters and downspouts with the following electric heating cables:

1. Plastic insulated, series resistance.
2. Self-regulating, parallel resistance.
3. Constant wattage.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.06 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

A. Basis-of-Design Product: 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. nVent – RayChem
2. Approved equal

B. Comply with IEEE 515.1.

C. Heating Element: Pair of parallel 16 AWG, nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

D. Electrical Insulating Jacket: Flame-retardant polyolefin.

E. Cable Cover: Tinned-copper and polyolefin outer jacket with ultraviolet inhibitor.

F. Maximum Operating Temperature (Power On): 150 deg F.

G. Maximum Exposure Temperature (Power Off): 185 deg F.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Capacities and Characteristics:

1. Maximum Heat Output: 5 W/ft.

2. Electrical Characteristics for Single-Circuit Connection:

    a. Volts: 120.
    b. Phase: Single-phase.
    c. Full-Load Amperes: 16.
    d. Maximum Overcurrent Protection: 20 ampere. EPD circuit breaker 30 mA trip required for all heat tracing circuits.

2.02 CONTROLS

A. Wall-Mounted Thermostats for Freeze Protection (Non-Hazardous Location):

1. Model: nVent AMC-1A.
2. Side mounted fixed fluid-filled bulb and capillary.
3. Adjustable temperature range from 15 to 140 deg F.
4. Enclosure: Type 4X, polyurethane-coated cast-aluminum housing, stainless-steel hardware.
5. Switch: SPDT.
6. Electrical rating: 22 Amps.
7. Provide required stainless steel mounting hardware, conduit fittings, and fasteners.

B. Wall-Mounted Thermostats for Freese Protection (Hazardous Location):

1. Model: AMC-1H.
2. Side mounted fixed fluid-filled bulb and capillary.
3. Adjustable temperature range from 17 to 140 deg F.
4. Enclosure: Class I, Division 2, exterior location.
5. Switch: SPDT.
6. Electrical rating: 22 Amps.
7. Provide required stainless steel mounting hardware, conduit fittings, and fasteners.

2.03 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

B. Power Connection with Junction Box: Glass fiber reinforced polymer suitable for non-hazardous and hazardous locations. Applicable for industrial parallel heating cables. Include pipe mounting stand, piping strapping, and core sealing boot.

C. End Seal Kit with indicator: Glass-filled polymer, rated for hazardous location, and above-insulation indicator.

D. Retain “Warning Labels” or “Warning Tape” Paragraph below.

E. Warning Labels: Refer to Section 16075 "Electrical Identification."

F. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Install the following types of electric heating cable for the applications described:

1. Wastewater process piping.

3.03 INSTALLATION

A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.

B. Electric Heating-Cable Installation for Freeze Protection for Piping:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install electric heating cables according to IEEE 515.1.
3. Install warning tape on piping insulation where piping is equipped with electric heating cables.

3.04 CONNECTIONS

A. Ground equipment according to Section 16060 "Grounding and Bonding."

B. Connect wiring according to Section 16120 "Conductors and Cables."

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test cables for electrical continuity and insulation integrity before energizing.
2. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

C. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.

D. Cables will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.06 PROTECTION

A. Protect installed heating cables, including nonheating leads, from damage during construction.

B. Remove and replace damaged heat-tracing cables.

END OF SECTION

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DIVISION 31 – EARTHWORK

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall remove existing trees, debris, and vegetation as necessary for construction of new work. The Contractor shall remove and relocate existing trees as designated on plans and as directed by the Engineer and Owner.

B. Clearing and grubbing shall consist of clearing, grubbing, removing and disposing of all vegetation and debris as designated on the drawings and as necessary for construction of new work. This work shall also include the preservation from injury of defacement of all vegetation, trees, and objects designated to remain.

C. Removing paving, improvements, or other obstructions which will interfere with new construction.

D. The Contractor shall strip site of topsoil and organic matter to a minimum depth of six (6) inches where affected by grading for buildings, paved areas, and where indicated. Stockpile topsoil where indicated.

1.02 QUALITY ASSURANCE

A. Codes, Standards: Perform work in compliance with applicable requirements of governing agencies having jurisdiction.

PART 2 - PRODUCTS

2.01 REMOVALS

A. The Contractor shall perform the work of clearing and grubbing so as to remove only material herein specified and, if he chooses to do such work with mechanical equipment and removes suitable material required on the project, and suitable material removed with the cleared and grubbed material shall be replaced by the Contractor at his own expense. All materials removed by the clearing and grubbing operation shall be removed from the project or otherwise disposed of as specified or directed by the Engineer.

B. The Engineer shall designate any vegetation which is not to be removed, and the Contractor shall protect them from any damage. If any such vegetation is damaged, they shall be replaced or repaired at the Contractor's expense.

C. All tree, debris, vegetation, or other material to be removed shall become the property of the Contractor and all materials removed in accordance with these requirements shall be salvaged or disposed of out of sight. Any burning shall be done within the requirements of State or local laws or regulations and be under complete control at all times.

PART 3 – EXECUTION

Not used.

END OF SECTION

DIVISION 31 - EARTHWORK

SECTION 31 22 00

GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work under this section shall include the supply of all labor, equipment, and materials necessary to perform the excavation and grading necessary for roadways and their appurtenances to the lines and grades indicated on the Contract Drawings.

B. Related Work Specified Elsewhere:

1. Section 31 22 13: Site Preparation and Rough Grading
2. Section 32 12 16: Hot Mix Asphalt Paving

C. Definitions: Subgrade: The prepared earth surfaces on or over which additional materials will be placed or work is to be performed.

D. The Subcontractor will be required to maintain the existing roadway which is to be used as his construction entrance to the treatment plant.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Association of State Highway and Transportation Officials:
   a. AASHTO T 180, Moisture-Density Relations of Soils, Using a 10-lb. Rammer and an 18-in. Drop.
   b. AASHTO T 147, Field Determination of Density of Soil In-Place.
2. American Society for Testing and Materials:
   a. ASTM D 1557, Moisture-Density Relations of Soils Using 10-lb. Rammer and 18-in. Drop.
   b. ASTM D 2167, Density of Soil in Place by the Rubber-Balloon Method.
   c. ASTM D 1556, Density of Soil in Place by the Sand Cone Method.
   d. ASTM D 2922-71, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.03 JOB CONDITIONS

A. As specified under Section 31 22 13 – SITE PREPARATION AND ROUGH GRADING.

B. Excess Materials: No right of property in materials is granted the Contractor for excess on-site materials prior to completion of site work. This provision does not relieve the Subcontractor of his responsibility to remove and dispose of surplus excavated materials. Materials unsuitable for subgrade and not suitable for other uses on-site shall become the property of the Contractor and shall be disposed of legally off-site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. As specified previously under Section 31 22 13 – SITE PREPARATION AND ROUGH GRADING.

B. Environmental Requirements: Do not perform excavation, backfill and compaction when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present on the soil or occurring during the Work.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. Roadway Excavation: Excavate or otherwise remove and satisfactorily dispose of materials located within the limits indicated on the Drawings for roadways.

B. Roadway Grading: Shape subgrade of roadways and intersections to no more than 0.10 foot above or below the elevations indicated on the Drawings.

C. Compaction: Compact subgrade material to a minimum final density of not less than 95% of the maximum dry weight density at its optimum moisture content. Perform finish rolling on roadway subgrade just prior to installation of aggregate base course.

3.02 FIELD QUALITY CONTROL

A. Surface Tolerance: Check finished subgrade surface for smoothness and elevation in accordance with the following:

1. Use an approved template shaped to conform to the design requirement indicated on the Drawings for checking crown and contour of roadways.

2. Use an approved ten foot straightedge to check for longitudinal irregularities in the subgrade.
3. Use string lines for controlling the finished elevation of roadway subgrade. Maintain such lines until surface irregularities have been satisfactorily corrected.

B. Corrections: Correct surface irregularities exceeding previously specified limits to the Engineer's satisfaction either by removing or adding material as required, followed by rolling until satisfactorily compacted.

END OF SECTION

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DIVISION 31 - EARTHWORK

SECTION 31 22 13

SITE PREPARATION AND ROUGH GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Includes the furnishing and use of equipment and labor required for clearing and grubbing, topsoil stripping, and rough grading.

B. Related Work Specified Elsewhere:

1. Section 31 10 00 - Site Clearing
2. Section 31 22 00 - Grading
3. Section 31 23 16 - Structural Excavation, Backfill and Compaction
3. Section 31 23 18 - Utility Excavation, Backfill, and Compaction
4. Section 31 25 00 - Erosion and Sediment Control

1.02 QUALITY ASSURANCE

A. Tests and Inspections:

1. Tests and inspections will be performed by an independent testing agency employed by the Owner. Work of the testing agency includes but is not limited to:
   a. Verification of subgrade suitability prior to fill placement.
   b. Monitor fill placement and compaction operations.
   c. Prior approval of material used as fill and backfill.
   d. Verification of compaction by in-place density tests.
2. Contractor shall provide access for and shall assist testing agency in acquisition of samples and performance of tests involving equipment outside the normal equipment used by the testing agency. Such assistance provided by the Contractor shall be accomplished at no cost to the Owner.

B. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

C. Reference Standards:

1. American Association of State Highways and Transportation Officials:
   a. AASHTO T 180, Moisture-Density Relations of Soils, using a 10-lb.

Rammer and an 18-in. Drop

b. AASHTO T 191, Field Determination of Density of Soil in Place.

2. American Society for Testing and Materials: ASTM D 2167, Density of Soil in Place by the Rubber-Balloon Method.

1.03 JOB CONDITIONS

A. Environmental Requirements:

1. Do not perform grading when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present on the soil or occurring during the work.
2. Exercise the necessary means and methods to control dust on the site as well as in the off-site work areas where excavation and grading are required.
3. Do not leave the site in a dusting condition following the work of this Section. If necessary, employ a watering schedule to control the dust.
4. Do not use frozen material in performing the work or place materials on frozen surfaces.
5. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling at no expense to the Owner, County or State.
6. Plan work so as to provide adequate protection during storms with provisions available at all times for preventing flood damage.

B. Protection:

1. Assume all risks attending the presence or proximity of overhead or underground utilities, pipes and conduits.
2. Complete responsibility for replacement and restitution work of whatever nature to the above, as damaged or destroyed by work of this Contract, rests solely with the Contractor and at no expense to the Owner.

C. Excess Materials: No right of property in materials is granted the Contractor of excess on-site materials prior to completion of site work. This provision does not relieve the Contractor of his responsibility to remove and dispose of surplus excavated materials. Unsuitable material such as sod, stumps and spongy soil as well as excess hard consolidated materials shall also become the property of the Contractor and shall be disposed of legally off-site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fill Material: On-site excavated soil materials free of topsoil, plant life, lumber, metal, refuse and rock. Borrow hauled to the job site shall be approved by the Engineer prior to hauling to the site and shall meet the requirements set forth for on-site fill material.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing and Grubbing: Grub and clear surface and remove surface materials of whatever nature over pipe trenches, structure sites and areas to be graded, paved or repaved.

B. Salvaged Topsoil: Within the areas indicated for grading, strip turf and topsoil to the depth of suitable topsoil material and stockpile for subsequent topsoiling operations.

C. Stockpiling: Place topsoil storage piles within the limits of the project, and at locations not interfering with the prosecution of work.

D. Proofrolling: After grubbing and stripping is accomplished throughout, exposed subgrade in areas to receive fill or where structures or pavement will be located at grade shall be proofrolled with vibratory roller to provide surficial densification and to locate any near surface pockets of soft or loose soils. Unsuitable materials so exposed shall be suitably densified or otherwise removed and refilled as directed by the Engineer.

3.02 PERFORMANCE

A. Rough Grading: Cut and fill to within 0.2 foot of the correct subgrade elevations. Set elevation of top of subgrade under paved areas to bottom of the pavement base. Set elevation of the top of subgrade under areas to receive topsoil, 4 inches below finished grades.

B. Fill:

1. Fill material shall be placed and spread in uniform, near horizontal layers, not exceeding 8 inches in thickness, prior to compaction. Each layer shall be thoroughly tamped or rolled by means of approved compaction equipment.
2. The Contractor shall add sufficient water during tamping and rolling to assure complete consolidation of fill material. If material is too wet for

satisfactory compaction, it shall be allowed to dry as required, prior to compaction. In general, moisture content should be maintained within 2 percent of optimum value depending on soil type and required compaction.

3. If sufficient fill material is not available from excavation, additional borrow material shall be imported. Borrow material shall be sand, gravel, silty sand or combination thereof. Borrow material shall be free of topsoil, plant life, lumber, metal, refuse and rock or similar hard objects. Such imported fill shall be of consistent type and quality, as approved by Engineer.

C. Compaction:

1. Fill materials in structural and pavement areas shall be compacted to a minimum dry density of 95 percent of the maximum dry weight density as determined by the Modified Proctor Test, ASTM D1557 or AASHTO T-180, Method A. Structural and pavement subgrade in cut areas shall be densified to the same degree of compaction. Fill material in landscape or other non-structural areas shall be compacted to a minimum dry density of 90 percent of optimum.
2. Compaction shall be accomplished with approved equipment. The equipment shall make sufficient passes to ensure that the required density has been uniformly obtained.
3. Each layer of fill shall be inspected, tested and approved by testing agency prior to placement and compaction of next lift.

D. Excavation of ditches and swales shall include shaping and finishing of earth bottom and slopes to the line and grade indicated. Care shall be taken not to over-excavate. Excessive ditch and swale excavation shall be backfilled with suitable material at no cost to the Owner. In no case shall excavated material be placed within 3 feet of top of bank. Excavation shall be maintained free from detrimental quantities of leaves, brush, sticks, trash and other debris until final acceptance.

END OF SECTION

DIVISION 31 - EARTHWORK

SECTION 31 22 19

FINISH GRADING AND LANDSCAPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Includes spreading of topsoil, fertilizing, sodding, seeding, shrubs, ground cover, planting and maintenance.

B. Related Work Specified Elsewhere:

1. Section 31 22 13: Site Preparation and Rough Grading

1.02 QUALITY ASSURANCE

A. Source Quality Control: Packaged Products shall indicate the manufacturer's guaranteed analysis on each package and arrive onsite as originally packaged and unopened.

B. Referenced Standards:

1. American Society for Testing and Materials, ASTM C 602, Agricultural Liming Materials.
2. American Association of State Highways and Transportation Officials, AASHTO Emulsified Asphalt.
3. American Standard for Nursery Stock: ASNI Z60.1.

1.03 SUBMITTALS

A. Test Reports: Submit laboratory test reports of the soil analysis and supplement recommendations to the Engineer for approval prior to adding any soil supplements to the topsoil.

1. Laboratory reports shall recommend both grade and application rates of fertilizer and such other soil supplements as required.
2. Take sufficient quantity of topsoil samples to give a representative analysis of on-site topsoil and topsoil from outside sources, if any.

B. Soil Supplement Product Certification: Submit certificates certifying such products to have a guaranteed analysis in conformity with the Engineer approved laboratory soil supplement recommendations report.

C. Seed Certification: Submit certificates or certifying tags indicating lawn seed mixture, seed purity percentage, seed germination percentage and weed seed content percentage to certify conformity with the Specifications.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver packaged products to the site in unopened containers with labels intact and legible.

B. Store packaged products in such a manner to prevent moisture damage and other forms of contamination.

1.05 JOB CONDITIONS

A. Environmental Requirements: Do not perform work of this section when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present or occurring during the work.

B. Seeding Dates: The following dates shall govern except when environmental conditions warrant, the Engineer may extend the seeding dates.

1. Spring: 3/1 to 5/15.
2. Fall: 8/15 to 11/15.

C. Existing Conditions: Following performance of related construction and prior to Finish Grading do such debris removal and site leveling as necessary in preparation for Finish Grading. Dispose of such debris legally off-site.

D. Dust Control: Exercise the necessary means and methods to control dust on the site as well as in the off-site work areas where Topsoiling and Finish Grading are required.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Use salvaged material from rough grading as specified previously in Section 31 22 13 - SITE PREPARATION AND ROUGH GRADING.

B. Borrow Topsoil: Use productive topsoils from Subcontractor's source and of a quality meeting the requirements specified above for topsoil.

C. Water: Water for use may be obtained from Owner, without charge.

D. Stakes and Guys: Hardwood, pointed.

2.02 SOIL SUPPLEMENT MATERIALS

A. Agricultural Liming Materials: Products containing calcium and magnesium compounds capable of neutralizing soil acidity and containing not less than 80% of total carbonates. Use liming materials meeting requirements of ASTM Designation C602 and conforming to applicable state liming material regulations.

B. Manure: Well rotted cow manure not less than six (6) months old, not more than two (2) years old, free from sawdust, shavings, or refuse of any kind, containing roughly twenty-five (25) percent of straw or other bedding material. Approved dehydrated manure (Farmanure, Bovung, or equal) may be used instead of raw manure at the Subcontractor's option. If so used, proportion 250 pounds of dehydrated material for each cubic yard of raw manure.

C. Peat Moss: Reasonably free from wood substances.

D. Commercial Fertilizer: See Erosion & Sediment Control Notes Plan Sheet. Free flowing and delivered in unopened containers.

E. Planting Soil: Mixture of 2 parts peat moss, 1 part manure and 10 parts of topsoil.

2.03 LAWN AND SEED MATERIALS

A. Grass Seed: See Erosion & Sediment Control Notes Plan Sheet. Deliver seed in standard containers showing weight, analysis and vendor's name. Provide seed mixed and supplied by an established seed house, certified as to proper purity and germination, and at least 96 percent weed free.

B. Lawn Mulch: Straw Stalks of any threshed grain or tall hay grass stalks free from seed bearing stalks or roots harmful to lawn growth. Mulch material containing noxious weeds, decomposed material or brittle weed material is not acceptable.

C. Mulch Binder: Emulsified asphalt conforming to the requirements of AASHTO Grade RS-1 and which does not contain solvents or other diluting agents toxic to plant life.

2.04 PLANTING MATERIALS

A. Plants: Sound, healthy, vigorous, free from plant diseases, insect pests or their eggs and with healthy normal tops and root systems. They shall be nursery growth stock, freshly dug and grown in the same climatic condition, or from colder zone, than the project location for at least two (2) years prior to date of contract award. Plants cut back from larger grades do not meet requirements of this specification and will not be acceptable.

B. Mulch: Pine bark nuggets.

C. Stakes and Guys: Hardwood, pointed.

D. Hose: New and Used, 1/2 inch in diameter.

E. Guying Wire: Pliable galvanized steel wire with galvanized turnbuckle.

F. Wrapping: Tree wrap tape 4 inches wide designed to prevent bore damage and winter freezing.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare subsoil surface for finish grading by dressing and shaping to provide for the uniform placement of topsoil.

B. Prepare subsoil surface for topsoiling by loosening to a depth of 3 inches and dressing and shaping to provide for the uniform placement of topsoil.

C. Remove surface rock or other foreign objects exceeding 3 inches in greatest dimension. Dispose of such rock and debris in a lawful manner off site.

3.02 PERFORMANCE

A. Placement: Place topsoil over disturbed areas. However, before topsoil placement, construction work in topsoiled areas shall have been completed. Observe precautions as follows:

1. Do not place topsoil over areas indicated to receive paving or walkways.

2. Do not work topsoil while frozen or wet. Do not work topsoil in a dusting condition but moisten same to prevent a dust nuisance.
3. Scarify subsoil to a depth of 2 inches for bonding topsoil with subsoil.
4. On sloped areas, work topsoil into subsoil to blend so as to eliminate any semblance of slip-planing between the two soils; but leave a sufficient cover of topsoil to insure seed germination. Perform such blending of soils by ridging or serrating the subsoil on the slopes.
5. Place topsoil as needed for dressing-up minor depressions due to settling and erosion and to eliminate any other minor irregularities.

B. Finished Elevations and Lines: Grade topsoiled areas of the site to within a tolerance of plus one-tenth of a foot of existing elevations.

1. Grade a uniform longitudinal fall in swales and other surface drainage areas to provide a drainage flow line that can easily be maintained and traversed with normal lawn maintenance equipment.
2. Establish finish grade of topsoil 1/2 to 3/4 inch below top of abutting walks or paving to provide positive drainage of same.
3. Leave finish grade surfaces free of objectionable material, such as lumber, metal, refuse, stone, concrete, paving material, etc. Dispose of such objectionable material in a legal disposal area off site.

C. Compaction: Compact finish grades as the final operation using a light roller weighing not over 120 pounds per foot-width of roller.

D. Tillage: Till finish graded soil over areas indicated for lawn regardless of type of lawn work performed. Use equipment and methods common to such work, and till soil to a two inch depth minimum.

E. Soil Supplement Addition: The soil supplements for lawn areas, as required according to the Engineer approved laboratory test reports may be incorporated into the soil during tillage operations. Assume a minimum of 10 pounds of fertilizer per 1,000 square feet of 10-20-20 fertilizer.

F. Seeding: Sow seed mixtures when air current is low and not more than five days after soil supplements have been applied. Sow seeds in two applications using either mechanical power seeders or mechanical hand seeders. Sow one-half of the seed mixture in one direction over designated areas and the remainder at right angles to the first sowing. Seeding rates as follows:

1. Grass seed mixture: See Erosion & Sediment Control Notes Plan Sheet.

G. Seed Cover: Imbed seed mixtures into topsoil 1/4 inch to 1/2 inch using a light drag or rake and moving in directions parallel to the contour lines. Immediately after dragging or raking, compact seeded areas using a cultipacker or similar design lawn roller, weighing 60 to 90 pounds per linear foot of roller, and roll at right angles to existing slopes.

H. Lawn Mulching: Evenly apply mulch over seeded areas not more than 48 hours after seeding. Start mulching at windward side of relatively flat areas, or at the upper part of slopes. Spread mulch in a total coverage at a depth not less than 1-1/2 inches or more than 3 inches. Mulch shall be applied at a rate of 70 to 90 pounds per 1,000 square feet.

I. Mulch Binding: Immediately following mulch spreading, apply mulch binder to anchor mulch to the soil. The number of passes over the mulch as needed to secure it firmly shall not exceed three passes with maximum applied binder not exceeding 10.0 gallons per 1,000 square feet.

3.03 PLANTING PROCEDURES

A. Plant evergreen material any time ground is suitable between October 15 and April 15, deciduous material between October 15 and April 1.

B. Plant locations to be approved before excavation is started.

C. Following approval of location, completely excavate pits and beds in accord with following:

1. Dig shrub pits circular, with vertical sides, at least 16 inches larger than maximum spread of roots and at least 4 inches below roots of plants as placed.
2. Pits for plants delivered in cans. A minimum of twenty-four (24) inches in diameter and eighteen (18) inches deep, with vertical sides. Remove can before planting.

D. Set plants plumb, in locations shown on drawings and at such level that after settlement, normal or natural relationship of crown on plant with adjacent ground surface is established.

3.04 MAINTENANCE AND GUARANTEE

A. Seeded Areas: Keep seed moist continually for proper germination and water thereafter as necessary to prevent drying out or burning. Reseed areas not showing a prompt catch of grass, correct depressions and irregularities and reseed; repeat until a complete coverage is obtained. Subcontractor shall take all necessary steps to eliminate weed growth in seeded areas.

B. Maintenance period extends from start of planting operations and runs continuously through growing season following initial acceptance of planting. Upon satisfactory completion of final plant replacement, maintenance period shall terminate.

C. During maintenance period, or approximately the 1st and 15th of every month, the Subcontractor shall provide sufficient supervision of equipment, materials and manpower to:

1. Keep plants in a healthy growing condition by watering when necessary, removing dead or drying branches, removing sprouts, tightening, repairing or replacing guys and wrapping, and maintaining a two (2) inch depth of mulch during maintenance period.
2. Remove dead or damaged plant materials, weed plant beds and plant pits.

D. Remove and replace plants in an impaired, dead, or dying condition following end of first growing season. Replacement materials and methods shall be identical to original. Growing season is defined as beginning March 1st and ending November 15th.

END OF SECTION

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DIVISION 31 – EARTHWORK

SECTION 31 23 16

STRUCTURAL EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall excavate, sheet, shore, dewater, backfill and compact all structural excavations necessary for constructing the work under this Contract. The Contractor shall furnish all labor, materials and equipment necessary for completion of the work, all in accordance with these specifications.

B. Related Work Specified Elsewhere:

1. Section 02 30 00 - Subsurface Exploration.
2. Section 31 23 19 - Dewatering.
3. Section 31 25 00 - Erosion and Sediment Control.
4. Section 31 40 00 - Sheeting, Shoring and/or Bracing.

C. Definitions:

1. Excavation: Materials of any kind in the excavation.
2. Excavation Below Subgrade: Same as "Excavation" except such excavation is performed below elevations given as subgrade.
3. Subgrade: Subgrade under footings, foundations or slabs shall be as indicated on the Contract Drawings. Where no subgrade is shown, it shall be considered as the planned bottom of footings, foundations or slabs or gravel bedding shown on the Drawings.

1.02 QUALITY ASSURANCE

A. Tests and Inspections:

1. The Engineer may, at his discretion, direct that Proctor and field density testing be done to determine the degree of compaction.
2. Tests and inspections will be performed by an independent testing agency employed by the Contractor. Work of the testing agency includes but is not limited to:
   a. Inspection of foundation excavations and verification of subgrade suitability.
   b. Prior approval of material used as fill and backfill.

c. Verification of compaction by in-place density tests.

3. Contractor shall provide access for and shall assist testing agency in acquisition of samples and performance of tests involving equipment outside the normal equipment used by the testing agency. Such assistance provided by the Contractor shall be accomplished at no cost to the Owner.
4. Whenever test results indicate compaction densities less than specified, subsequent re-testing occasioned by the initial non-compliance shall be performed by the same testing agency and all costs thereof shall be borne by the Contractor.

B. Reference Standards:

1. American Association of State Highways and Transportation Officials (AASHTO):
   a. T 180: Method A: Moisture-Density Relationship; Modified Proctor Test.
   b. T 191: Density By Sand Cone.
   c. T 224: Coarse Particle Correction.
   d. T 238: Density By Nuclear Methods.
   e. T 239: Moisture Content by Nuclear Methods.
   f. T 272, Method C: Moisture-Density Family of Curves.

1.03 SUBMITTALS

A. Samples: Submit aggregate samples to the Engineer.

B. Submit sources of supply for approval by Engineer.

1.04 JOB CONDITIONS

A. Environmental Requirements:

1. Do not perform excavating, backfilling or compacting when weather condition or materials are such that, in the opinion of the Engineer, work cannot be performed satisfactorily.
2. Do not use frozen materials as backfill nor wet materials containing moisture in excess of the amount necessary for satisfactory compaction.
3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
4. Prior to use, dry wet backfill material to a sufficient moisture to obtain satisfactory placement or compaction.
5. Accommodation of Drainage: Keep sewers, drains and ditches open for surface drainage. No damming or ponding of water in gutters or other waterways will be permitted. Do not direct flow of water across or over pavements except through approved pipes or properly constructed troughs. Provide pipes or troughs of such sizes and lengths as may be required.

Control grading in the vicinity of excavations so the ground surface is properly pitched to prevent water running into excavated areas. Plan work so as to provide adequate protection during storms with provisions available at all time for preventing flood damage. Protect installed piping and other work at all times against damage from uplift due to high ground water levels.

6. Pumping: Dewatering shall be accomplished in accordance with Section 31 23 19 - DEWATERING.
7. Control groundwater and surface water during construction in order to maintain soil stability. Maintain the water table elevation sufficiently below the levels of excavation so that slopes will remain stable and bottoms of excavations will not become loosened by flow of water. If the foundation material loses its strength due to improper dewatering techniques, over excavate the material and replace it with Special Backfill at the Contractor's expense.

B. Protection:

1. The Contractor shall, at his own expense, sustain in their places, and protect from direct or indirect injury, all pipes, walls, buildings, and other structures or property in the vicinity of his work, whether above or below ground, or that may appear in the excavation. He shall at all times have a sufficient quantity of timber and plank, chains, ropes, and other material and equipment, on the ground and shall use them as necessary for sheeting his excavations and for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened, or weakened.
   a. Perform sheeting and shoring in accordance with Section 31 40 00 - SHEETING, SHORING AND/OR BRACING.
2. The Contractor shall take all risks attending the presence or proximity of pipes, poles, wires, walls, buildings, and other structures and property, of every kind and description, in or over his excavation, or in the vicinity of his work, whether above or below the surface of the ground; and he alone shall be responsible for all damages and assure all expense for direct or indirect injury, caused by his work, to any of them, whether such structures are or are not indicated on the Contract Drawings.
3. The Engineer reserves the right under such conditions to stop the excavation or any other part of the work, and to require the Contractor to complete the structure and the backfilling up to such a point as the Engineer, without assuming responsibility for safety to persons or property may require before proceeding further with the excavation; and the Contractor shall not thereby become entitled to demand or to receive any allowance or compensation, other than an extension of the contract time for as many days as the Engineer may determine that the work was delayed by such stoppage.

C. Responsibility for Condition of Excavation: The Contractor shall solely be responsible for the condition and results of excavations made by him. Slides and cave-ins shall be removed without extra compensation at whatever time and under whatever circumstances they may occur.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: No right of property in materials is granted the Contractor of excavated materials. This provision does not relieve the Contractor of his responsibility to remove and dispose of surplus excavated material.

B. Gravel/Stone Bedding: Stone or gravel in accordance with the Maryland State Highway Administration Standards.

C. Structural Backfill: Suitable soil free of topsoil, plant life, lumber, metal refuse and rock or similar hard objects.

D. Special Backfill: All requirements contained above for Structural Backfill shall apply to Special Backfill.

PART 3 - EXECUTION

3.01 PREPARATION

A. Subgrade Preparation: Areas on which bedding layers are to be placed shall be trimmed and dressed to conform to cross sections shown on the Drawings, within an allowable tolerance of +1 inch from the theoretical slope lines and grades. Where such areas are below the allowable minus tolerance limit, they shall be brought to grade by filling with earth similar to the adjacent material and well compacted or by filling with well compacted bedding material. No additional payment will be made for any material thus required. No bedding shall be placed upon a frozen surface; no snow, ice, or any frozen material shall be incorporated in the bedding. The prepared base shall be inspected immediately prior to placing the bedding, and no material shall be placed thereon until that area has been approved.

3.02 PERFORMANCE

A. Excavation:

1. General:
    a. Perform excavation using machinery, except that hand excavation may be required where necessary to protect existing structures or buried utilities. No additional compensation will be paid for hand excavation instead of machine excavation as may be necessary from any cause whatsoever.
    b. Perform excavation of every description and of whatever substances encountered to the lines and grades or depths indicated by the Drawings and as specified herein.
    c. Where work space is limited, remove excavated material from the limited area and replace the material after the structure has been installed. No additional compensation will be made for such removal and replacement.
2. Excavation Below Subgrade:
    a. Do not excavate below depths indicated on the Drawings or such depths as required by the Engineer.
    b. Excavation below depths indicated on the Drawings, through the fault of the Contractor, shall be restored to the indicated or required depths with special backfill at the expense of the Contractor.

B. Backfilling:

1. General
    a. Perform backfilling using machinery, except that hand backfilling may be required where necessary to prevent displacing walls, foundations or buried utilities or damage to such. No additional compensation will be paid where backfilling by hand is required.
    b. After completion of footings and walls and the removal of forms and prior to backfilling, clean excavation free of trash and debris.
2. Gravel Bedding: Where gravel bedding is indicated on the Contract Drawings to be used as a subbase under slabs, footings or foundations, spread backfill uniformly without segregation of coarse and fine material. Thoroughly compact material to the satisfaction of the Engineer with a vibrator compactor. Where more than six inches of aggregate is required, place aggregate in six (6) inch layers and thoroughly compact each layer with a vibratory compactor to the satisfaction of the Engineer.
3. Structural Backfill: Includes all other areas requiring backfill.
    a. Place backfill in horizontal layers not exceeding eight (8) inches in depth, moistened if required and compact by hand or mechanical tampers to a density of not less than 95 percent of the maximum dry weight density, in accordance with the testing procedures of Modified Proctor Test AASHTO T-180, Method "A".

b. No fill or other load shall be placed on or against concrete surfaces before expiration of the minimum period after placing the concrete, as indicated below, unless otherwise specified.

(1) Walls and vertical faces 14 days

(2) Horizontal footings 14 days

(3) After the minimum period specified above has elapsed, fill operations may be initiated. Within 3 feet (measured horizontally) of walls and vertical or near-vertical faces and within 5 feet (measured vertically) of horizontal footings, no hauling equipment will be permitted, and all compaction shall be by approved power tampers. Any damage to structures caused by the Contractor's equipment shall be repaired to the satisfaction of the Engineer without cost to the Owner.

C. Cleanup: Excess excavated material that cannot be used at the project site shall be removed and disposed of off the site in a legal manner at no additional expense to the Owner.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 31 23 18

UTILITY EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work shall consist of all excavation necessary to open the pipe or conduit trench, lay the pipe or conduit, and backfill and compact to the existing or proposed grade as required by the Contract Drawings.

B. Related Work Specified Elsewhere:

1. Section 02 30 00 - Subsurface Exploration.
2. Section 31 23 19 - Dewatering.
3. Section 31 25 00 - Erosion and Sediment Control.
4. Section 31 40 00 - Sheeting, Shoring and/or Bracing.

C. Definitions:

1. All excavation for this Contract is unclassified. Items involved in the excavation such as grassed areas and sidewalks, of whatever material will be considered as unclassified excavation, and no extra payment will be made for removal.
2. Excavation: Removal of materials of any kind in the excavation.
3. Excavation Below Subgrade: Same as excavation except such excavation is performed below elevations given as subgrade.
4. Subgrade: Trench bottom prepared as specified to receive gravel bedding, concrete cradle or concrete encasement or the bottom of excavations prepared to receive pipe line structures.

1.02 QUALITY ASSURANCE

A. Tests and Inspections:

1. The Engineer may, at his discretion, direct that Proctor and field density testing be done to determine the degree of compaction.
2. Tests and inspections will be performed by an independent testing agency selected and paid by the Contractor. Work of the testing agency includes but is not limited to:
   a. Prior approval of material used as fill and backfill.

b. Verification of compaction by in-place density tests.
c. Contractor shall provide access for and shall assist testing agency in acquisition of samples and performance of tests.

2. Contractor shall provide access for and shall assist testing agency in acquisition of samples and performance of tests.
3. Whenever test results indicate compaction densities less than specified, the Contractor shall correct the installation and retest until satisfactory results are achieved. All costs thereof shall be borne by the Contractor.

B. Reference Standards:

1. American Association of State Highway and Transportation Officials (AASHTO):
   a. T 180, Method A: Moisture-Density Relationship; Modified Proctor Test.
   b. T 191: Density By Sand Cone.
   c. T 224: Coarse Particle Correction.
   d. T 238: Density By Nuclear Methods.
   e. T 239: Moisture Content By Nuclear Methods.
   f. T 272: Method C: Moisture-Density Family of Curves.

1.03 SUBMITTALS

A. Samples: Submit aggregate samples to the Engineer.

B. Submit sources of supply for approval by the Engineer.

1.04 JOB CONDITIONS

A. Environmental Requirements:

1. Do not perform trenching, backfilling or compacting when weather conditions or the condition of materials are such, in the opinion of the Engineer, that work cannot be performed satisfactorily.
2. Do not use frozen materials as backfill nor wet materials containing moisture in excess of the amount necessary for satisfactory compaction.
3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
4. Prior to use, dry wet backfill material to a sufficient moisture to obtain satisfactory placement or compaction.
5. Plan work so as to provide adequate protection during storms with provisions available at all time for preventing flood damage. Protect installed piping and other work at all times against damage from uplift due to high ground water levels.
6. Accommodation of Drainage: Keep gutters, sewers, drains and ditches open at all times for surface drainage. No damming or ponding or water in

gutters or other waterways will be permitted. Do not direct water flows across or over pavements except through approved pipes or properly constructed troughs. When so required, provide pipes or troughs of such sizes and lengths as may be required, and place the same as required at no expense to the Owner. Perform grading in the vicinity of trenches so that the ground surface is properly pitched to prevent water running into the trenches.

7. Pumping: Dewatering shall be accomplished in accordance with Section 31 23 19 - DEWATERING.

B. Removal of Obstructions:

1. Except for items specifically noted to be removed or relocated, if the position of any pipe, conduit, pole, or other structure above or below ground be such as in the opinion of the Engineer to require its removal, realignment, or change due to work to be done under the Contract, the work of removal, realignment, or change will be done as extra work unless noted as a part of a lump sum item, or will be done by the Owner of the obstructions without cost to the Contractor; but the Contractor shall uncover and support such structures at his own expense before such removal, and before and after such realignment or change as a part of the contract; and the Contractor shall not be entitled to any claim for damage or extra compensation on account of the presence of said structure or on account of any delay in the removal or rearrangement of same.
2. The Contractor shall not interfere with any person, firms, or corporations or with the Owner in protecting, removing, changing, or replacing their pipes, wires, conduits, poles, or other structures; but he shall suffer said persons, firms, or corporation or the Owner to take all such measures as they may deem necessary or advisable for the purpose aforesaid; and the Contractor shall thereby be in no way relieved of any of his responsibilities under the Contract.

C. Protection:

1. Assume all risks attending the presence or proximity of overhead or underground utilities, pipes, conduits, existing structures, and property of whatever nature. Damages and expenses for direct or indirect injury to such structures or to any person or property by reason of them or by reason of injury to them; whether such structures are or are not shown on the Drawings, by work of this Contract, rests solely with the Contractor.
2. Pipe Supports: Adequately support underground pipes or conduits exposed as a result of excavations. Provide adequate support along their entire exposed length by salt treated timber or planking. Install such supports in such manner that backfilling may be performed without dislodging such pipes or conduits. Place and carefully compact material from excavation or Special Backfill, as required, around the supports, and leave such supports

in place as a guard against breakage due to backfill settlement. No additional payment will be due the Contractor for support material left in place nor for the labor of installing and maintaining supports.

D. Excavation Condition:

1. Condition and results of excavation are solely the responsibility of the Contractor. Remove slides and cave-ins at whatever time and under whatever circumstance they occur.

E. Change of Trench Location:

1. In case the Engineer shall direct that the location of a trench be changed to a reasonable extent from that shown on the drawings on account of the presence of an obstruction or from other cause or if a changed location shall be authorized upon the Contractor's request, the Contractor shall not be entitled to extra compensation or to a claim for damage provided that the change is made before the excavation is begun. If, however, such change made at the direction of the Engineer involves the abandonment of excavation already made, such abandoned excavation together with the necessary refill will be classed as miscellaneous excavation and refill. In the event that the trench is abandoned in favor of a new location at the Contractor's request, the abandoned excavation and refill shall be at the Contractor's expense.

F. Trench Work for Electrical:

1. Refer to Division 26 of these Specifications.
2. Requirements specified herein for excavating, backfilling and compacting pipeline trench work shall also apply to such work required for electrical conduit installations.

G. Perform sheeting and shoring in accordance with requirements of Section 31 40 00 - SHEETING, SHORING AND/OR BRACING. An OSHA approved steel trench box may be considered in lieu of sheeting, shoring, and/or bracing.

H. Perform soil erosion and sediment control work in accordance with details and notes shown on the Drawings and applicable requirements of the Soil Conservation District.

I. If stability of adjoining structures or walls is endangered by excavations, shoring and bracing or underpinning shall be provided as necessary to insure their stability.

J. If it is necessary to place or operate power shovels, trucks or other heavy objects on a level above and near an excavation, the sides of the excavation shall be sheet-piled,

shored and braced as necessary to resist the extra pressure due to such superimposed loads.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: No right of property of material is granted the Contractor of excavated materials prior to backfilling. This provision does not relieve the Contractor of his responsibility to remove and dispose of surplus excavation materials.

B. Pipe Bedding:

1. Pipe bedding shall consist of coarse stone aggregate meeting Maryland State Highway Association requirements.

C. Trench Backfill:

1. On site excavated soil or soil-rock mixed materials free of topsoil, plant life, lumber, metal, refuse and rock or similar hard objects larger than two inches in any dimension.
2. Backfill material shall contain sufficient moisture for proper compaction and shall be compacted to not less than 95% of the maximum density for any specific soil classification, as determined by the Modified Proctor Test AASHTO T-180, Method "A".

D. Special Backfill:

1. Material for borrow: See 2.01.D, Section 31 23 16.

PART 3 - EXECUTION

3.01 PREPARATION

A. Pipe Lines and Grades: Prior to excavation for any run of piping, set control points for line and grade.

1. Control Point: Sufficiently offset control points from trench centerline to prevent loss of points during excavation and pipe laying operations. Make the offset on the trench side opposite the excavated material stockpile.
2 Set the control points 25 feet apart maximum for lines less than 100 feet in length. Set control points at maximum of 100 feet apart or less if required by the Contractor, for lines greater than 100 feet in length, with a minimum of 4 control points.

a. In unpaved or unsurfaced areas, place control points on top of hubs driven firmly into the earth. Place a reference stake next to each hub.
b. In paved areas, drive spikes or cut crosses into paving; in either case, enclose in a painted circle.

3. Elevations: Taken using a surveyor's level and recorded. Depths of cut to pipeline invert shall be computed and both the stationing and computed depth of cut shall be marked on the stakes and the road surface.
4. Horizontal and Vertical Control: Use either properly calibrated laser or grade stakes and batter boards to maintain vertical and horizontal alignment. Laser operation personnel shall be competent, trained for use with the instrument.
5. Methods used to lay out and maintain lines and grades of pipelines, other than those specified previously, will be permitted; however, such methods will be subject to the approval of the Engineer.

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3.02 PERFORMANCE

A. Excavating: Perform excavation and backfilling using machinery except that hand excavation and backfilling may be required where necessary to protect existing structures or utilities and except that backfilling shall be done by hand to the extent hereinafter specified. No claim for extra compensation will be allowed for hand excavation instead of machine excavation as may be necessary from any cause whatever.

1. Excavate trenches to necessary width and depth as required elsewhere herein.
2. Begin excavation in trenches at the control point having the lower invert and proceed upgrade.

B. Bedding Placement: Bedding shall be placed uniformly on the prepared base, in a satisfactory manner, to the lines and grades indicated on the Drawings. Placing of bedding by dumping from top of slope or by other methods that will tend to segregate particle sizes within the bedding will not be permitted. Any damage to the surface of the bedding base during placing of the bedding shall be repaired before proceeding with the work.

C. Trench Width and Depth:

1. Trench width shall provide suitable room for proper laying and joining of pipes, considering any sheeting or dewatering requirements.
2. From subgrade elevation to an elevation at least twelve inches above the top of the outside barrel of the pipe, excavate trench banks to vertical lines.
3. From a point twelve inches above the top of the outside barrel of the pipe, keep trench banks as nearly vertical as possible with due regard for safety.

D. Trench Width and Depth for Electrical Work:

1. Refer to Division 26 - Electrical. Excavate trenches for both single and banked conduit runs to vertical lines and to not less than a minimum nor more than a maximum width required to accommodate the conduit or conduits, with due regard for safety.
2. Excavate trenches for both single and banked conduit runs to elevations indicated, and where not indicated, to the depth required to provide the minimum cover specified in Division 26 - Electrical.

E. Length of Open Trench:

1. No greater length of trench in any location shall be left open in advance of the completed structure placed therein than shall be authorized or directed. The Engineer shall be empowered at any time to require the backfilling of open trenches over completed pipeline if in his judgment such action is necessary, and the Contractor shall thereby have no claim for extra compensation even though to accomplish said backfilling, he is compelled temporarily to stop excavation or other work at any place.
2. If work is stopped on any trench for any reason and the excavation is left open for an unreasonable length of time in advance of construction, the Contractor shall if so directed backfill such trench at his own cost and shall not again open said trench until he is ready to complete the structure therein. If the Contractor shall refuse or fail to backfill such trench completely within 48 hours after said notice, the Owner shall be authorized to do the work; and the Owner shall charge the expense thereof to the Contractor and retain the same out of any monies due or to become due him under the contract.

F. Backfilling:

1. Backfill excavations as rapidly as practicable after completion of construction work therein or after excavations have served their purpose. Unauthorized excavations made by Contractor shall be immediately backfilled at the Contractor's cost. Accomplish backfilling as specified herein and as indicated on drawings.
2. Use material from excavation for backfill unless, in the opinion of the Engineer, such material is not suitable for use as backfill.
3. Unless otherwise indicated or directed, hand place backfill materials in six (6) inch layers to a point at least two (2) feet above pipe crown. Thoroughly compact each layer for the full trench width and under, around and over pipe, using mechanical tampers exerting a pressure of not less than 250 foot pounds per square foot of tamping face.
4. Remainder of trench, more than two feet above pipe crown, may be backfilled by machinery in eight (8) inch layers. Thoroughly compact each layer for the full trench width using mechanical tampers.

5. Upon completion of backfilling in any area under the Contract, the Engineer may require tests to determine the degree of compaction of the backfill material. If the results of tests indicate densities less than specified, the Contractor shall, at his own expense, remedy the condition as directed, in such portions of the trenches as may be required.
6. No puddling of backfill shall be allowed.
7. Do not use frozen backfill materials or place backfill materials on frozen subgrade or trench surfaces.

G. Cleanup: After trenches and other excavations are refilled and the work completed, remove surplus excavated materials, stone or such other materials from the work in such manner as the Contractor may elect or provide, but subject to the Engineer's approval. Dispose of such materials off the site in a legal manner at no additional expense to the Owner.

1. If the Contractor fails or neglects to do so or to make satisfactory progress in doing so, within twenty-four hours after the receipt of a written notice from the Engineer, the Owner may remove such surplus material and the expense for such work charged to the Contractor and deducted from any monies due or to become due him under the Contract.

END OF SECTION

DIVISION 31 - EARTHWORK

SECTION 31 23 19

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall keep all excavations and structures free from water while the construction work is in progress and to such an extent as may be necessary while excavation work is being carried on. He shall provide for the disposal of the water in such a manner as to not impede the normal operation of the facility, nor will the Contractor be permitted to direct any of this water to the existing wastewater treatment plant.

B. The Contractor will be responsible for developing a complete dewatering plan, which protects all areas within the construction site. The Contractor will not be permitted any additional compensation due to the presence of high ground water in his excavation.

C. The Contractor's attention is directed to the fact that the water table in this area is very high.

D. Related Work Specified Elsewhere:

1. Section 02 30 00: Subsurface Exploration
2. Section 31 22 13: Site Preparation and Rough Grading
3. Section 31 23 16: Structural Excavation, Backfill and Compaction
4. Section 31 23 18: Utility Excavation, Backfill and Compaction
5. Section 31 25 00: Erosion and Sediment Control

1.02 PERMITS

A. The Contractor shall be responsible for obtaining necessary permits for dewatering activities.

1.03 SUBMITTALS

A. If dewatering methods are proposed, the Contractor shall prepare a plan of dewatering system and discuss with Owner and Engineer. Review or comments by Owner and Engineer concerning the proposed plan shall not relieve Contractor of his responsibilities for dewatering his excavations in conformance with this Section.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 METHODS

A. Dewatering can be accomplished by ordinary pumping methods, by the use of underdrains or by deep well points. In order to ensure continuous dewatering, duplicate units of the selected system incorporated with emergency power should be employed so that a reliable operation may be obtained. It is essential that all excavations be kept dry during construction operations.

3.02 DEWATERING OF WORK AREAS

A. All permanent improvements shall be constructed in areas free from water. The Contractor shall construct and maintain all permanent or temporary slopes, dikes, levees, drainage ditches, sumps, and observation wells necessary for the removal of water from work areas. The Contractor shall design, furnish, install, maintain, and operate all necessary pumping and other dewatering equipment required for dewatering the various work areas and for keeping these and other work areas free from water from any and all sources.

B. All dewatering shall be performed in advance of excavation. The dewatering shall be accomplished in a manner that will prevent loss of fines from the foundation, will maintain stability of all excavated slopes and bottoms of excavations, and will permit all construction operations to be performed in the dry. Dewatering of excavation shall be performed to the extent required to permit placement of compacted fill materials and to prevent sloughing of the excavation side slopes.

3.03 DISPOSAL OF DRAINAGE WATER

A. The disposal of all water from the dewatering and control of water operation and surface drainage shall be accomplished in a manner to have no detrimental effect on any of the new or existing facilities. The method and location of disposal of all water shall be subject to the approval of the Engineer. In addition, no water shall be drained into work built or under construction without prior consent of the Engineer.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 31 25 00

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Requirements for soil erosion and sediment control at project site.

B. Removal of control structures and restoration of site.

1.02 GENERAL

A. Provide necessary equipment, labor and supplies for erosion and sediment control throughout project. The work consists of grading of the site, providing sediment traps and settling trenches, perimeter controls, and other necessary measures required for effective control. Excavation work, mechanical compaction of fills, pipe outlets, seeding and mulching, and other work shall be as required by the laws of the State of Maryland and the Worcester County Soil Conservation District. The receipt of a proposal by a bona fide bidder shall be interpreted to mean the Contractor has familiarized himself with these Regulations and Rules of procedure and is fully cognizant of exactly what is required.

B. Contractor shall comply with all applicable Maryland Air Quality Regulations to ensure that construction activities do not exceed air quality emission thresholds.

1.03 EROSION AND SEDIMENT CONTROL PLAN

A. No work shall be started until the erosion control schedules and methods of operation have been accepted by the Engineer and the Worcester County Soil Conservation District

B. No changes or revision to the approved sediment control plan shall be made unless approved by Worcester County Soil Conservation District.

C. Regulating authorities reserve the right to amend the approved Erosion and Sediment Control plan as necessary to compensate for field conditions. Such revisions shall be the sole responsibility of the Contractor to perform and shall not entitle the Contractor to any additional compensation.

1.04 PERMITS

A. The Contractor is responsible for obtaining permits and/or approvals from the local office having jurisdiction in the area for work off site, where such work is necessary as a result of construction.

B. Onsite permit cost will be paid by the Owner. Offsite permit cost will be paid by the Contractor.

1.05 RESTORATION

A. Upon completion of work, remove sediment control traps, trenches, and other devices and restore grades to conditions existing prior to start of work unless indicated otherwise. Apply topsoil and seed areas affected by work. Restoration shall not take place until approval is given from regulating authority.

PART 2 – PRODUCTS

2.01 COMPLIANCE

A. All products used shall comply with those specified on the approved Erosion and Sediment Control Plans or as amended by the regulating authority.

PART 3 – EXECUTION

3.01 COMPLIANCE

A. Contractor shall follow Sequence of Construction from approved Erosion and Sediment Control Plans or as amended by the regulating authority.

B. All Erosion and Sediment Control devices shall be installed in accordance with the latest edition of the Erosion and Sediment Control Handbook.

END OF SECTION

DIVISION 31 - EARTHWORK

SECTION 31 40 00

SHEETING, SHORING, AND/OR BRACING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related work specified elsewhere:

1. Section 31 23 16 - Structural Excavation, Backfill and Compaction
2. Section 31 23 18 - Utility Excavation, Backfill and Compaction
3. Section 31 23 19 - Dewatering

1.02 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Shoring materials and installation work shall conform to Federal, State and local laws, rules, regulations, requirements, precautions, orders and decrees.
2. Provide material for all sheet piling, sheeting, bracing and shoring and drive or set in place in accordance with Federal, State and local laws for excavations and construction; and as may be required to protect the workers and the plant personnel, or to maintain the trench widths specified in Section 31 23 18 – UTILITY EXCAVATION, BACKFILL AND COMPACTION regardless of whether the same is or is not considered necessary by the Contractor.

1.03 RESPONSIBILITY FOR PERFORMANCE

A. The responsibility for the performance of shoring methods and devices, including slopes, if any, shall lie entirely with the Contractor. The correction of settlement and damage to persons and property due to settlement shall be the responsibility of the Contractor.

B. Shoring shall be executed in such a way that underground utilities are not damaged or disturbed, and so that access to them is not hindered.

C. The failure or refusal of the Engineer to suggest the use of bracing or sheeting, or a better quality, grade, or section, or larger sizes of steel or timber, or to suggest sheeting, bracing, struts, or shoring to be left in place, shall not in any way or to any

extent relieve the Contractor of any responsibility concerning the condition of excavation or of any of his obligations under the Contract, nor impose any liability on the Engineer or the Owner nor shall any delay whether caused by any action or want of action on the part of the Contractor, or by any act of the Engineer, Owner, or their agents, or employees, resulting in the keeping of any excavation open longer than would otherwise have been necessary, relieve the Contractor from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of his obligations under the Contract relating to injury to persons, or property, nor entitle him to any claims for extra compensation.

1.04 SUBMITTALS

A. Submit for Engineer's review the design of the sheeting and shoring system for all excavations where these systems are employed. Design shall bear the seal of a State of Maryland licensed professional engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood Materials: Use wood sheeting, sheet piling, bracing and shoring which is in good serviceable condition and timbers of sound condition, free from large or loose knots and of proper dimensions.

B. Steel Materials: Steel sheet piling and bracing of equal strength may be substituted for wood.

C. Props, shores, jacks, needles, braces, sheeting, cribbing, etc., shall be materials standard with and available to the Subcontractor, which are of proper size, and are in good serviceable condition. Materials that are unsuitable for the intended purpose, or which are severely damaged shall not be used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Subcontractor shall support the sides and ends of all excavations, wherever necessary, with sheeting, shoring, and/or bracing of the quality and character as required. Using skilled labor, drive or set sheeting, sheet piling, braces or shores in place shall be so arranged such that they may be withdrawn as the excavations are backfilled, without injury to piping and structures, and without injury to or settlement of adjacent structures and pavements.

B. Excavations, if over four feet in depth, unless in solid rock, hard shale, or hardpan, shall be shored, sheeted, and braced.

C. Where the cross section of the horizontal stringer or wale is not square, the greatest dimension shall be placed in a horizontal plane to gain the maximum strength of the member.

D. Where a mechanical digger is used, the sheeting and bracing shall be placed as close as possible to the lower end of the boom.

E. The bracing shall be held in place by hydraulic jacks, screw jacks or by cross braces cleated and wedged in place. Where the width of the excavation is such that horizontal bracing is not feasible, diagonal cross bracing shall be installed such that the bottom of the bracing shall bear against a footing in the earth at the bottom of the excavation and adequate means shall be taken to prevent that bracing from kicking out. In hand excavated trenches, cleats shall be securely fastened to join the ends of braces to stringers to prevent the braces from being knocked out of place.

F. Excavated material and superimposed loads shall not be placed nearer than 18 inches to the sides of a trench or other excavation, unless bracing has been installed which is designed to withstand the load.

G. When trenches are undercut, they shall be shored to safely support the overhanging material. The design of shoring shall be performed and sealed by a professional structural Engineer registered in the State of Maryland. The design shall be submitted to the Engineer for review prior to installation.

H. If a trench is cut, or an embankment is created by excavating or grading alongside an existing structure, object or underground utility, and the footing or elevation of the bottom of the structure, object, or utility is nearer to the trench or embankment than the angle of repose for the soil, the sidewall of the trench or the embankment shall be rigidly and adequately supported and braced. If the method of, and the materials to be used for support are not indicated on the Contract Drawings, same shall be submitted to the Engineer for review, in accordance with paragraph G above, prior to the start of the excavation or grading work.

I. When the depth of the trench requires two (2) lengths of sheet piling, one above the other, the lower length shall be set aside the bottom stringers or wales of the upper length and driven down and braced as the excavation continues.

J. Remove sheeting, bracing and shores as trenches and other excavations are being backfilled.

1. All sheeting, shoring, and/or bracing in excavations shall be withdrawn in stages on both sides of trenches, to prevent lateral movement of the pipe.

2. In withdrawing sheeting and sheet piling, exercise care to ensure that all voids or holes left by planks as they are withdrawn are backfilled and thoroughly rammed with thin rammers provided specially for that purpose.
3. Exercise care to carry backfill up evenly on all sides of items installed in excavations.

K. Where the Engineer permits the Subcontractor to leave sheet piling in place at the Subcontractor's own request, the Subcontractor will not be entitled to any extra compensation.

L. Any sheeting ordered left-in-place by the Engineer shall be cut-off a minimum of two feet below finished grade. The Subcontractor shall remove and properly dispose of the material cut-off without compensation, therefore.

M. Wherever necessary in quicksand, or soft ground, or for the protection of any structure or property, sheeting shall be driven without extra compensation to such additional depth below the bottom of the trench as may be required or directed.

N. A trench box may be used in lieu of sheeting, shoring, and/or bracing only upon approval of appropriate Safety Agencies.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 12 16

HOT MIX ASPHALT PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish all labor, materials and equipment necessary to perform all paving and surfacing where shown on the Contract Drawings. The type of material, thickness and typical sections shall be as shown on the Contract Drawings.

B. Related Work Specified Elsewhere:

1. Section 31 22 00: Grading

1.02 QUALITY ASSURANCE

A. Source Quality Control: Maintain quality in products by using those of a qualified bituminous concrete producer having qualified plant operating personnel.

B. Experience: The bituminous concrete producer shall be a bulk producer regularly engaged in production of hot-mixed, hot-laid bituminous concrete conforming to the standards referenced herein.

C. Workmen Qualifications: Provide at least one person thoroughly trained and experienced in the skills required who readily understands the design and is completely familiar with the application of stone base and bituminous concrete paving work. Said person shall be present at all times during progress of the stone base and bituminous concrete paving work and shall direct the performance of said work. For actual finishing of bituminous concrete surfaces and operation of the equipment, use only personnel thoroughly trained and experienced in the skills required.

D. Reference Standards: Maryland Department of Highways and Transportation Standard Specifications, current edition.

1.03 JOB CONDITIONS

A. Weather Limitations: Apply tack coats only when ambient temperature is above 50°F, and when temperature has not been below 35°F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphaltic concrete surface course only when atmospheric temperature is above 40°F, and when base is dry. Binder course may be placed when air temperature is above 40°F and rising.

C. Grade Control: Establish and maintain required lines and elevations.

1.04 SUBMITTALS

A. Mix designs for hot mix asphalt shall be submitted in writing by the Contractor sufficiently in advance of paving operations to allow three weeks for review and approval. The design information shall include the following:

1. The use of which the material is proposed.
2. The designation, source and anticipation graduation of each of the component aggregates.
3. The estimated percentage of each aggregate required to yield the desired blend.
4. The resulting percentage passing each sieve size stipulated by the appropriate band.
5. The source of the asphalt material to be used.

B. Delivery Tickets: Submit in triplicate for each load placed on the project.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. General: Use locally available materials and gradations which exhibit a satisfactory record at previous installations.

B. Sub-Base Course Aggregate, Binder Course Aggregate and Surface Course Aggregates: Crushed stone, crushed slag or crushed gravel and siliceous sand as specified in MSHA Section 501. Specifications as amended. Replacement materials same as existing pavement.

C. Asphalt Cement: Comply with MSHA, AASHTO M226, Grade AC-20.

D. Bituminous Tack Coat: Comply with MSHA, Section 904.04.

E. Hot Mix Asphalt Paving: Construct Superpave HMA, 19.0 mm Base Course and Superpave HMA, 9.5 mm Surface Course to the cross section shown on the plans and in strict accordance with MSHA Section 504.

2.02 PAVEMENT MIXES

A. Composition of Mixtures: Binder and wearing course mixture composition shall conform to the requirements of the above referenced specifications and the following:

1. Establish a job-mix formula prior to beginning work which shall not be changed during the progress of work without the Engineer's approval. Job-mixing tolerances shall not be presumed to permit acceptance of materials whose gradations fall outside the master ranges set forth in the above referenced specifications.
2. The approved job-mix formula shall lie within the specification limits and be suitable for the layer thickness and other conditions prevailing. It shall not be changed after work has started without the approval of the Engineer.

B. Aggregate Quality: Aggregate shall meet the requirements of the Standard Specifications for "Crushed Stone, Crushed Slag, and Crushed Gravel for Dry- or Water-Bound Macadam Base and Surface Courses of Pavements," ASTM D 693-77 with the exception that gradation shall be as described above, and a soundness test is required.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall not install permanent hot mix asphalt pavement until the entire project is substantially complete. The Contractor shall install and maintain aggregate subbase during the construction of the project and shall make all repairs to subbase as required by the Engineer.

3.02 INSPECTION

A. Examine areas and conditions under which asphalt concrete paving is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.03 PAVEMENT BASE COURSE

A. Grade Control: During construction, maintain lines and grades including cross-slope of base course.

B. Placing: Place sub-base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting sub-base material during placement operations.

3.04 SURFACE PREPARATION

A. Remove loose material from compacted sub-base surface before applying binder course.

B. Proof roll or tamp prepared sub-base to check for unstable areas and areas requiring additional compaction.

3.05 PLACING MIX

A. General: Place hot mix asphalt over base course as specified in MSHA Specifications, Section 504.

B. Compaction: Conform with procedure outlined in Section 504.03.06 Specifications.

3.06 FIELD QUALITY CONTROL

A. General: Test in-place asphaltic concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

1. Binder Course: 1/2", plus or minus.
2. Surface Course: 1/4", plus or minus.

C. Surface Smoothness: Test finished surface of each asphaltic concrete course for smoothness, using 10' straightedge. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

1. Base Course Surfaces: 1/4".
2. Wearing Course Surface: 3/16".

3.07 PROTECTION

A. Protect from damage and vehicular traffic until paving has cooled and attained its maximum degree of hardness.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 13 13

SIDEWALKS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete walks with sub-grade preparation, forms, reinforcing, finishing, and curing.

1.02 JOB CONDITIONS

A. Conform to applicable sections of DIVISION 31 for requirements relating to sub-grade preparation and DIVISION 03 for concrete work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with DIVISION 3 sections for concrete formwork, reinforcing, materials, expansion joint material, curing, and quality control.

B. Use air-entrained concrete with 4% to 6% air content, 28–day compressive strength of 4000 psi. Design concrete mix in accordance with ACID 211.1. Slump shall be between 3-1/2 and 4-1/2 inches.

2.02 FORMS

A. Forms: Wood or steel, of an approved type and design, securely fastened and braced to prevent any movement during placing of concrete. Do not remove forms until at least twelve (12) hours after concrete has been placed.

2.03 BASE

A. Compacted sand cushion, thoroughly wetted prior to concrete placement, or as indicated on the Contract Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare sub-base to required dimensions and grade.

B. Remove loose material from compacted sub-base surface.

C. Proof roll sub-base to check for unstable areas. Re-compact if necessary.

3.02 PLACEMENT

A. Place reinforcing, concrete expansion joint material, cure, and finish in accord with the applicable requirements in DIVISION 03.

B. ADA standards will be strictly adhered to. No sidewalk will not be accepted with cross slopes greater then 2%, or slopes in the direction of travel greater then 12h:1v. Hand formed sidewalk shall be measured by hand for compliance. Sidewalk not meeting requirements shall be removed and replaced at contractor's expense.

3.03 CONCRETE DECK PAVING

A. Slope for drainage as shown in drawings. In no case shall any part of any surface retain water.

B. Provide expansion joints full depth of concrete at right angles to walks at intervals not greater than 20'-0"; also where any walk is confined between a curb and a fixed structure, or other relatively immovable object. Fill with non-extruding pre-molded joint filler to within 1" of top and seal as specified in Section 07 92 00 - SEALANTS AND CAULKING.

C. Wood-float decks perfectly smooth. Before concrete has taken final set, provide an approved broom finish. Provide contraction joints (Scoring), 3/4" deep. Cut surfaces into approximate areas of not over twenty (20) square feet each, or as indicated. Finish all edges of each area with a 1/4" radius-edging tool.

D. Provide ramps where indicated. Finish as specified for decks.

END OF SECTION

DIVISION 33 - UTILITIES

SECTION 33 05 61

MANHOLES

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Contractor shall construct manholes of precast reinforced concrete risers and base sections where indicated and as detailed on the drawings. The Contractor will not be allowed to field cut, break, or core pipe openings through precast manhole walls.

B. Manholes shall be built at such points on the pipelines and of such form and dimensions as are shown on the drawings or as may be directed. Manholes shall be built as pipe laying progresses, and the Engineer may stop work entirely on laying pipe if manhole construction is delayed to such an extent as to be hazardous to construction or the public.

1.02 SUBMITTALS

A. The Contractor shall submit certifications to the Engineer that all manhole sections, gaskets, pipe-to-manhole connectors, frames and covers, watertight inserts, and steps are as specified herein. Shop drawings shall be submitted for any proposed substitutions.

PART 2 – PRODUCTS

2.01 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS

A. Precast reinforced concrete risers, eccentric cones (use of slab tops subject to Engineers approval or where shown on Drawings) and bases shall be as detailed on the drawings and in conformance with AASHTO M199. Joints between riser sections shall be fitted with an O-ring manhole joint gasket meeting the requirements of ASTM Designation C 443. The seal between the manhole sections shall be in accordance with ASTM C 923.

B. Precast reinforced concrete base and riser sections shall be as manufactured by Atlantic Concrete Products Company, or equal. Base section shall be manufactured using a monolithic pour.

C. Lifting holes in the walls of precast reinforced concrete risers will be allowed. The lifting hole is to be formed by a plastic insert cast integrally into the manhole wall, to

assure water tightness. Not more than two holes shall be cast in the walls of each riser section for the purpose of handling. Said insert is to be “Key-Lok” as manufactured by A-Lok Products or equal.

D. The manhole manufacturer is to identify all inlets and the outlet of each manhole. An “I” and an “O” painted over the hole will be acceptable.

E. Manholes with pipes 24” or more in diameter or drop connections shall have an inside diameter of 5 feet. All other manholes are to have an inside diameter of 4 feet. Drop connections shall be inside the manhole. Outside drop connections will not be permitted.

F. Interior and exterior joint spaces of all manhole risers shall be mortared.

2.02 CONNECTIONS AND STUBS

A. All pipe-to-manhole connections for sanitary sewer manholes shall be made by means of an integrally cast flexible connector which shall be Lockjoint flexible manhole sleeve as manufactured by Interpace Corp., Parsippany, New Jersey, or A-Lok flexible manhole gasket as manufactured by A-Lok Corp., Trenton, New Jersey, or equal.

2.03 BRICK

NOT REQUIRED

2.04 MORTAR

A. Cement shall be in accordance with the “Standard Specifications for Portland Cement”, ASTM Designation C 150 for Type II.

B. Sand shall be composed of sharp, angular, siliceous grains, coarse, or graded from fine to coarse with the coarsest grains predominating, and sensibly free from clay, loam, dirt, mica, organic matter, or other impurities. Sand containing more than 5 percent by weight of foreign material shall not be used. This limit may be changed for special classes of work if hereinafter specified. Sand exhibiting more than an acceptable amount of fine matter or impurities may be required to be washed after delivery on the work or shall be rejected altogether. Sand for mortar shall be screened to reject all particles of a greater diameter than 1/4-inch and shall not contain more than 5 percent by weight of a very fine material.

C. Sand obtained from the excavation shall not be used.

2.05 MANHOLE STEPS

A. Manhole steps shall be made of No. 3 steel reinforcing bars, ASTM Designation A 615, Grade 60, encased in polypropylene plastic. Manhole steps shall have a notched tread ridge with retainer lug on each side.

B. Manhole steps shall be cast in place during manufacture of precast reinforced concrete risers and eccentric top sections. Embedment length shall be suitable for minimum 5 inch thick, precast reinforced concrete riser walls.

C. Manhole steps shall be OSHA approved and as manufactured by M.A. Industries, Inc., Peachtree City, Georgia, ICM, Inc., Jacksonville, Arkansas, or equal.

2.06 MANHOLE FRAMES AND COVERS

A. Material for frames and covers shall be in accordance with the standard specifications for gray iron castings ASTM Designation A 48 for Class No. 35B and as detailed on the Contract Drawings.

B. Frames and covers shall be heavy duty and rated for H20 loading applications.

C. “Sewer” shall be cast in the cover where applicable.

2.07 WATERPROOFING

A. The exterior surface of all manholes shall receive a minimum two coat application of a 68 percent solids coal tar type protective coating. The total average dry film thickness shall measure 24 mils with no single measurement to be less than 20 mils. Surfaces shall be prepared in accordance with the manufacturer’s instructions and coatings applied in the factory in a manner acceptable to the Engineer. The coating material shall be Bitumastic Super Service Black manufactured by Kop-Coat Inc., Pittsburgh, Pennsylvania, Tar-Jet Super Black XX-32-B-22 manufactured by Pennsbury Coatings Corp., New Britain, Pennsylvania, or equal. The Contractor shall be responsible to repair areas of the coating damaged during handling and installation of the manholes.

2.08 FLOW CHANNELS

A. All flow channels shall be formed of concrete in the bottom of vaults/inlets and shall slope smoothly and evenly from the pipes entering the vaults/inlets to the outlet pipe.

PART 3 – EXECUTION

3.01 MANHOLE INSTALLATION

A. Interior joint spaces of all manhole risers shall be mortared. The exterior joint may be mortared with hydraulic cement or filled with a joint filler compound. Said compound shall be Pioneer 301 as manufactured by Daubert Chemical Company, Oakbrook, Illinois, or equal.

B. Stub connections shall be constructed where indicated on the plans of the same material used for sewer construction and shall extend 2 feet in length with factory bell end outside the manhole wall. The outer end of the stub connection shall be plugged with an approved stopper and secured in place as directed.

C. Frames and covers for manholes shall be set by the Contractor as the work progresses. The frame shall be well bedded in mortar.

D. Any excavation for manhole installation must be backfilled with imported material from an off-site borrow pit.

3.02 QUALITY ASSURANCE

A. If inspection reveals any visible leakage or seepage in any manhole, the Contractor will be required to accomplish such remedial measures as may be directed by the Engineer. Caulking or patching of interior manhole surfaces will not be acceptable.

END OF SECTION

DIVISION 33 – UTILITIES

SECTION 33 41 00

STORM DRAIN SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes gravity-flow, nonpressure, storm drainage outside the building, with the following components:

1. Special fittings for expansion and deflection.
2. Drains.
3. Corrosion-protection piping encasement.
4. HDPE Catch basins

1.02 DEFINITIONS

A. EPDM: Ethylene-propylene-diene-monomer rubber.
B. HDPE: High Density Polyethylene plastic.
C. PP: Polypropylene plastic.
D. PVC: Polyvinyl chloride plastic
E. RCP: Reinforced Concrete pipe

1.03 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 2psi. Pipe joints shall be at a minimum soil tight, unless otherwise indicated.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fittings.
2. Storage and leaching chambers.

B. Shop Drawings: For the following:

1. Manholes: Include plans, elevations, sections, details, and frames and covers. Include design calculations, and concrete design-mix report for cast-in-place manholes.
2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer’s written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.06 JOB CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupies by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two (2) days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner’s written permission.

PART 2 – PRODUCTS

2.01 PIPING & FITTINGS

A. Corrugated HDPE Drainage Pipe and Fittings NPS 10 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silt-tight Couplings: HDPE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soil-tight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated HDPE Drainage Pipe and Fittings NPS 12 to NPS 48: AASHTO M 294M Type S, with smooth waterway for coupling joints.

1. Silt-tight Couplings: HDPE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
2. Soil tight Couplings: AASHTO M 294M, corrugated matching pipe and fittings.

2.02 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as

piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded Flexible Couplings: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:
   a. Fernco Inc.
   b. Approved substitution.

D. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

1. Manufacturers:
   a. Fernco Inc.
   b. Approved substitution.

2.03 HDPE CATCH BASINS

A. Catch Basins shall be HDPE bodies as manufactured by Nyloplast or approved equal. Structures shall be rated for minimum H-20 loading in road way.

B. Frames and Grates: Grates shall be Ductile Iron with the same load rating as the body structure. Grates shall be from the same manufacture as body structure.

2.04 CONCRETE

A. Refer to Section 03 30 00.

PART 3 – EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 02 Section "Earth Moving."

3.02 PIPING APPLICATIONS

A. Gravity-Flow, Nonpressure Piping: Use the pipe material indicated on contract drawings. If pipe material is not called out contractor may chose between concrete and HDPE pipe but must meet the specifications of this section.

3.03 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at design slope.
2. Install piping with restrained joints at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 18-inches minimum cover.
4. Install piping below frost line.
5. Install HDPE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

3.04 PIPE JOINT CONSTRUCTION

A. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join corrugated HDPE piping according to CPPA 100 and the following:
   a. Use silttight couplings for Type 2, silttight joints.
   b. Use soiltight couplings for Type 1, soiltight joints.
2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.05 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use heavy-duty, top-loading classification cleanouts in all areas except as required below.
2. Use extra-heavy-duty, top-loading classification cleanouts in City of Lewes Streets.

B. Set cleanout frames and covers in concrete or asphalt pavement with tops flush with pavement surface.

3.06 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.07 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R.

3.08 DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer’s written instructions.

B. Install with top surfaces of components, except piping, flush with finished surface.

C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in four (4) inches minimum concrete around bottom and sides.

3.09 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape over ferrous piping.
2. Use warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
    a. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.11 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION

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DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 00

PIPE AND PIPE FITTINGS – BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, wastewater treatment process piping, sludge piping, and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittals.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

D. Piping Schedule:

Type of Service	Type of Pipe	Type of Joints
Wastewater - Exterior (Buried) 3” and Larger	D.I.P.	Push-On (Restrained)/Mechanical Joint
Wastewater – Interior/Exterior (Exposed) 3” and Larger	D.I.P.	Flanged
Sludge - Exterior (Buried) 3” and Larger	D.I.P. (Glass Lined)	Push-On (Restrained)/Mechanical Joint
Sludge - Interior/Exterior (Exposed) 3” and Larger	D.I.P. (Glass Lined)	Flanged
Low Pressure Air – Interior/Exterior (Exposed)	D.I.P. (Unlined)	Flanged

Low Pressure Air – Exterior (Buried)	D.I.P. (Unlined)	Push-On (Restrained)/Mechanical Joint
Sanitary Sewer – 4” and Larger	SDR 35 P.V.C	Push-On
Potable Water & NPW – Exterior (Buried) Greater than 2”	C900 P.V.C.	Push-On (Restrained)/Mechanical Joint
Potable Water & NPW – Exterior 2” and Smaller	Sch-80 P.V.C.	Solvent Weld
Potable Water & NPW – Interior	Sch-80 P.V.C.	Solvent Weld

1.02 QUALITY ASSURANCE

A. Pipe Testing:

1. The Inspector shall be notified in advance of all tests, and all tests shall be conducted to the entire satisfaction of the Engineer.
2. All wastewater, sludge, filtered water, and finished water piping, chemical piping, waste piping, and sewer piping, shall be hydrostatically tested at 50 percent over the system working pressure, but not less than 100 pounds per square inch. Prior to pressure testing, take the following precautions:
    a. Free piping of trapped air prior to testing.
    b. Do not subject equipment, piping specialties or plumbing fixtures to test pressures.
    c. Isolate all such items in lines that may be damaged by test pressures.
    d. Maintain test pressure to within 3 psi of initial test pressure, without introduction of additional pressure, until a visual examination is made of every joint and connection, but in no case less than 4 hours actual test time.
3. Drain and Vent System Tests:
    a. Hydrostatic at not less than 10 foot head of water, except when danger of freezing, then conduct tests with air pressure.
4. Low Pressure Air Piping:
    a. Test in accordance with ASME B31.3.
4. Leaks and defects shall result in the pipe being repaired, replaced or otherwise remedied by the Contractor at no expense to the Contractor and to the complete satisfaction of the Engineer. Repair or replacement of pipe shall be accomplished when leaks become apparent and shall be completed within one month after detection of leak but prior to Contractor’s final acceptance of the project.

1.03 SUBMITTALS

A. Shop Drawings and Product Data. Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of valves and piping specialties, in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

B. Contractor shall submit complete dimensional layouts of interior and exterior piping systems for approval. These layouts must be coordinated with equipment and valves to be furnished.

C. Certifications: The Contractor shall submit certifications for pipe, fittings, linings and materials to the Engineer for approval. Certifications shall state that pipe furnished complies with standards specified herein.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packing Lists: Packing lists shall accompany each pipe delivery made to the site. Absence of such list may cause refusal of shipment.

1. Packing lists shall indicate customer's order number or contract number, truck routing, type and classes of pipe, pipe diameters, weights and lengths of pipe, date of manufacturer, plant identification of the particular lots of piping contained in the shipment.
2. Submit a copy of packing lists to the Inspector or Engineer as soon as practicable after delivery of piping.

B. Handling: Exercise care not to damage exterior coatings and linings of pipes during loading and unloading operations.

1. Use lifting devices or harnesses of the type recommended by pipe manufacturers in handling pipes.
2. Do not drop pipe and pipe fittings, valves and appurtenances.

C. Storage: Store pipe, fittings, valves and appurtenances so as not to contact earth or other contaminants.

PART 2 - PRODUCTS

2.01 EARLY WARNING TAPE & DETECTION WIRE – BURIED PIPING

A. Provide detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved, with warning and identification

imprinted in bold black letters continuously over entire tape length. Warning and identification shall be CAUTION BURIED WATER LINE BELOW or similar.

B. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

C. Provide 8 gauge solid copper locating wire secured to the top of all buried pipelines. Terminate wire at a location where it is accessible by the Owner for future use.

D. Refer to the contract drawings for details regarding pipe installation.

2.02 PIPE INSULATION – EXPOSED PIPING

A. All exposed non-potable and potable water piping (hot and cold), fittings, other piping, and valves shall be heat traced and insulated, where shown in the Contract Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Field Measurement:

1. The Drawings are in general indicative of the work, with symbols and notations for clarity. However, the drawings are not an exact representation of all conditions involved, therefore, layout piping to suit actual field measurements. No extra compensation will be made for work due to differences between indicated and actual dimensions.
2. Submit details of proposed departures necessitated by field conditions or other causes to the Engineer for approval.

B. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Engineer shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation unless all required precautions as to the minimum length of open trench and promptness of backfilling are observed.

C. Whenever directed, the Contractor shall lay pipe upon an artificial foundation which he shall construct. Such foundation may consist of gravel, sills, or of concrete; all to be of the form and dimensions and placed in the manner required by the Engineer. All artificial foundations shall be of a character equal to that as hereinbefore specified.

3.02 INSTALLATION (PIPING)

A. General:

1. Clean piping prior to installation and following installation to prepare for painting. Keep open ends of piping and pipe attachment openings on equipment capped or plugged until actual connection.
2. Construct piping from full lengths of pipe using short sections only for runs of less than full pipe length. Make changes in direction of pipe runs with fittings only.
3. Cut pipe accurately to measurements established in the field and assemble in place without springing, forcing, excessive cutting or weakening of the structure.

B. Exposed Piping:

1. Run piping parallel or perpendicular to the lines of the structure. Keep piping a sufficient distance from other work to permit clearance of not less than one inch between the piping or insulated piping and adjacent work. Install piping as close as possible to walls, overhead construction, columns, and similar to facilitate insulating work and removal of piping later.
2. Run piping to compensate for structural interferences, to preserve headroom, and not to interfere with openings, passageways and equipment.
3. Do not install piping with joints and fittings over motors, switchboards, panels, or similar electrical apparatus unless otherwise directed in the contract drawings.
4. Install unions and flanges in accessible locations and where indicated or not, install union adjacent to all equipment and wherever removal of equipment for repair or replacement is required. Use dielectric unions at points of connection of copper tubing and piping to ferrous metal piping or equipment.

C. Underground Piping:

1. Pipe and fittings shall be carefully handled and lowered into the trench. Special care shall be taken to insure that each length shall abut against the next in such manner that there shall be no shoulder or unevenness of any kind along the inside of the pipe.
2. Before pipe is placed, the bottom of the trench shall be carefully shaped to fit the lower part of the pipe exterior with reasonable closeness for a width of at least 60% of the pipe width as indicated on the plans. Bell holes shall be dug sufficiently large to insure the making of proper joints and so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Any defects due

to settlement shall be made good by the Contractor without additional compensation therefore.

3. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipe shall be used. Pipe shall be laid to the grades indicated on the Drawings. Pipe shall be laid with the bell ends uphill.
4. Whenever a pipe requires cutting to fit into the line or to bring it to the required location, the work shall be done in a satisfactory manner so as to leave a smooth end.
5. Sewer mains shall be laid at least 10 feet horizontally from any existing water main. Sewer mains crossing water mains shall be laid to provide a minimum of 18 inches between the outside of the water main and the outside of the sewer. When it is impossible to obtain proper horizontal or vertical separation as stipulated above, concrete encasement shall be installed. For crossings, the encasement shall be installed 5 feet each side of the crossing point on the lowest utility.
6. Backfill materials shall be hand placed and mechanically tamped in 6-inch layers, placed uniformly on both sides of the pipe, to a point at least two feet above the pipe crown. Each layer shall be thoroughly compacted for the full trench width and under, around and over the pipe. Mechanical tampers shall exert a pressure of not less than 250-foot pounds per square foot of area of tamping face.
7. For refill of the remaining trench depth, refer to Section 31 23 18 – UTILITY EXCAVATION, BACKFILL AND COMPACTION.

D. Pipe Joining:

1. General: Exercise care when making pipe joints and make joints in accordance with the pipe material manufacturer's recommendations and the following requirements. In each instance of pipe joining, those portions of pipes involved must be absolutely clean just prior to assembly. If a joint is extremely difficult to assemble or sealing is not affected, disassemble the joint and correct the difficulty if possible. Remake the joint using new materials when necessary.
2. Bell and Spigot Joints: Two sections of pipe shall be assembled in accordance with the manufacturer’s recommendation. Joint shall be tested in accordance with ASTM D3212 “Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals.”

E. Field Touch-up of Pipe Coating:

1. Prior to placement of coated pipe touch-up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch-up to job site in original sealed and labeled containers.
3. Contractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the

quantity of each coating purchased was sufficient to properly coat all surfaces.

4. In addition to field touch-up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

F. Marking Pipe and Fittings: Each length of pipe and each fitting shall be marked with the weight, class or nominal thickness, and casting period cast upon them. Each length of pipe and each fitting shall be marked with the manufacturer's identification and year of manufacture in a conspicuous location. Ductile iron pipe shall have the letters "DI" or "Ductile" cast or stamped on the pipe. All required markings shall be clearly legible.

G. Sterilization:

1. Sterilization of potable water lines shall be done by the Contractor, as directed, without additional payment therefore. The Contractor shall provide all labor, materials, water and equipment for and shall perform the sterilizing operations complete to comply with AWWA C 651. Contractor shall provide all bac-T testing through a certified laboratory.
2. Contractor shall be responsible for disposing of chlorinated water after sterilization in a satisfactory manner and testing for the absence of bacteria in the piping. If bacteria is found to be present after disinfection, the Contractor shall repeat the process until passing bac-T tests are achieved. No piping shall be placed in service until it has passed bac-T testing.

3.03 COLOR CODING OF PIPING

A. With the exception of piping installed underground or encased in concrete, color code and label the entire exposed piping system as per the schedule below.

B. Do not paint valves and operators.

C. Stainless Steel, SCH 80 CPVC, and SCH 80 PVC piping shall not be painted. These materials shall be provided with labels and flow arrows made of vinyl, indicating the flow direction and contents, using the color scheme shown below. Labels and flow arrows shall be the size indicated in the table below. Submit information on the type of label proposed for the engineer’s review.

D. Exclude supports, brackets, hangers, and other accessories from color coding. Paint these items to match adjoining surfaces.

E. After finish painting mark exposed piping with stenciled name of contents and flow direction arrows.

F. Piping labels and flow arrows shall be placed at the following locations:

1. Where pipes enter or leave the room space.

2. At junction points and points of distribution.
3. Adjacent to valves and equipment.
4. At changes in direction.
5. At five (5) feet maximum intervals along the piping where necessary for identification.

G. Label piping according to its specific contents (e.g., Raw Water, Settled Water, Filtered Water, MLSS, Membrane Feed, Effluent, Plant Effluent, etc.) as directed by the Engineer.

H. Place labels and flow arrows where they can be easily read from the floor: at the horizontal or vertical center lines. Where pipes are adjacent to each other, arrange legends neatly in line. Place letterings below the horizontal center line where pipelines are too close together or where located above normal line of vision.

I. Use gothic style lettering. Stencil same size arrows as letters, indicating direction of flow pointing away from the label. Letter sizes shall be per the schedule below.

J. Pipe Color: Paint exposed piping in accord with the following schedule:

	Service	Pipe Color	Lettering Color
a.	Wastewater	Light Gray	Black
b.	Sludge	Dark Brown	White
c.	Low Pressure Air	Light Green	White
d.	Potable Water	Light Blue	Black
e.	Sanitary Drain/Vents	Dark Gray	White
f.	Non-Potable Water	Purple	White
g.	Chemicals	Safety Yellow	Black

OUTSIDE DIAMETER OF PIPE OR COVERING	HEIGHT OF LETTERING	WIDTH OF COLOR BAND
Over 10 inches	3 ½ inches	12 inch
7 to 10 inches	2 ½ inches	12 inch
3 to 6 inches	1 ¼ inches	8 inch
1 ½ to 2 ½ inches	¾ inch	8 inch
¾ to 1 ¼ inches	½ inch	8 inch
Under ¾ inch	Do not paint ***	8 inch

*** Identify pipes less than 3/4 inches outside diameter with LEM Snap-Wrap Series SNP Pipe Markers (or approved substitution), pre-curled PVC, designed to snap around pipes or covering without mechanical fasteners to provide pipe identification and information.

3.04 DEFECTS TO BE CORRECTED

A. If, at any time before the expiration of the guarantee period under this contact, any broken pipe, or any other defects are found in any of the lines or in any of the appurtenances, the Contractor shall cause the same to be removed and replaced by proper material and workmanship, without extra compensation for the labor and material required, even though such injury or damage may not have been due to any act, default, or negligence on the part of the Contractor. All materials shall be carefully examined by the Contractor for defects prior to installation, and any found defective shall be rejected for use.

END OF SECTION

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DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 07

HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor shall be responsible for the complete support of all process piping systems such that the system operates without excessive deflection, vibration, or transmission of loads to equipment.

B. Furnish all labor, materials, equipment, and incidentals required to provide complete hanger, support, anchor, and restraint systems for all above-grade process piping as indicated and specified.

C. Supports shall be designed to carry the weight of piping, contents, insulation, and appurtenances and to resist forces due to thermal expansion, surge, water hammer, vibration, and equipment operation.
Section includes hangers and supports for process piping and equipment.

D. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
4. Section 09 91 00: Paints.
5. Section 23 05 29: Hangers and Supports for HVAC Piping and Equipment
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

E. References:

1. American Society of Mechanical Engineers (ASME): B31.
2. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) Standard Practices:
    a. SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture.
    b. SP-69 Pipe Hangers and Supports - Selection and Application.
    c. SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices.

d. SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

1.02 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Load capacity and sizing schedules specific to Project.
3. Installation methods.

C. Certifications:

1. Support calculations if requested by Engineer.
2. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.

D. Shop Drawings:

1. Bases, hangers and supports including spacing, anchor locations, guides, and equipment supports
2. Connections to equipment and structure.
3. Structural assemblies.

1.03 SYSTEM DESCRIPTION

A. Select hangers and supports to perform under all operating conditions, allowing for expansion and contraction while preventing excessive stresses in piping and connected equipment.

B. Support systems shall control movement of piping and provide for intended thermal movement.

C. Provide anchors, guides, and restraints as required to control pipe movement and resist thrust forces.

D. Provide vertical adjustment capability after installation and during commissioning to ensure proper slope and alignment.

E. Contractor shall modify support locations and types as required to accommodate actual field conditions and to ensure proper system operation.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturing facilities shall be registered to ISO 9001.2000 and assessed to ISO 9000.2000 standard. A copy of the current certificate shall be available upon request.

B. Installer Qualifications:

1. Utilize an installer experienced in performing work of this section who is experienced in installation of work similar to that required for this project and per the minimum requirements of MSS SP-89.

C. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights, Owner may have under Contract Documents.

PART 2 - PRODUCTS

2.01 PIPE SUPPORT AND ANCHOR MATERIALS

A. Materials

1. Do not use installed hangers for rigging or erection purposes.

2. Provide materials to comply with location and application requirements unless noted otherwise on drawings and schedules. Fabricate hangers, supports and sway braces to comply with building codes.
    a. Structural steel: ASTM A36 minimum.
    b. Pipe supports and hangers: Carbon steel unless noted otherwise.
    c. Fasteners: ASTM A307 or A325.
    d. Pipe shields for insulated piping.

B. Concrete Inserts:

1. Where piping is supported from the concrete structures, use inserts made of carbon steel ASTM A 36 or malleable iron ASTM A 47.
2. Where the pipe load exceeds the recommended load for the inserts, use two inserts with a trapeze type connecting member below the concrete.

C. Hanger Rods:

1. Carbon steel conforming to ASTM A 576.
2. In no case shall hanger rods less than 3/8-inch diameter be used for support of pipe 2 inches and smaller, or less than 1/2 inch diameter rod for supporting pipe 2 1/2 inches and larger.

D. Base Supports:

1. For valves and pipe fittings shall consist of concrete bases or saddles supported by pipe columns.
2. Concrete Bases:
    a. Conform to the miscellaneous detail on the drawings, if applicable.
    b. Do not use concrete base supports where the distance from the floor to the bottom of the unsupported element exceeds five feet.
    c. Concrete work as specified in Division 3 Concrete.
3. Saddles:
    a. Shall consist of ITT Grinnell Figure 258, or equal, Cast-Iron Pipe Saddle Support and pipe column designed to adequately support the applied loads with a steel base bolted to the floor and set on a one inch thick grout bedding.
    b. Consideration will be given to pipe saddles fabricated by the Contractor equal to ITT Grinnell Figure 258, or equal.
    c. Install saddles supported by pipe columns where hangers cannot be utilized.

E. Riser Clamps:

1. Support vertical runs of piping at each floor, or closer where required, with carbon steel clamps ASTM A 36 bolted around pipes and attached to the building construction.

2. Use copper plated clamps for copper tubing support.
3. Use two bolt type clamps designed for installation under insulation on insulated pipe runs.

F. Hangers:

1. Hangers fabricated malleable iron ASTM A 47 or carbon steel ASTM A 36.
2. Use coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
3. Hangers for piping 2 1/2 inches or larger shall incorporate a means of vertical adjustment after erection while supporting the load.
4. Adjustable Bank Hangers: Use carbon steel band type hangers designed for suspension on hanger rods with provisions for vertical adjustments and locking in position using supporting and locknuts. Use band hangers to support non insulated pipe.
5. Clevis Hangers for Insulated Pipe: Use carbon steel yoke and U strap type hanger designed for installation under insulation with cross bolt outside the insulation.

G. Brackets: Where piping is run adjacent to walls or steel columns, use welded steel brackets ASTM A 36.

H. Auxiliary Steel: Steel shapes used for installation of pipe hangers and supports shall conform to Miscellaneous Metal as specified in Section 05 50 00 - METAL FABRICATIONS.

I. Stainless Steel Anchors and Supports: AISI Type 304 stainless steel conforming to ASTM A 167 with No. 1 Finish.

J. Fasteners: Use types specified herein as best suited for anchoring auxiliary steel, miscellaneous metal supports, and pipe supports into structure materials at intended point of installation.

1. Screw Type Expansion Anchors: Fed. Spec. FF 325.
2. Self tapping Screws: Fed. Spec. FF 107C(2).
3. RAWL PLUGS NOT PERMITTED.
4. Anchoring devices for fastening into solid masonry or concrete shall conform to Fed. Spec. FF 325 Group II, Type **3,** Class 3 for sleeve type a anchors: McCullock KWIK BOLT, Molly PARABOLT, Phillips RED HEAD Anchors, or equal.

2.02 CORROSION PROTECTION

A. Exterior locations and interior wet or corrosive areas: Hot-dip galvanized.

B. Wet wells, chemical areas, and exposed outdoor process areas: Type 316 stainless steel supports, anchors, and hardware.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all piping in accordance with Section 40 05 00 where applicable.

3.02 INSTALLATION

A. General:

1. Install pipe supports and anchors to hold piping straight and true to line both vertically and horizontally.
2. Where thermal movement in the pipeline will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions.
3. The supporting force at each hanger shall prevent excessive stress in the pipe and connected equipment.
4. Install pipe supports anchored directly to or suspended directly from structural supports. Where pipe hangers fall between structural members use auxiliary steel supports to carry pipe hangers.

B. Spacing of Hangers and Supports:

1. General:
   a. Space hangers and supports as stated herein and in ANSI B31.1 and MSS SP 58 and SP 69.
   b. Give special consideration to spacing of hangers and supports where components such as fittings and valves impose concentrated loads.
2. Ductile Iron Pipe:
   a. Provide at least one support for each length of pipe with the hanger located adjacent to the joint.
   b. Hanger spacing should be no more than 12 feet.
   c. Support each change of direction or branch connection.
3. Copper Tubing: In accordance with following table:

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
3/8 thru 3/4	5
1	6
1-1/4	7
1-1/2 thru 2	8

4. Provide supports within 2 feet of valves, meters, and heavy fittings.

C. Anchors and Guides

1. Provide anchors to prevent movement at pumps, valves, and changes in direction.
2. Guides shall allow axial movement while restraining lateral movement.
3. Design guides for minimum lateral load equal to 20 percent of the dead load.

3.03 TESTING

A. All testing shall be done in accordance with Section 40 05 00 where applicable.

3.04 FINAL ADJUSTMENT

A. Adjust Hangers and Supports:

1. Ensure that rod is vertical under operating conditions.
2. Equalize loads.

B. Adjustable Clevis:

1. Tighten hanger load nut securely to ensure proper hanger performance.
2. Tighten upper nut after adjustment.

C. C-Clamps:

1. Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

D. Beam Clamps:

1. Tighten all set screws and lock nuts.
2. Hammer jaw firmly against underside of beam for Figure 127 only.

END OF SECTION

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DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 19

DUCTILE IRON PROCESS PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, water treatment process piping and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittals.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Section 40 05 07: Hangers and Supports for Process Piping
5. Division 40: Process Interconnections.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment.

1.02 SUBMITTALS

A. Shop Drawings

1. Comply with Section 40 05 00 – PIPE AND PIPE FITTINGS - BASIC REQUIREMENTS.
2. Certification of factory hydrostatic testing.
3. If mechanical coupling system is used, submit piping, fittings, and appurtenant items which will be utilized to meet system requirements.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Pipe:

1. All process piping and force mains, indicated on the drawings as ductile iron pipe, shall have flanged, grooved mechanical joint, or push–on joint ends of the sizes shown on the Contract Drawings, or as specified herein. The jointed sections of the piping shall be so placed as to allow maintenance and to permit units and equipment connected to the piping to be removed without disturbance to the main piping systems. If grooved type joints are used, refer to Section 2.02 below.
2. All ductile iron pipe shall be manufactured in accordance with the standards of ANSI/AWWA C151/A21.51 and ANSI/AWWA C150/A21.50. Ductile iron pipe shall be not more than 20 feet in length.
3. All underground ductile iron pipe shall be furnished with mechanical joint end design conforming to ANSI/AWWA C111/A21.11 or push-on joint ends. All joints within 25 feet of any change in horizontal or vertical alignment or tank structure shall be furnished with ductile iron retainer glands.
4. All above ground ductile iron pipe shall be furnished with flanged joint end design conforming to ANSI/AWWA C115/A21.15 and ANSI B16.1, faced and drilled 125# standard.
5. The nominal thickness of all ductile iron pipe shall not be less than ANSI/AWWA C151/A21.51 Class 50 for mechanical joints and Class 53 for grooved and flanged joints.
6. Ductile iron pipe/pipe system shall be furnished by Griffin Pipe, American Cast Iron Pipe Company, U.S. Pipe and Foundry, or equal.

B. Fittings:

1. All fittings and specials for ductile iron pipe shall be made of cast iron or ductile in accordance with ANSI/AWWA C110/A21.10 and/or ANSI/AWWA C153/A21.53.
2. Fittings and specials for underground ductile iron pipe shall be provided with mechanical joint ends or push-on ends, furnished in accordance with ANSI/AWWA C111/A21.11, except where otherwise indicated on the drawings or required by the pipe, valves or other materials being placed or installed.
3. Fittings and specials for exposed ductile iron pipe shall be flanged in accordance with ANSI/AWWA C110/A21.10 and ANSI B16.1 faced and drilled 125# standard, or grooved in accordance with AWWA C606, except where otherwise indicated on the drawings or required by the pipe, valves or other materials being placed or installed.

4. Restrained Joints: Mechanical joint restraints shall be wedge type. Furnish Megalug as manufactured by EBAA Iron, Gripper Gland as manufactured by U.S. Pipe, or equal. Set screw retainer glands will not be permitted.
5. Grooved End Joints: Provide grooved end joints in accordance with applicable section in Specification 40 05 19.
6. Flange Adapters: Flanges shall be drilled to meet ANSI B16.1 125# standard. Flange material shall be ductile iron meeting ASTM A536 Grade 65-45-12. The Gasket shall be EPDM suitable for wastewater. Set screws shall be AIAI 4140 Steel-tensile 190,000 psi minimum, heat traced to Rockwell C42-50 and zinc plated for corrosion resistance. Flange adapter shall be Uni-Flange Series 400 or equal.
7. All hardware provided for buried connections shall be 316 stainless steel.

C. Pipe Coatings:

1. The interior of all cement lined ductile iron pipe and fittings shall be sealed with a bituminous seal coat per ANSI/AWWA C104/A21.4.
2. The exterior surface of all ductile iron pipe and fittings for underground and unexposed locations shall be asphaltic coated - minimum of 1.0 mils dry film thickness per ANSI/AWWA C151/A21.10
3. The interior of all ductile iron air piping shall be unlined.
4. The interior of all ductile iron sludge pipe shall be glass lined as provided by Fast Fabricators or equal. Glass lining materials shall consist of vitreous and inorganic material applied to internal surfaces that have been prepared by blasting. Lining shall be applied in minimum of 2 coats, separately applied and fired. Items shall be exposed to maturing temperature of 1400°F. Total finished coat shall be min of 10 mils. Finished lining shall withstand strain of 0.001 inch/inch without damage of glass. Lining shall be of light bright color. Hardness shall be 5-6 on Motts scale with density of 2.5 – 3.0 grams/cubic centimeter per ASTM D-792. Glass lining shall be capable of withstanding instantaneous thermal shock of 350°F. It shall be resistant to corrosion between PH3 and PH-10 at 125°F. There shall be no loss of surface gloss after immersing sample in 8% sulfuric acid at 148°F for 10 minutes. Test according to ASTM C-283. Applicator shall have a minimum of 5 years successful experience in high temperature glass and porcelain coatings. All glass lining of pipe and fitting should be from one manufacturer.
5. The exterior surfaces of all ductile iron pipe and fittings for interior exposed installation shall be shop coated with a universal primer suitable for finish painting after installation in accordance with Section 09 91 00.

2.02 GROOVED PIPING AND FITTINGS

A. Mechanical grooved pipe couplings and fittings as manufactured by Victaulic Company shall be used on all applicable ductile iron piping systems. Grooved pipe couplings and fittings shall conform to the following requirements. Grooved end product

manufacturer to be ISO-9001 certified. All grooved joint couplings, fittings, and valves shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

B. Grooved end cast or ductile iron pipe shall be grooved in accordance with ANSI/AWWA Standard C-606. Rigid radius groove dimensions shall be utilized where flexibility is neither required nor desired. Flexible grooves shall be provided as necessary for settlement or expansion as determined and approved by the engineer.

C. Mechanical Fittings

1. Fittings shall be ductile iron conforming to ASTM A395, Grade 65-45-15 and/or ASTM A536, Grade 65-45-12, or cast iron, ASTM A48, Class 30-A, and conform to the requirements of ANSI/AWWA-C110/A21.10 or ANSI/AWWA C153/A21.53 for center to end dimensions and AWWA C-153 or ANSI 21.10/AWWA C-110 for wall thickness and ANSI/AWWA-C606 rigid radius grooving dimensions for end preparation.
2. Mechanical couplings shall be Victaulic Style 31 cast of ductile iron conforming to ASTM-395, Grade 65-45-15 and/or ASTM A-536, Grade 65-45-12, with an alkyd-phenolic primer coating (unless specified otherwise) with a FlushSeal® synthetic rubber gasket and plated nuts and bolts, 3"-36" (DN80-DN900) size range.
3. Bolts shall be heat treated plated carbon steel, track head, conforming to the chemical and physical properties of ASTM A-449 and the physical properties of ASTM A-183, minimum tensile strength 110,000 PSI (758450 kPa) or optional - bolts and nuts shall be Type 304 (or 316) stainless steel conforming to ASTM A-193, Grade B-8, (or B-8M), Class 2 or heavy hex head bolt and nut to ASTM A325 Type 3 (Cor-Ten) as an alternate for buried service.
4. Victaulic Style 341 Vic-Flange® Adapter shall be used to facilitate connection from grooved fittings or grooved pipe to flanged valves, pumps, pipe, fittings, and other Class 125 flanged components. The flange adapters shall be ductile iron conforming to ASTM-395, Grade 65-45-15 and ASTM A-536, Grade 65-45-12, 3"-24" (DN80-DN600) size range.

D. Gaskets shall be FlushSeal® design molded of synthetic rubber specially compounded to conform to ductile pipe surfaces with a short center leg which shall bridge the pipe ends offering an initial seal on the leading edge of the pipe ends. Elastomers shall have properties as designated in ASTM D-2000. Reference shall always be made to the latest published Selection Guide for Victaulic gaskets for proper gasket selection for the intended service.

1. Gasket supplied for water service from -20 degrees F to +200 degrees F (-29 degrees C to +93 degrees C) on ductile iron pipe, from 3"-36" (DN80-DN900) shall be Grade “M” halogenated butyl, with brown color code, specially compounded to conform to ductile pipe surfaces recommended for

water service within the specified temperature range plus a variety of diluted acids, oil-free air, and many chemical services. Grade “M” gaskets are UL classified to ANSI/NSF 61 for cold +86 degrees F (+30 degrees C) potable water service. Not recommended for petroleum services.

2. Lubricant gaskets in accordance with the manufacturer’s recommendations with lubricant supplied by the coupling manufacturer that is suitable for the gasket elastomer and system media. Standard of Acceptance: Victaulic ‘Vic-Lube.’

E. Grooving and grooved end dimensions shall conform to AWWA C-606, or the Victaulic published specifications.

F. Provide coatings and linings for specified piping systems in accordance with Section 09 91 00.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all piping in accordance with Section 40 05 00 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with Section 40 05 00 where applicable.

B. Pipe Joining:

1. Mechanical Joints: To make ductile iron pipe mechanical joint, position sealing gasket and gland for bolting and enter the spigot into pipe bell end until joint line is visible. Tighten bolts evenly maintaining approximate distance between gland and face of flange at all points around the socket. Do not exceed pipe manufacturer's specifications for maximum torque applied to bolts.
2. Grooved End Joints: Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the coupling manufacturer. See the latest copy of the Victaulic Field Assembly and installation instruction pocket handbook (I-300). All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.
3. Flanged Joints: Make ductile iron and steel pipe joints faced true, fitted with gaskets, and drawn up square and tight to insure full pipe flow and satisfactory seal.

C. Field Touch up of Pipe Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.
3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

D. Cutting: Do not damage interior lining material during cutting. Use abrasive wheel cutters or saws. Make square cuts and bevel and free cut ends of sharp edges after cutting.

E. Marking Pipe and Fittings: Each length of pipe and each fitting shall be marked with the weight, class or nominal thickness, and casting period cast upon them. Each length of pipe and each fitting shall be marked with the manufacturer's identification and year of manufacture in a conspicuous location. Ductile iron pipe shall have the letters "DI" or "Ductile" cast or stamped on the pipe. All required markings shall be clearly legible.

3.03 TESTING

A. All testing shall be done in accordance with Section 40 05 00 where applicable.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 31

PLASTIC PROCESS PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Section 40 05 07: Hangers and Supports for Process Piping
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 SUBMITTALS

A. Shop Drawings

1. Comply with Section 40 05 00 – PIPE AND PIPE FITTINGS - BASIC REQUIREMENTS.
2. Certification of factory hydrostatic testing.
3. If mechanical coupling system is used, submit piping, fittings, and appurtenant items which will be utilized to meet system requirements.

PART 2 - PRODUCTS

2.01 PVC SEWER PIPE AND FITTINGS

A. Polyvinyl chloride (PVC) pipe, used for sewer construction, shall equal or exceed the requirements of ASTM D3034 for 6-inch through 15-inch pipe and ASTM F679 for 18-inch through 27-inch pipe. The PVC sewer pipe shall have a minimum standard dimension ratio (SDR) of 35 and the minimum pipe stiffness, as tested in accordance with ASTM D2412, shall be 46 psi when measured under 5 percent deflection at 73 degrees Fahrenheit. Pipe shall be manufactured with integral wall bell and spigot joints in standard lengths not exceeding 20.0 feet.

B. All polyvinyl chloride (PVC) pipe and fittings 4-inch and smaller shall be SCH 40 with solvent welded connections.

C. All polyvinyl chloride (PVC) pipe and fittings shall utilize an elastomeric O-ring gasketed joint assembled in accordance with the manufacturer's recommendations. Gaskets shall have a minimum cross sectional area of 0.20 square inches and conform to ASTM F-477 specification.

D. Polyvinyl chloride wye branches, repair couplings, tee wyes, pipe stoppers and other fittings shall be manufactured in accordance with the same specifications and shall have the same thickness, depth of socket, and annular space as the pipe. PVC sewer fittings shall conform to ASTM D-3034 specification with minimum wall thickness of SDR 35 as defined in section 7.4.1. Fittings in sizes through 8" shall be molded in one piece with elastomeric joints and minimum socket depths as specified in Sections 6.2 and 7.3.2. Fittings 10" and larger shall be molded or fabricated in accordance with Section 7.11 with manufacturers standard pipe balls and gaskets. Saddle fittings shall not be acceptable. PVC material shall have a cell classification of 12454-B or C as defined in ASTM D-1784. Fittings shall be Harco or equal.

E. Polyvinyl chloride pipe shall be delivered and stockpiled in unit pallets. Stacking of pallets above 5 feet in height will not be allowed. If pipe is stockpiled for more than 30 days prior to installation in the trench, it must be suitably covered with reflective material to protect the pipe from ultra-violet rays emanating from sunlight. Do not use plastic sheets. Allow for air circulation under covering.

F. Bowed sections of pipe will be unacceptable and installation of pipe which has bowed, whether or not the bow has been corrected, will not be allowed on this project.

2.02 PLASTIC PIPE FOR POTABLE WATER

A. C900 PVC Water Main - Buried

1. Piping greater than 2-inch diameter shall be ANSI/AWWA C900 PVC pressure pipe material conforming to ASTM D1784, minimum class 150

psig, (DR18) push-on joint conforming to ASTM D3139 with elastomeric gaskets conforming to ASTM F477. The pipe shall be rated for a working pressure of at least 150 psi plus a surge allowance of at least 35 psi and shall have a minimum ultimate hydrostatic strength of 600 psi.

2. Polyvinyl chloride pipe and fittings shall be manufactured with integral wall bell and spigot joints which shall utilize a flexible O-ring rubber gasketed joint conforming to ASTM D 3139, "Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals". Pipe ends shall be beveled to accept gasketed fittings.
3. Each pipe section including bell or coupling shall be subjected to a hydrostatic test of not less than 500 psi for at least 10 seconds. Pipe shall be tested in accordance with conditions specified in ASTM D 618. Any pipe that leaks or is unable to withstand the test pressure shall be rejected. The test shall be conducted at the factory and certification stating that the test has been conducted as specified and the pipe meets all conditions of this specification shall be submitted to the Engineer.
4. Polyvinyl chloride pipe specified herein is manufactured to ductile iron pipe size. However, if adapters for connecting polyvinyl chloride pipe to ductile iron fittings and valves are necessary, they shall be of the type recommended by the pipe manufacturer. Adapters must be manufactured of material specified herein or approved by the Engineer. Furnishing and installing adapters shall be included in the unit prices bid for the pipe.
5. Mechanical Joint Fittings
    a. Compact Fittings: Ductile iron fittings shall be mechanical joint with a 350 psi rating conforming to ANSI/AWWA A21.53/C153. Mechanical joint ends shall be furnished in accordance with ANSI/AWWA A21.11/C111.
    b. Restrained Joints:
        1) Mechanical joint restraints for ductile iron pipe shall be multiple gripping wedge incorporated into a follower gland as manufactured by EBAA Iron, Inc. Model Megalug Series 1100, Uni-Flange Series 1400, or equal.
        2) Mechanical joint restraint for PVC C900 pipe shall be multiple gripping wedge incorporated into a follower gland as manufactured by EBAA Iron, Inc. Model Series 2000 PV, Uni-Flange Series 1500S, or equal.
    c. Restraint Harness:
        1) Restraint harness for ductile iron pipe shall consist of wedge action restraint ring on the spigot jointed to a split ductile iron ring behind the bell, as manufactured by EBAA Iron, Inc. Model Megalug Series 1700, Uni-Flange Series 1450, or equal. The restraint rings shall have individually actuated wedges that increase their resistance to pull-out as pressure or external force increases and rings shall be connected by thrust tie rods back to each fitting.

2) Restraint harness for C900 PVC shall consist of a split non-serrated ring used behind pipe bell with a serrated ring on plain or spigot end to grip pipe and sufficient number of bolts to connect bell ring and gripping ring as manufactured by EBAA Iron, Inc. Model Series 1600, Uni-Flange Series B90C, or equal.

6. Flange Fittings:
   a. Fittings and specials for exposed ductile iron pipe shall be flanged in accordance with ANSI/AWWA C110/A21.10 and ANSI B16.1 faced and drilled 125# standard or grooved in accordance with AWWA C606. Flange fittings shall be furnished by Griffin Pipe, U.S. Pipe and Foundry, or equal.
   b. Flange Adapters: Flanges shall be drilled to meet ANSI B16.1 125# standard. Flange material shall be ductile iron meeting ASTM A536 Grade 65-45-12. The Gasket shall be EPDM suitable for water. Set screws shall be AIAI 4140 Steel- tensile 190,000 psi minimum, heat traced to Rockwell C42-50 and zinc plated for corrosion resistance. Flange adapter shall be Uni-Flange Series 400, EBBA Iron Series 1000 E-Z, Star 400S, or equal.

B. SDR-21 PVC

1. SDR-21 pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in ASTM D 1784
2. Solvent Welded Joints: Pipe and fittings for pressure applications shall be Iron Pipe Size (IPS) conforming to ASTM D 2241 for plain-end, solvent-welded PVC pipe and ASTM D 2672 for belled-end pipe. Buried pipe shall be installed in accordance with ASTM F 1668. Solvent welded joints shall be made in a two-step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564
3. Push-on (Gasketed) Joints: Polyvinyl chloride pipe and fittings shall be manufactured with integral wall bell and spigot joints which shall utilize a flexible O-ring rubber gasketed joint conforming to ASTM F 477. Pipe ends shall be beveled to accept gasketed fitting – Joints shall conform to STM D3139

2.03 CPVC PIPE

A. CPVC pipe shall be ASTM F-441, Schedule 80.

B. Schedule 80 solvent cement socket weld-type joints shall be used on pipe runs; fittings shall be CPVC.

2.04 SCHEDULE 80 PVC PIPE AND FITTINGS AND ACCESSORIES

A. Pipe: Rigid polyvinyl chloride (PVC) used in the extrusion of Schedule 80 pipe shall be of Type I, Grade 1 compound as stated in ASTM D-1784. Schedule 80 PVC pipe shall fully meet or exceed the requirements of ASTM D1785 latest edition.

B. Joints: Socket type or Van Stone flange are indicated on the Drawings. Socket fittings per ASTM D 2467, manufactured from Class 12454 B Rigid PVC compound and solvent per ASTM D 2564. Flanged fittings per ASTM D 1784, Schedule 80, 150 pound, manufactured from Rigid PVC compounds, with soft rubber full face flat type gaskets and stainless steel bolts.

C. Use Schedule 80 pipe and solvent weld (2” and smaller) and Van Stone flange (2” and larger) unless otherwise indicated.

D. Ball Valves: True (double) union type manufactured from schedule 80 PVC with Viton O-ring seals and self-lubricating Teflon seats, Nibco Chemtrol TUB series or equal.

E. Check Valves: True (double) union type manufactured from Schedule 80 PVC with Viton O-ring seals and self-lubricating Teflon seats. Shall function equally well in horizontal or vertical position. Supply Nibco Chemtrol TUC series or equal.

F. PVC Relief Valves (Back Pressure Relief): Schedule 80 PVC all plastic with non-sticking Teflon shaft and Viton seals. Pressure range from 5-100 psi, straight relief style. Supply Plast-O-Matic DS-2 or equal.

2.05 PVC/ CPVC FLANGES

A. Flanges for PVC and CPVC piping shall be Van Stone type consisting of a solvent-welded hub with a rotating steel backup flange.

B. Gaskets shall be full-face EPDM unless chemical service requires alternate material.

C. Bolts and nuts:

1. Zinc-plated steel for dry interior locations
2. Type 316 stainless steel for wet or corrosive locations

D. PVC/CPVC flanges shall be ANSI Class 150 bolt pattern unless noted otherwise.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all piping in accordance with Section 40 05 00 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with Section 40 05 00 where applicable.

B. PVC pipe shall be installed in accordance with AWWA C 605, latest revision. Pipe and fittings shall be carefully handled and lowered into the trench. The ends of pipe shall abut against each other in such manner that there shall be no shoulder or unevenness on the inside of the main.

1. Use lubricants specified and supplied by pipe manufacturer and approved for water service for proper pipe joint installation.
2. Special care shall be taken to insure that the pipes are well bedded on a solid foundation, and any defects due to settlement shall be made good by the Contractor at his own expense. Bell holes shall be dug sufficiently large to insure the making of proper joints.
3. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Care shall be taken to prevent the pipe wall from being damaged, and any wall damage shall be repaired to the satisfaction of the Engineer by the Contractor.
4. Pipe and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. At the close of each work day, the end of the pipeline shall be tightly closed with an expansion type stopper or plug so that no dirt or other foreign substance may enter the line, and this stopper or plug shall be kept in place until pipe laying is again resumed.
5. Whenever a pipe or fitting requires cutting, to fit into the line or to bring it to the required location, the work shall be done in a satisfactory manner so as to leave a smooth end, and without extra compensation. Polyvinyl chloride pipe shall be beveled in accordance with manufacturer's recommendation before making pipe joint.
6. In jointing pipe and fittings, the Contractor shall exercise particular care to insure that the outside of the spigot and inside of the bell are entirely free of oil, tar and greasy substances to insure a tight fit.
7. All concrete required to construct buttresses behind plugs, tees, bends and other fittings and anchorages above or beneath vertical bends shall be placed as directed and/or as shown on the Drawings. Concrete shall be 3,000 psi, with Type II Portland cement.

C. PVC Flanged Connections:

1. Provide Van Stone flanges at valves, equipment connections, and where shown on the Drawings.
2. Flanges shall be installed so that the rotating backup flange allows proper alignment without placing stress on the piping or equipment.
3. Bolts shall be tightened in a star pattern and torqued in accordance with manufacturer's recommendations. Over-torquing of PVC/CPVC flanges shall not be permitted.
4. Provide full-face gaskets. Do not use ring gaskets on PVC/CPVC flanges.
5. Contractor shall re-torque flange bolts after system has been in operation.
6. Plastic flanges shall not be used to draw piping into alignment. Piping shall be properly aligned prior to bolting.

D. Field Touch up of Pipe Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.
3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

E. Cutting: Do not damage interior lining material during cutting. Use abrasive wheel cutters or saws. Make square cuts and bevel and free cut ends of sharp edges after cutting.

F. Marking Pipe and Fittings: Each length of pipe and each fitting shall be marked with the weight, class or nominal thickness, and casting period cast upon them. Each length of pipe and each fitting shall be marked with the manufacturer's identification and year of manufacture in a conspicuous location. Ductile iron pipe shall have the letters "DI" or "Ductile" cast or stamped on the pipe. All required markings shall be clearly legible.

3.03 TESTING

A. All testing shall be done in accordance with Section 40 05 00 where applicable.

B. After backfilling has been completed, all newly laid pipe and any valved section thereof shall be subject to a hydrostatic pressure test of 150 psi for a duration of two hours with the pressure measured at the highest elevation on the line. The procedure for the pressure test shall be as follows:

1. Each valved section of pipe shall be slowly filled with water, and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer and Inspection Agency.
2. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points so the air can be expelled.
3. Maintain test pressure to within 3 psi of initial test pressure, without introduction of additional pressure.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 51

COMMON REQUIREMENTS FOR PROCESS VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, water treatment process piping and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittals.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 VALVE SCHEDULE

A. Exact number of valves is dependent upon what is shown in the contract drawings. Unless shown otherwise on the Drawings, contractor to provide valves as follows:

Service	Type	Size (dia) Inches	Actuator[1]	Open / Close or Modulating[2]
Sludge	Plug Valve	4,6	M	O/C
Low Pressure Air	Butterfly Valve	4,6	M	O/C
Wastewater	Gate Valve	8	M	O/C

1. M = Manual, E = Electric, P = Pneumatic
2. O/C = Open/Close, MOD = Modulating

B. Service defined in design drawings and Section 40 05 00 – Pipe and Pipe Fitting Basic Requirements.

1.03 QUALITY ASSURANCE

A. Valve Testing:

1. The Inspector and Engineer shall be notified in advance of all tests, and all tests shall be conducted to their entire satisfaction.
2. All raw water, settled water, filtered water, and finished water piping, chemical piping, waste piping, sewer piping, and blower air piping, shall be hydrostatically tested at 50 percent over the system working pressure, but not less than 100 pounds per square inch. Prior to pressure testing, take the following precautions:
   a. Free piping of trapped air prior to testing.
   b. Do not subject equipment, piping specialties or plumbing fixtures to test pressures.
   c. Isolate all such items in lines that may be damaged by test pressures.
   d. Maintain test pressure to within 3 psi of initial test pressure, without introduction of additional pressure, until a visual examination is made of every joint and connection, but in no case less than 4 hours actual test time.
3. Drain and Vent System Tests:
   a. Hydrostatic at not less than 10 foot head of water, except when danger of freezing, then conduct tests with air pressure.

4 Compressed Air Piping – Air Testing:
   a. Pressurize the entire air system between the blower discharge and all valved outlets to 100 psig with compressed air. With the system under pressure, check each joint and connection by painting with soapy water. Remove and renew cracked pipe, fittings, and valves indicating leakage. Retest.
   b. Slowly increase the system pressure to 150 psig. Allow one hour for the system to stabilize; then re-adjust the system pressure to 150 psig. Record this gauge reading and start the test.
   c. For the system to pass the test, it must maintain 150 psig for a minimum of 2 hours with no drop in pressure.
   d. Soap test joints, fittings, and valves while the system is under test pressure. Correct all leaks and retest as often as necessary until satisfactory results are achieved.
5. Leaks and defects shall result in the pipe being repaired, replaced or otherwise remedied by the Subcontractor at no expense to the Contractor and to the complete satisfaction of the Engineer. Repair or replacement of pipe shall be accomplished when leaks become apparent and shall be completed within one month after detection of leak but prior to Contractor's final acceptance of the project.

1.04 SUBMITTALS

A. Shop Drawings and Product Data. Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of valves and piping specialties, in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

B. Contractor shall submit complete dimensional layouts of interior and exterior piping systems for approval. These layouts must be coordinated with equipment and valves to be furnished.

C. Certifications: The Contractor shall submit certifications for pipe, fittings, linings and materials to the Engineer for approval. Certifications shall state that pipe furnished complies with standards specified herein.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packing Lists: Packing lists shall accompany each pipe delivery made to the site. Absence of such list may cause refusal of shipment.

1. Packing lists shall indicate customer's order number or contract number, truck routing, type and classes of pipe, pipe diameters, weights and lengths of pipe, date of manufacturer, plant identification of the particular lots of piping contained in the shipment.
2. Submit a copy of packing lists to the Inspector or Engineer as soon as practicable after delivery of piping.

B. Handling: Exercise care not to damage exterior coatings and linings of pipes during loading and unloading operations.

1. Use lifting devices or harnesses of the type recommended by pipe manufacturers in handling pipes.
2. Do not drop pipe and pipe fittings, valves and appurtenances.

C. Storage: Store pipe, fittings, valves and appurtenances so as not to contact earth or other contaminants.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide valves of the same type and size range by same manufacturer; suitable for the intended service.

B. Markings shall be factory cast on the bonnet or body of each valve indicating manufacturer's name or mark, year of valve casting, size of valve, directional flow arrow and designation of working water pressure.

C. Valve pressure temperature ratings of not less than the design criteria applicable to system components.

D. Valves shall open to the left (counterclockwise). Valves shall be operated by nut, hand wheel, lever, floorstand, chainwheel or otherwise as indicated on the Drawings or specified herein. Operating nuts or wheels shall have cast thereon an arrow indicating the direction of opening.

E. Provide chain wheels and chains for operating overhead (5 feet or greater above finished floor) or inaccessible valves.

F. Valves buried or below floor shall be provided with stainless steel extension stem operators. Operating nut shall terminate no more than 6 inches below surface. The unsupported length of extension stems shall not exceed 10 feet. Furnish valve position indicators for all buried valves.

G. For wrench operated valves, provide at least one wrench for each type and size valve except where valves are in convenient groups; supply one wrench for each four valves.

H. Valve ends shall be as indicated on the Drawings or specified herein and unless indicated otherwise shall conform to the following:

1. Grooved: AWWA C 606.
2. Flanged: ANSI B16.1 & AWWA C110/A21.10
3. Mechanical: ANSI/AWWA C111/A21.11

I. Valve flanges shall conform to ANSI B16.10, 125# and 250# Class as applicable.

J. Cast-iron valve material shall meet or exceed the requirements of ASTM A-126, Class B.

K. Valve Tags and Directory:

1. Provide valve tags for all valves.
2. Tags shall be made from a plastic laminate of heavy plastic with a brass eyelet in the corner and shall indicate the valve number and fluid in the pipe as provided by the Contractor and/or Engineer.
3. Tags shall be fastened to each valve with a brass chain.
4. Tags to be made by Seton Name Place Company, New Haven Connecticut; W.H. Brady Company; or equal.

5. A preliminary valve directory shall be submitted by the Contractor prior to fabrication. A final valve directory shall be provided, listing all valve numbers, the valve function, and location. The directory shall be typewritten and framed with a glass cover and delivered to the Owner after inspection and approval by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Field Measurement:

1. The Drawings are in general indicative of the work, with symbols and notations for clarity. However, the drawings are not an exact representation of all conditions involved, therefore, layout piping to suit actual field measurements. No extra compensation will be made for work due to differences between indicated and actual dimensions.
2. Submit details of proposed departures necessitated by field conditions or other causes to the Engineer for approval.

B. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Engineer shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation unless all required precautions as to the minimum length of open trench and promptness of backfilling are observed.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Valve painting shall be completed in accordance with Division 09 – Finishes

C. Setting Buried Valves:

1. Locate valves installed in pipe trenches where buried pipe indicated on Drawings. Place valves on firm footing in trenches to prevent settling and excessive strain on connection to pipe.
2. Se valve and valve boxes plumb. Place valve boxes directly over valves with top of box being brough to surface of finished grade.
3. Install valves in the closed position.
4. After installation, backfill up to top of box for a minimum distance of 4 feet on each side of the box.

D. Support exposed and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.

E. For grooved coupling valves, install rigid type couplings or provide separate support to prevent rotation of valve from installed position.
F. For threaded valves, provide union on one side within 2 feet of valve to allow valve removal.

G. Install valves accessible for operation, inspection, and maintenance.

3.04 DEFECTS TO BE CORRECTED

A. If, at any time before the expiration of the guarantee period under this contact, any broken valve, or any other defects are found in any of the lines or in any of the appurtenances, the Contractor shall cause the same to be removed and replaced by proper material and workmanship, without extra compensation for the labor and material required, even though such injury or damage may not have been due to any act, default, or negligence on the part of the Contractor. All materials shall be carefully examined by the Contractor for defects prior to installation, and any found defective shall be rejected for use.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 52

MISCELLANEOUS VALVES & APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, water treatment process piping and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 SUBMITTALS

A. Shop Drawings

1. Comply with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

A. Contractor shall submit shop drawings for valves in accordance with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

1. Shop drawings shall include manufacturer’s written instructions for delivery, handling, storage, installation, and start-up.

B. Contractor shall submit operation and maintenance manuals in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

PART 2 - PRODUCTS

2.01 GENERAL

A. For service in potable water applications or water that will be treated to become potable, materials and equipment shall be in conformance with NSF/ANSI 61.

2.02 MISCELLANEOUS APPURTENANCES

A. Air Release, Air and Vacuum Valves:

1. Wastewater: Sewage air and vacuum valve body shall be Stainless Steel 316 with 2-inch flange. Provide A.R.I. Flow Control Accessories, Ltd. D-020, H-Tec USA Model 986, or equal.

B. Needle Valves:

1. Needle valves shall be bronzed bodied, sized, and located as shown on the Contract Drawings. Needle valves shall be of the globe type as manufactured by Powell, Crane, or equal.

C. Post & Yard Hydrants:

1. Yard hydrants shall be non-freeze, automatic draining, backflow protected, exposed head hydrants with 3/4-inch hose connections provided with 3/4-inch quick disconnect male hose adapters. Yard hydrants shall be Model Y2 as manufactured by Woodford Manufacturing Company or equal.
2. Post Hydrant shall be self-draining, non-freezing, compression type with 2-3/16” main valve opening. Hydrant shall have permanently attached handwheel. Post hydrant shall be Model Eclipse No.2 Post Hydrant as manufactured by John C, Kupferle Foundry Company or equal.

D. Thermoplastic Ball Valves

1. Thermoplastic ball valves shall be provided on chemical and polymer piping lines, and other plastic piping lines, except at ends of chemical fill lines.
2. All thermoplastic ball valves furnished are to be of the true union-full bore design and manufactured of PVC or CPVC material (to match piping system) with Teflon seats and Teflon seals.
3. Pipe, fittings, and valves are to be of one manufacturer and of the same specified material in order to assure compatibility of system components.
4. All thermoplastic ball valves shall be equipped with snap on, snap off handles.
5. Outdoor or submerged valves shall be have UV inhibitors.
6. Manufacturers – Asahi; Hayward, or equal.

E. Quick-Disconnect Fittings:

1. For Chemical Fill Connections
   a. All chemical fill lines shall terminate in “quick-disconnect” adapters as shown on the Contract Drawings. “Quick-disconnect”, lockable duct caps and chains shall be attached to adapters.
   b. An engraved, laminate plastic sign shall be permanently mounted on building wall adjacent to each connection, giving chemical name.
2. For General Use
   a. All connections shown in the contract drawings with “quick-disconnect” adapters shall be lockable and provided with chains
3. Adapters, dust caps, and chains shall be solid brass or bronze, Ever-Tite Part F, Kam-loc; or equal. If brass or bronze are incompatible with the material being carried in pipe, adapters, dust caps, and chains shall be made of suitable chemical-resistant material by Dixon Valve and Coupling. Co. or equal.

F. Valve Boxes:

1. Valve boxes shall be cast iron, screw type, with 5 1/4 inch shaft and extra deep lid, having the word "water", "sewer" or “sludge”, as appropriate, cast thereon. Valve boxes shall be 3 piece type.
2. Boxes shall be adjustable within the limits necessary to provide for the setting depths required and shall have base sizes adequate for the valves to be covered.
3. Boxes shall be as manufactured by Mueller Company, or equal.
4. The valve box shall be carefully placed and set at right angles to the main. 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 finished grade. (The flange at the bottom of the top section shall rest upon planks which shall extend into solid ground on each side of the trench for a minimum of 8 inches). In tamping the backfill around the valve, special care shall be taken so as to avoid settlement.

G. Service Saddles:

1. Saddles for use with AWWA C900 PVC pipe shall be stainless steel as manufactured by Power Seal, Model 3412.

H. Corporation Stops:

1. Shall have AWWA thread pattern on inlet side.
2. Outlet connection type shall coordinate with water service line material.
3. Furnish Mueller #H-15008 or equal.

I. Curb Stops and Boxes:

1. Curb stops and boxes shall be provided as indicated on the drawings. Valves shall be heavy cast bronze with Buna-N seats and seals.
2. Provide shut off rod with tee handle of sufficient length to allow underground valve operation.
3. Curb stops and boxes shall be as manufactured by Ford Meter Box Company, Mueller Company, or equal.

J. Wall Castings and Sleeves:

1. Wall pipes shall be Type 304 stainless steel for sizes and connections of pipe types as indicated on the Contract Drawings, with center flanged water stop welded integral with the pipe barrel to be cast into the concrete at the midpoint. Unless specifically indicated otherwise, each end of the wall pipe shall protrude a sufficient distance from each face of the finished concrete into which it is cast to allow adequate clearance for tools, bolts and nuts required to complete the type of pipe connection indicated. Wall pipes shall be rated for a working pressure of 250 psi.
2. Wall sleeves and floor sleeves in cast-in-place concrete shall be fabricated from type 304 Stainless Steel with a welded 2 inch wide intermediate anchoring flange of 3/16 inch stainless steel midway on the sleeve or provide sleeve product similar to Model SWSW as manufactured by Advance Products & Systems, LLC, or equal. Pipes within wall sleeves shall be sealed with Link-Seal by Thunderline Corp., or equal, with stainless steel nuts and bolts. Pipes within floor sleeves shall be sealed with oakum and lead.

K. Pipe Couplings:

1. Unless otherwise indicated, ductile iron pipe couplings shall be made with a Style 38 coupling as manufactured by Dresser Manufacturing Division, Rockwell Product Number 411, or equal.
2. The sleeve type couplings shall be designed to fit accurately the outside diameters of the pipe which they are to connect. Couplings shall be furnished complete with bolts, nuts, and gaskets. Gaskets shall be of molded rubber, Dresser plain Grade 27, or equal. Middle rings for couplings used on ductile iron pipe shall be at least 3/8 inch thick. Middle rings shall be not less than 7 inches wide. Couplings shall be installed in strict accordance with the manufacturer's recommendations.

L. Floor Drains:

1. See contract drawings.

M. Backflow Preventers:

1. Backflow preventer shall meet the requirements of AWWA C-511 and operate under the reduced pressure principle that water will not flow from a zone of lower pressure to one of higher pressure. The backflow preventer shall be complete with isolation valves.
2. Drain outlet of backflow prevention device should be piped down to the nearest drain leaving a sufficient air gap as required by code.
3. Backflow preventer shall be Watts Regulator Co. Series LF009 or equal.

N. Hose Bibs:

1. Frost-proof ¾-inch bronze sillcock with hose outlet male threads conforming to ANSI B2.4, integral vacuum breaker and self-draining feature. Hose bibs shall be Nibco FIG. 95C frostproof- sillcok, or equal. Length to suit wall construction.

O. Strainers:

1. General
   a. Strainers shall be Y-type constructed of PVC or CPVC material (to match piping system). Strainers furnished are to be of the true union-full bore design and include EPDM O-ring material. Strainer shall have an easily removable cover and screen made of stainless steel.
   b. Provide valved and capped blowdowns in each strainer.
   c. Furnish Hayward YS Series Y-Strainers for sizes 4” and smaller or equal. Provide spare strainer screen for each strainer installed.

P. Cleanouts:

1. Provide cleanouts where shown constructed of the same materials specified for the pipelines and fittings to be connected.
2. Provide watertight, leak proof plug or cap at the end of the riser. Provide cast iron frame and cover over riser pipe suitable for use in paved, traveled roadways.

Q. Wall Seal:

1. Hydrostatic seal designed to seal opening between pipes and a true wall opening. Use Link-Seal by Thunderline Corp. or equal. Caulking, mastic sealants, lead/oakum are not equal.

R. Flexible Coupling:

1. Flexible coupling shall consist of an inner tube, body and outer cover and shall have flanged ends.

2. Body shall consist of fabric and rubber compounds reinforced with steel wire for strength.
3. Body materials shall be compatible with the tube and suitable for the specified service conditions.
4. Couplings shall be of arch type and must have a cover formed from rubber suitable to external service.
5. Furnish Red Valve Co. Redflex Type J-1, General Rubber Co. Style 1015 Maxi-Joint or equal. All Flexible couplings shall be provided with stainless steel restraining control rods.

S. Pipe Couplings/Adapters:

1. General:
   a. Coupling linings for use in potable water systems shall be in conformance with NSF 61.
   b. Couplings shall be rated for working pressure and not less than 150 psi.
   c. Couplings shall be lined and coated with fusion-bonded epoxy in accordance with AWWA C213.
   d. Unless thrust restraint is provided by other means, couplings shall be harnessed in accordance with requirements of AWWA Manual M11, and restrained with retainer bar or ring welded to pipe end, or as shown on Drawings.
   e. Sleeve type couplings shall conform to AWWA C219 and shall be hydraulically expanded beyond minimum yield for accurate sizing and proofing of tensile strength.
2. Flexible Sleeve Type Coupling:
   a. Manufacturers and Products:
      i. Steel Pipe:
         (a) Dresser Piping Specialties; Style 38.
         (b) Smith-Blair, Inc.; Style 411.
         (c) Or Equal
      ii. Ductile Iron Pipe:
         (d) Dresser Piping Specialties; Style 253.
         (e) Smith-Blair, Inc.; Style 411.
         (f) Or Equal
3. Reducing and Transition Coupling for Steel Pipe:
   a. Manufacturers and Products:
      i. Dresser Piping Specialties; Style 62.
      ii. Smith-Blair, Inc.; Style 413 or 415.
      iii. Or Equal
4. Flanged Coupling Adapter:
   a. Shall only be used where construction does not permit use of welded flanges or approved by engineer.
   b. Manufacturers and Products:
      i. Steel Pipe:

(a) Dresser Piping Specialties; Style 128.
(b) Smith-Blair, Inc.; Style 913.
(c) Or Equal

ii. Ductile Iron Pipe:
(a) Dresser Piping Specialties; Style 128.
(b) Smith-Blair, Inc.; Style 912.
(c) Or Equal

5. Restrained Flange Adapter:
   a. Shall only be used where construction does not permit use of welded flanges or approved by engineer.
   b. Thrust Restraint:
      i. Provide hardened steel wedges that bear against and engage outer pipe surface and allow articulation of pipe joint after assembly while wedges remain in their original setting position on pipe surface.
      ii. Products employing set screws that bear directly on pipe will not be acceptable.
   a. Manufacturer and Product:
      i. EBAA Iron Sales Co.; Mega-Flange.
      ii. Smith-Blair, Inc.; Style 911 or 920.
      iii. Or Equal
6. Dismantling Joints:
   a. Pressure Rating:
      i. Minimum working pressure rating shall not be less than rating of the connecting flange.
      ii. Proof testing shall conform to requirements of AWWA C219 for bolted couplings.
   b. Manufacturers and Products:
      i. Dresser Piping Specialties; Style 131.
      ii. Smith-Blair, Inc.; Style 911 or 926
      iii. Or Equal

T. Pressure Gauges

1. Furnish and install two (2) pressure gauges, one on the suction piping and one on the discharge piping of each pump, and also where indicated on the contract drawings, unless otherwise directed by the Engineer. Subcontractor shall provide and install ball valves/stop cocks for isolation of each gauge to allow maintenance and also supply piping as necessary to make gauges visible from walkways or floor level.
2. Discharge side pressure gauges shall have a measurement range from zero to twice the pump TDH specified converted to psi and shall read in psi. Other pressure gauges shall have measurement ranges as indicated in the contract drawings in psi
3. Suction side compound gauge shall have a measurement range of 30”Hg-30psi.

4. All gauges shall have a lower connection properly sized to match pump gauge taps where applicable. Dial size shall be 3-1/2" minimum.
5. Each gauge used, unless otherwise specified to be protected by a gauge isolation ring, shall be protected by a diaphragm seal and stop cock with flushing connection. Provide Ashcroft Type 101 or equal. For chemical feed applications refer to Section 11345.
6. Gauges shall be Ashcroft Duralife 1009-XLL Series with "Plus" performance option or equal.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all valves in accordance with Section 40 05 51 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with the following sections where applicable:

1. Section 01 87 13 – Equipment General Provisions.
2. Section 40 05 00 – Pipe and Pipe Fittings – Basic Requirements.
3. Section 40 05 51 – Common Requirements for Process Valves.

B. Install valves in accordance with the Contract Documents and manufacturer's written instructions. In even of conflict between the Contract Documents and manufacturer's written instructions, obtain written interpretation or clarification from Engineer.

C. Field Touch up of Valve Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.
3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

3.03 Testing

A. All testing shall be done in accordance with Section 40 05 51 where applicable.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 61

GATE VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, water treatment process piping and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 SUBMITTALS

A. Comply with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

B. Shop Drawings and Product Data. Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of valves and piping specialties, in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

C. Contractor shall submit complete dimensional layouts of interior and exterior piping systems for approval. These layouts must be coordinated with equipment and valves to be furnished.

D. Certifications: The Contractor shall submit certifications for pipe, fittings, linings and materials to the Engineer for approval. Certifications shall state that pipe furnished complies with standards specified herein

PART 2 - PRODUCTS

2.01 GENERAL

A. For service in potable water applications or water that will be treated to become potable, materials and equipment shall be in conformance with NSF/ANSI 61.

2.02 GATE VALVES

A. Valves 2” and larger:

1. Gate valves shall be iron body, bronze mounted, resilient seated wedge type in accordance with AWWA C509 and these specifications.
2. Valve bodies and bonnets shall be cast iron. Valve hand wheels, stuffing boxes and wedges shall be ductile iron, ASTM A536. The wedge shall be fully encapsulated with synthetic rubber for the resilient seat. The wedge shall be symmetrical and seal equally well with flow in either direction. There shall be no exposed metal seams, edges or screws within the waterway when the valve in the fully closed position. Tongue and groove guides shall be provided on the sides of the gate and in the body to keep the gate centered between the seats throughout its length of travel.
3. Valve stems shall be bronze in full compliance with Section 4.7 of AWWA C509. Design of the stuffing box shall permit repacking while valve is fully open and under line pressure.
4. Valve interior and exterior shall be fully epoxy coated in compliance with AWWA C550.
5. All gate valves shall be rated for 200 psi working pressure.
6. Unless otherwise indicated or required, valves for above ground ductile iron pipe shall have flanged ends in accordance with ANSI B16.1, Class 125. Provide hand wheel operators.
7. Acceptable Manufacturer: Mueller 2360 Series; Kennedy Valve Manufacturing Company, Inc; or approved equal.

B. Operators:

1. Manually operated gate valves 6 inches and larger shall have geared operators and shall be provided with hand wheels or chain wheels. All manually operated valves located higher than 5 feet above the floor, except those provided with extension rods for operating from above shall be chain operated, with the chain extending to within 5 feet of the floor. All hand wheel operated valves shall open with counterclockwise rotation of the wheel. For valves located in horizontal pipes, the valve and operator shall be arranged such that when the valve is open, the plug shall be located above the horizontal centerline of the pipe.

C. Valves Smaller Than 2":

1. Gate valves on ferrous piping shall be IBBM designed for 150# W.O.G. Stockham Catalog No. B-105, Kennedy Fig. 525 screwed ends, or equal.
2. Gate valves on non-ferrous piping (copper) shall be soldered ends, bronze body, Nibco S-111, Stockham B-108, or equal.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all valves in accordance with Section 40 05 51 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with the following sections where applicable:

1. Section 01 87 13 – Equipment General Provisions
2. Section 40 05 00 – Pipe and Pipe Fittings – Basic Requirements
3. Section 40 05 51 – Common Requirements for Process Valves

B. Install valves in accordance with the Contract Documents and manufacturer's written instructions. In even of conflict between the Contract Documents and manufacturer's written instructions, obtain written interpretation or clarification from Engineer.

C. Field Touch up of Valve Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.
3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

3.03 Testing

A. All testing shall be done in accordance with Section 40 05 51 where applicable.

B. Contractor shall, to extent practical, verify proper and free operation of each installed check valve.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 62

PLUG VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install plug valves complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 SUBMITTALS

A. Comply with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

B. Shop Drawings and Product Data. Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of valves and piping specialties, in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.

C. Contractor shall submit complete dimensional layouts of interior and exterior piping systems for approval. These layouts must be coordinated with equipment and valves to be furnished.

D. Certifications: The Contractor shall submit certifications for pipe, fittings, linings and materials to the Engineer for approval. Certifications shall state that pipe furnished complies with standards specified herein

PART 2 - PRODUCTS

2.01 GENERAL

A. For service in wastewater, sludge, and grit applications.

2.02 PLUG VALVES

A. 3” and larger:

1. General:
    a. Valves shall be of the non-lubricated, eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the Drawings. Flanged valves shall be faced and drilled in accordance with the ANSI B 16.1 Class 125/150 lb. standard.
    b. All plug valves for the entire plant shall be furnished by one manufacturer.
    c. The minimum port area thru the valve shall be at least 100% of the full pipe area.
    d. Flanged Valves 6 inches and larger and all buried mechanical joint valves shall be gear operated to allow for proper plug orientation.
    e. Valve bodies shall be of ASTM A-126 Class B cast iron in compliance with AWWA C507-73 Section 5.1. All exposed nuts, bolts, springs, washers, etc. shall be stainless steel or zinc plated.
    f. Valve pressure ratings shall be as follows and shall be established by hydrostatic test as specified by ANSI B16.1.1967. Pressure ratings shall be 175 psi for valves through 12 inches. Valves shall be capable of providing drip-tight shut-off up to the full rating with pressure in either direction.
    g. All plug valves shall be provided with a valve position indicator which can be read from the floor level.
    h. Unless otherwise indicated or required, underground (buried) plug valves shall have mechanical joint ends or grooved ends. Provide stainless steel extension stem, valve box and cover for each valve. Operating nut shall be extended to within 6 inches of top of valve box. Underground valves shall be given a protective outside coating of coal-tar epoxy, minimum 75 percent solids by volume, to a dry film thickness of 8 mils minimum.
    i. When grooved end valves are used for buried valves, a plain end/grooved end spool piece must be provided to transition from mechanical joint pipe to grooved end valve. Grooved couplings shall be furnished with 304 stainless steel nuts and bolts.
    j. Plug valves shall be DeZurik, Pratt, or equal.
2. Plug:
    a. The plug shall be of one piece construction and shall be capable of withstanding the full pressure rating of the valve in either direction

without the use of structural ribs that extend beyond the profile of the plug.

b. The plug shall be covered with a resilient neoprene suitable for use in sewage, and no metal part of the plug shall be exposed to sewage.

3. Seats:
   a. Valves shall be furnished with corrosion resistant, non-ferrous metal seats which comply with AWWA C507-73, Section 7, Paragraph 7.2.
   b. Seats shall be raised so that the plug does not come in contact with the iron body of the valve when the plug is in the closed position.
4. Bearings:
   a. Valve plugs shall be furnished with replaceable, sleeve type 300 series stainless steel or bronze bearings on the upper and lower journals.
   b. Bearings shall be designed not to exceed a stress of 1/5 of the compressive strength of the material used and the stress shall not exceed 2,000 psi.
5. Shaft Seals:
   a. The plug shaft seal shall utilize a stuffing box and split pull-down packing gland, or other means.
   b. The plug shaft seal shall be adjustable and completely replaceable without disturbing or removing the operator or actuator from the valve.
   c. The plug shaft seal shall be capable of being replaced or repacked while under line pressure with the valve in the open position.
   d. Any leakage thru the plug shaft seal shall be allowed to drain away from the valve and shall not be allowed to enter the operator.
6. Operators:
   a. Manually operated plug valves 6 inches and larger shall have geared operators and shall be provided with hand wheels or chain wheels. All manually operated valves located higher than 5 feet above the floor, except those provided with extension rods for operating from above shall be chain operated, with the chain extending to within 5 feet of the floor. All hand wheel operated valves shall open with counterclockwise rotation of the wheel. For valves located in horizontal pipes, the valve and operator shall be arranged such that when the valve is open, the plug shall be located above the horizontal centerline of the pipe.
   b. Plug valves shall be provided with valve position indicators. Where required valve operators shall have limit switches to indicate fully open or fully closed switch shall be in NEMA 4 enclosure and shall operate on 120V, single phase service.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all valves in accordance with Section 40 05 51 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with the following sections where applicable:

1. Section 01 87 13 – Equipment General Provisions
2. Section 40 05 00 – Pipe and Pipe Fittings – Basic Requirements
3. Section 40 05 51 – Common Requirements for Process Valves

B. Install valves in accordance with the Contract Documents and manufacturer's written instructions. In even of conflict between the Contract Documents and manufacturer's written instructions, obtain written interpretation or clarification from Engineer.

C. Field Touch up of Valve Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.
3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

3.03 Testing

A. All testing shall be done in accordance with Section 40 05 51 where applicable.

B. Contractor shall, to extent practical, verify proper and free operation of each installed check valve.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 64

BUTTERFLY VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to gravity flow piping, pressure flow piping, water treatment process piping and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable.
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 SUBMITTALS

A. Shop Drawings

1. Comply with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

A. Contractor shall submit shop drawings for valves in accordance with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

1. Shop drawings shall include manufacturer’s written instructions for delivery, handling, storage, installation, and start-up.

B. Contractor shall submit operation and maintenance manuals in accordance with Section 01 78 23 – OPERATION AND MAINTENANCE MANUALS.

PART 2 - PRODUCTS

2.01 GENERAL

A. For service in potable water applications or water that will be treated to become potable, materials and equipment shall be in conformance with NSF/ANSI 61.

2.02 BUTTERFLY VALVES

A. Water Service: Butterfly valves shall meet or exceed AWWA C504, cast iron body, neoprene rubber seated. The mating material for the resilient seat shall be stainless steel, 200 psi pressure rated.

B. Valve Position Indicator: Notch-plate level throttling handles for valves 6-inch size and smaller. Heavy duty manual actuators for valves larger than 6 inches.

C. Operators:

1. Floor stand operators shall be standard pattern non-rising stem, indicating type and manufactured by Clow, or equal.
2. Provide necessary accessories for mounting and proper operation of floor stand operators where indicated on contract drawings.

D. Butterfly valves shall be manufactured by:

1. Process Air Service: Dezurik BOS-CL, or equal.
2. Water/Wastewater Service: Dezurik BAW, or equal.

E. Where indicated on the drawings, provide an electric actuator for operating the provided butterfly valve:

1. Electric actuator shall conform to the requirements of AWWA Standard C-540. Actuators shall contain motor, gearing, manual override, limit switches, torque switches, drive coupling, and integral motor controls where required. The motor shall be specifically designed for actuator service.
2. The motor shall be of the induction type with Class F insulation and protected by means of thermal switches imbedded in the motor windings. Motor enclosure will be totally enclosed, non-ventilated. Motors will be capable of operating on 208v/3ph/60hz power on a 20-amp circuit. Actuator housing shall be NEMA type 4 (watertight) and suitable for short-term submersion in water to a depth of 8 feet for 30 minutes. All gearing shall be grease lubricated and designed to withstand the full stall torque of the motor.

3. Manual operation shall be available by means of a handwheel. Return from manual to electric operation will be automatic upon motor operation. A seized or inoperable motor shall not prevent manual operation.
4. Limit switches will be furnished at each end of travel. Limit switch adjustment will not be altered by manual operation. Limit switch drive shall be counter gear. Limit switches must be capable of quick adjustment requiring no more than five (5) turns of the limit switch adjustment spindle. One set of normally open and one set of normally closed contacts will be furnished and available for use by the plant control system at each end of the travel where indicated. Contact shall be of silver and capable of reliably switching a low voltage DC source from the control system furnished by others.
5. Mechanically operated torque switches shall be furnished at each end of travel. Torque switches will trip when the valve load exceeds torque switch setting. The torque switch adjustment device must be calibrated directly in engineering units of torque. All wiring shall be terminated at a plug and socket connector. Actuators shall be capable of operating in an ambient temperature range of -20 to 175 degrees F.
6. Mechanical dial position indicator will be furnished on all valves.
7. All actuators will be furnished with integral motor controls consisting of reverse starters, control transformer, phase discriminator, monitor relay, positioner, “open-stop-close” pushbuttons, “local-off-remote” selector switch in addition to red and green indicating lights. The positioner shall be capable of accepting 4-20 mADC signal from the controller and positioning the valve by comparing the command signal with the present valve positions as indicated by the feedback potentiometer mounted inside the actuator. The positioner shall be field adjustable to fail in the “open”, “closed”, or “last” position on loss of 4-20 mADC command signal. Actuator shall include feature for position feedback to plant control system.
8. All actuators shall be Model No. SAR14.2 as manufactured by AUMA Actuators Inc., of Pittsburgh, PA.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all valves in accordance with Section 40 05 51 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with the following sections where applicable:

1. Section 01 87 13 – Equipment General Provisions
2. Section 40 05 00 – Pipe and Pipe Fittings – Basic Requirements
3. Section 40 05 51 – Common Requirements for Process Valves

B. Install valves in accordance with the Contract Documents and manufacturer's written instructions. In even of conflict between the Contract Documents and manufacturer's written instructions, obtain written interpretation or clarification from Engineer.

C. Field Touch up of Valve Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.
3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

3.03 TESTING

A. All testing shall be done in accordance with Section 40 05 51 where applicable.

B. Contractor shall, to extent practical, verify proper and free operation of each installed butterfly valve.

END OF SECTION

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 05 66

CHECK VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: Contractor shall furnish and install piping systems complete with valves and other appurtenances as shown on the Drawings and in accordance with this Specification. This includes but is not limited to: gravity flow piping, pressure flow piping, wastewater treatment process piping, sludge piping and force mains.

B. Contractor shall review Sequence of Operation to verify the system is functioning properly and can meet all requirements specified.

C. Related Work Specified Elsewhere:

1. Section 01 33 00: Submittal Procedures.
2. Section 31 23 18: Utility Excavation, Backfill and Compaction.
3. Section 31 23 19: Dewatering.
4. Section 09 91 00: Paints.
5. Division 40: Process Interconnections, where applicable.
6. Division 43: Process Gas and Liquid Handling, Purification and Storage Equipment, where applicable
7. Division 46: Water and Wastewater Equipment, where applicable.

1.02 SUBMITTALS

A. Shop Drawings

1. Comply with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

A. Contractor shall submit shop drawings for valves in accordance with Section 40 05 51 – COMMON REQUIREMENTS FOR PROCESS VALVES.

1. Shop drawings shall include manufacturer’s written instructions for delivery, handling, storage, installation, and start-up.

B. Contractor shall submit operation and maintenance manuals in accordance with Section 01 33 00.

PART 2 - PRODUCTS

2.01 GENERAL

A. For service in potable water applications or water that will be treated to become potable, materials and equipment shall be in conformance with NSF/ANSI 61.

2.02 SWING CHECK VALVES

A. Swing Check valves shall meet the requirements of AWWA C508.

B. Swing Check valves 2” in Diameter and Larger (Grooved or Flanged):

1. Designed for a minimum working water pressure or 150 psi.
2. Iron body, bronze mounted, full opening swing check type with bolted cover, stainless steel hinge and malleable iron clapper arm.
3. Disc of cast iron with bronze seat ring.
4. Valves less than 10 inches furnished with outside lever and weight.
5. Acceptable Manufacturers: Kennedy Valve Manufacturing Company, Inc.; Clow Corporation; or equal.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare all valves in accordance with Section 40 05 51 where applicable.

3.02 INSTALLATION

A. Install all piping in accordance with the following sections where applicable:

1. Section 01 87 13 – Equipment General Provisions
2. Section 40 05 00 – Pipe and Pipe Fittings – Basic Requirements
3. Section 40 05 51 – Common Requirements for Process Valves

B. Install valves in accordance with the Contract Documents and manufacturer’s written instructions. In even of conflict between the Contract Documents and manufacturer’s written instructions, obtain written interpretation or clarification from Engineer.

C. Field Touch up of Valve Coating:

1. Prior to placement of coated pipe touch up chipped, cracked or abraded pipe surfaces with two coats of the previously specified coating material.
2. Bring coating materials for field touch up to job site in original sealed and labeled containers.

3. Subcontractor shall submit to the Engineer, immediately upon completion of field applied coating, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.
4. In addition to field touch up of pipe surfaces, thoroughly cover completed pipe joints with pipe coating material.

3.03 TESTING

A. All testing shall be done in accordance with Section 40 05 51 where applicable.

B. Contractor shall, to extent practical, verify proper and free operation of each installed check valve.

END OF SECTION

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DIVISION 40 – PRIMARY CONTROL DEVICES

SECTION 40 90 10

INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General system integration requirements.

B. System integration overview.

1.02 RELATED REQUIREMENTS

A. Division 26 – ELECTRICAL

B. Section 40 95 13 - Process Control Panels and Hardware.

C. Section 40 95 33 - Process Control Networks.

1. Fiber Optic Cable.

D. Section 40 96 00 - Process Control Software.

1.03 DEFINITIONS

A. GC: General Contractor.

B. SCADA: Supervisory Control and Data Acquisition.

C. SI: System Integrator.

1.04 SUBMITTALS

A. The submittal requirements listed in this section are additional requirements to those listed in other sections of these specifications and do not release the contractor from any requirements listed in other sections.

B. Submit catalog cuts and shop drawings for materials and equipment. Electrical shop drawings shall include:

1. Terminal identification diagrams and schedules.
2. Point-to-point interconnection diagrams.
3. Single line and elementary wiring diagrams, for all power, signal, control and lighting systems, together with panel layout drawings.
4. Description of Operation.

C. The system integrator shall be subject to approval by the Owner.

D. The system integrator shall meet the following minimum requirements:

1. Actively involved in the control integration for control systems for a period of at least five years.
2. Actively involved in the design and installation of Ethernet local area networks.
3. Experienced in the installation, configuration, and programming of PC based SCADA software using the specified software.
    a. The system integrator shall have provided these services for not less than two major projects, using the specified SCADA software, within the last 5 years.
    b. This experience shall be documented by submitting two references, complete with project descriptions, services provided, contact names and phone numbers, for projects which included not less than 5 personal computers on a standard local area network using the specified SCADA software to monitor and control plant processes through programmable logic controllers.
    c. Each of these systems shall be for a system with not less than 100 points.
4. Experienced in configuring and programming PLCs for industrial processes, such as a pumping station, including PID control.
    a. The system integrator shall have provided these services for not less than two major projects within the last 5 years.
    b. This experience shall be documented by submitting two references, complete with project descriptions, services provided, contact names and phone numbers, for projects which included multiple PLCs with not less than 100 points of I/O.

E. Submit the following information necessary to determine the adequacy of the system integrator.

1. A detailed experience list of at least five control systems assembled and programmed by the system integrator. Include project descriptions, contact names and phone numbers in the list.
    a. List shall include at least one control system upgrade of similar size and scope to this project.
2. A description of the system integrator’s capabilities. Include a listing of personnel who shall work on this project, test equipment available, and facility size and layout.

3. All other references, resumes, and other information required to document that the proposed system integrator meets all requirements of the contract specifications and is capable of providing all required services.
4. Provide a copy of the letter or stamp used to review and approve the submitted control equipment and designs of other sections of this specification.

F. The Contractor shall submit an expended initial schedule to the Engineer for approval showing all the work specified in this section. The contractor shall adjust the schedule as per the comments of the Engineer and resubmit the schedule for final approval by the Engineer.

G. Programming:

1. Submit detailed description of all proposed control equipment programming prior to delivery to the site. The submittal shall include:
    a. A tabular listing of all I/O points.
    b. Written functional description, including:
        1) Listing of the input signals, including a reference to the monitored instruments and devices.
        2) Listing of the output signals, including a reference to the controlled devices
        3) Listing of status tags and calculated values interfacing with all other plant control systems, including existing controllers and control systems specified in other sections and divisions of this Contract.
        4) A description of the control functions generating the output signals and calculated values
        5) Submit a Power-On, Start-Up sequence.
        6) Provide a state sequence table to indicate the state of each output under normal sequencing of a filters.
    c. Preliminary program listings
    d. OIT panel graphics
    e. Any programming manuals or other documents required to interpret the program listings.

H. Testing Plan:

1. Detailed step-by-step test procedures to demonstrate all functions and features of each component of the control system.
2. These test procedures shall cover all control and communication equipment and materials specified under other sections of these specifications plus any additional items required to document that a complete and fully functional system has been installed.

3. Submit a detailed testing plan and procedure for each I/O data point and calculated value, including test forms.
4. Refer to TESTING subsection in Part 3 of this specification for additional requirements.
5. Test forms to document completion of field tests with written procedures, expected results, spaces for entry of actual results, spaces for comments, and spaces for sign off by the contractor, system integrator, and Plant representative.

I. Submit final As-Built Drawings, the As-Built Drawings shall depict the actual installation with all items clearly identified, all dimensions exactly as installed, and all details correct.

J. The electrical section of the As-Built Drawings shall consist of one-line diagrams of the complete installation, one-line and relay diagrams of the power systems, elementary diagrams of power control and signal circuits, complete connection and interconnection wiring diagrams for the entire installation, including items furnished under other contracts, conduit schedules and panelboard schedules.

K. Submit Operating and Maintenance Manuals containing detailed information for all equipment and associated control systems furnished and installed under this Contract.

L. O&M Manuals:

1. Submit detailed final documentation including as-built (record) drawings, Operation & Maintenance manuals, software documentation, and other items required to fully document the system as installed and commissioned.
    a. The O&M manual shall include a detailed functional description and alarm section with descriptive trouble-shooting procedures for each alarm.
2. Include final copies of all program listings with annotations, comments and cross reference tag list in both hard copy printout and on and CDs in O&M Manuals.
    a. Load Final copies of all programs on the HMI workstation, along with the configuration programs, and verify communication and interaction of all development software with remote equipment prior to submitting O&M manual.
3. Each O&M Manual shall include:
    a. A complete set of reduced-size prints of the final As-Built Drawings.
    b. A complete list of all relay settings, and all control and alarm point settings.
    c. One copy of the manufacturer's spare parts list for all equipment furnished.

M. IP Address Listing:

1. Submit a complete IP address listing of all existing and proposed Ethernet components.

N. I/O Data Base:

1. Submit an I/O Database for all new and modified PLC data points. Database shall include:
   a. Unique Signal ID (Record Key Value)
   b. PLC Tag Name
   c. OIT Tag Name
   d. I/O Description
   e. Drawing Reference
   f. Source Unit
   g. Source Unit Address
   h. Signal Type
   i. Signal Level
   j. Signal Format
   k. Signal Power (Field or Panel)
   l. Raw_zero
   m. Raw_full
   n. Eng_zero
   o. Eng_full
   p. Eng_units
   q. Zero State
   r. One State
   s. Alarm

1.05 QUALITY ASSURANCE

A. All electrical work to be performed and all materials to be furnished shall be in accordance with the Contract Drawings and Specifications, to the satisfaction of the Engineer, and the requirements of the following codes, regulations, and specifications:

1. National Electrical Code (NEC)
2. National Fire Protection Association (NFPA)
3. National Electrical Manufacturer's Association (NEMA)
4. Institute of Electrical and Electronic Engineers (IEEE)
5. American National Standards Institute (ANSI)

B. Materials:

1. No materials of any kind shall be used that have not been approved by the Underwriters Laboratories, Inc., where UL provides such service, and each piece of equipment shall have marked thereon, where it can readily be observed, the name or trademark of the manufacturer.
2. Materials and equipment shall be the best of their several kinds and all work shall be performed in a neat, substantial and workmanlike manner, to the satisfaction of the Engineer.

1.06 FIELD CONDITIONS

A. In connection with all of the foregoing, Contractor must have on the construction site, all materials, equipment, construction facilities, adequate supervision and a sufficient number of qualified workmen to insure carrying out all of the above work in the shortest possible time.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. The Contractor shall furnish and install all materials and equipment which are reasonably inferable to be part of the complete installation without any additional charge to the Owner.

B. If, in the opinion of the Contractor, any work shown on the Drawings or called for under these Specifications is insufficiently specified or specified in such a manner as to make it impossible for him to produce first-class work which will meet the approval of the Engineer, he shall refer same to the Engineer before proceeding with the work and, if he fails to refer such instances to the Engineer, no excuse for poor workmanship will be entertained.

PART 3 - EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall furnish all labor, equipment and materials required to install a fully functional monitoring and control system including any and all items recommended by the System Integrator.

1. The Contractor shall furnish all programming and configuration required for a complete and functional system to automatically control and monitor all of the equipment being supplied under this Project.
2. The Contractor is responsible to notify the Engineer immediately upon recognition of an instruction or specification contained herein that would cause the supplied system to fail to meet the conditions set forth in these specifications.

B. The Contractor shall coordinate the implementation and recommendations of the System Integrator with Contractors staff and the Contractor's subcontractors.

C. Review and approve all submitted control equipment and designs of other sections of this specification prior to submission to the Engineer.

D. Supervise, inspect and test the installation of the control equipment and materials supplied under other sections of this specification.

3.02 SYSTEM INTEGRATOR RESPONSIBILITIES

A. Selection and Evaluation of Components:

1. The System Integrator shall evaluate and select the individual components of the control system. The evaluation shall be based on the specification requirements, industry standards, compatibility between components and the experience of the System Integrator.
2. The System Integrator shall review and approve all control hardware, software and control system related components prior to submission to the engineer.
3. The System Integrator shall assist in the preparation of submittals and documentation of other sections of this specification as needed for a complete and coordinated hardware design.

B. The Engineer shall review all equipment following approval by the System Integrator.

1. Interfacing of Equipment:
2. The System Integrator shall interface between all components within the control system including those components supplied by others and existing equipment.
3. The system Integrator shall evaluate the interface between components and supply and/or modify systems to ensure compatibility.
4. The System Integrator shall provide any design assistance required to accommodate the selected equipment, to completely configure and program the equipment, and to the interface the new equipment to new and existing field devices.

C. Programming:

1. The System Integrator shall provide all programming, control logic and software for the system controls and monitoring.
2. The System Integrator shall interact with the Engineer to determine detailed operational conditions and shall incorporate those conditions into the system control logic.

3. All configuration and programming performed under this contract shall be fully documented by the system Integrator and shall become the property of the Owner.
4. Programming for the control algorithms shall be performed with the equipment vendor’s latest configuration software using the IEC ladder diagram configuration.
5. Provide all manufacturer's services required for installation, startup, calibration, inspection, and training.
6. Provide all programming necessary implement the new control functionality as shown on the Contract Drawings and/or herein specified.

D. Furnish, Install and Test:

1. Control panels, programmable controllers, enclosures and appurtenant equipment.
2. Software products, interface cables and related products.
3. Relays, resistors, signal splitters or other devices required to condition input and output field signals for the control equipment.
4. Connect and test all input and output field wiring to and from the control equipment.

E. Installation:

1. The System Integrator shall oversee the installation and field connection of the control system.
2. The System Integrator shall make all the necessary modifications, additions and/or updates to hardware and software as required to accommodate the field conditions encountered.

F. Field Tests:

1. The System Integrator shall be present during the start-up of each programmable controller to respond to any discrepancies or questions which arise.
2. The System Integrator shall be present during the operational testing of the systems.
3. Perform the Final Acceptance Testing of all control equipment and materials supplied under this Contract.

G. Documentation:

1. The System Integrator shall provide detailed documentation for the design of the control system. As a minimum the following design documentation is required:
   a. Cut sheets and descriptions of all components and hardware including ratings and limitations.
   b. Wiring diagrams for all connections and controls.
   c. Program logic on both hard copy printout and compact disk.
   d. Flow charts describing the functioning of the control system.
   e. As-built drawings for field wiring and connections.
   f. Panel layouts.
2. The System Integrator shall document the field tests in accordance with detailed test reports.
3. The System Integrator shall coordinate the final documentation, including as-build drawings, O&M Manuals and Warranty information. All documentation shall be submitted to the Engineer for review and shall become part of the Operation and Maintenance Manuals.
4. The System Integrator or contractor shall label all wires and equipment with a unique nonrepeating system. The labeling identification numbers shall be included on the As-Built, existing loop and interconnection drawings.
5. The System Integrator shall provide special and standard warranty services.

H. Training:

1. The System Integrator shall provide or coordinate the training of control equipment provided for under this or other sections of the specification with Plant personnel.
2. Provide and coordinate the training of Owner's personnel in the operation, configuration, and maintenance of the new control system.

I. All items and created works performed under this contract shall become the property of the Owner and shall be turned over to the plant personnel at the completion of Testing.

J. Provide continuing system integration support.

1. The Contractor shall provide for the supply of additional support days of onsite programming and configuration services above and beyond all programming and configuration requirements specified herein.
    a. Five additional support days shall be provided under this Contract.
    b. These service days will not necessarily be consecutive calendar days.
2. The bidder is advised that these services are to be provided at any time during the contract including up to 30 days following successful completion of the reliability acceptance tests for the system and that this contract shall remain open until that time.
3. The application of the additional work during construction shall be determined and approved by the Engineer and Owner.
4. The application of the additional work after the installation and acceptance of the new equipment shall be provided at the written request of the Owner.
    a. The support shall be provided by the staff member who performs the original programming under this contract.
5. Services to be provided may include additional training, system troubleshooting, configuration and programming services, and other on-site services as required.

3.03 SCOPE AND PURPOSE

A. The scope of work under this contract includes but is not limited to:

1. The System Integrator shall provide all labor, material and necessary equipment to furnish and install a complete SCADA system as specified herein and shown on the Contract drawings and be responsible for the satisfactory operation of the hardware specified herein.
2. Furnish, install, connect, configure and test PLC hardware, and software products and related items.
3. Furnish, relocate, install, connect, configure and test Ethernet LAN and PLC LAN communication equipment hardware, software and related items.
4. Furnish and install all equipment enclosures, power supplies, interconnecting cables, and support software and equipment required for a complete and functional system.
5. Furnish and install all conduit, conductors, terminal boxes, and appurtenant equipment shown on the Contract Drawings, hereinafter specified, and/or required for a complete and fully functional installation to the satisfaction of the Engineer.

6. Configure all equipment to operate satisfactorily and demonstrate that the system is properly operating.
7. Provide training on the OIT and PLC hardware and software supplied and implemented under this contract.
8. Provide additional services from the System Integrator, as requested, for additional training, configuration and programming services, troubleshooting, and related activities.
9. The following paragraphs summarize the work required by the System Integrator at each Building or location:
    a. Sludge Dewatering Building: A new control panel shall be provided and tied into the existing control system via a Fiber connection. It shall serve the Belt Press Control Panel, Blowers, Conveyor Control Panel, and other instruments.
10. The system shall also include:
    a. Spare parts as specified herein.
    b. All such accessories that may be required to provide functions specified.
    c. All mounting hardware (e.g. nuts, bolts, washers, pipe stands or cinch anchors) associated with connecting or mounting the equipment and security cameras, as herein specified, shall be provided and connected. All mounting hardware shall be stainless steel.
    d. All required Ethernet switches and Ethernet cables as required for a complete system.
    e. All required 120 volt power to the new control panels.

3.04 SEQUENCE OF CONSTRUCTION

A. General

1. This section outlines procedures and requirements that will assure a timely installation with minimal disruption to the operation of the facility. Any requirements listed in this section are in addition to requirements listed in other sections.

B. The contractor shall begin the submittal process within two weeks after notice to proceed by submitting the name of the proposed System Integrator along with all information required to determine the adequacy of the proposed System Integrator.

C. Within one month after approval of the System Integrator, all hardware and software product submittals shall be delivered to the Engineer.

D. Within two months after approval of the System Integrator, detailed installation submittals shall be delivered to the Engineer.

E. All work shall be coordinated with plant maintenance personnel and approved by plant operations personnel prior to beginning any work.

F. Provide and implement a workaround to address any Plant control or monitoring process that is affected by temporary or permanent work being performed under this contract.

G. Train operators in the functional operation of the new equipment in each process area, as each process area comes on line.

H. Demonstrate that the new and existing equipment is properly configured and operating by displaying process data at the local workstation and at other workstations on the existing SCADA system and verifying the accuracy of the displayed data.

3.05 SCHEDULING OF WORK

A. The Plant will be kept in full scale operation during the performance of the work specified in this section. All modifications to existing panels, all equipment/device/panel replacement work and all rehabilitation work shall be scheduled by the contractor and submitted to the Engineer for approval.

B. Written consent from the Owner or Owner's Representative must be obtained not less than one week prior to carrying out any portion of the work included in this Contract which requires interruption of service.

C. Plant operations staff shall be notified no less than 24 hours prior to beginning any work that requires disruption of system operation.

D. Refer to Section 26 00 10 - Basic Electrical Materials and Methods for additional information on electrical outage requirements and restrictions.

3.06 FIELD ENGINEERING

A. Where existing conditions and dimensions are shown or indicated on the Contract Drawings, the information given is approximate only, and is not warranted by the Owner to be either complete or correct. The Contractor shall verify actual existing conditions and dimensions in the field before ordering materials or starting construction.

B. The Contract Drawings indicate the general location and arrangement of conduit, wiring devices, equipment, and other products. The Contractor shall adjust the indicated locations (subject to approval in the field) as necessary to:

1. Comply with all applicable code requirements.
2. Permit access for construction, inspection, testing, operation, and maintenance.
3. Avoid conflict with pipes, mechanical equipment, structural openings (e.g., doors), and other obstructions, as built, whether or not as shown on the Contract Drawings.

4. Produce a neat, workmanlike arrangement.

C. The Contractor shall determine the proper connection points for all power, control, and signal wiring, regardless of whether the connection points are in equipment furnished under this Contract, in equipment furnished by others, or in existing equipment.

D. The Owner will make available to the Contractor any reference drawings it may have. However, the Owner does not guarantee the correctness, completeness, or availability of reference drawings. Should the Contractor choose to rely upon the reference drawings, he does so at his own risk.

E. The Contractor shall perform all field surveys, wire tracing, and other work required to ascertain the proper connection points for all wiring.

F. The Contractor shall coordinate the making and sealing of all holes through structures to accommodate electrical conduits and supports for electrical equipment, and shall submit working drawings thereof for the Engineer's approval.

G. The Contractor shall ensure that proper service is provided to all mechanical equipment requiring electricity for power or control.

3.07 MATERIAL AND EQUIPMENT INSTALLATION

A. Unless otherwise specified, all conduits shall be installed concealed in partition walls and finished ceilings and exposed on concrete surfaces. Before starting the work, the Contractor shall submit to the Engineer, for approval, his proposed arrangement and mounting details.

B. All items shall be installed in accordance with the manufacturer's recommendations. The Contractor shall furnish and install all material and hardware required for mounting and to provide a complete and functional installation, at no additional cost to the Owner.

C. Mounting hardware shall be stainless steel, unless otherwise noted. Field mounted instruments shall be mounted on pipe stands or mounting brackets which will allow easy removal. Supports shall be attached to concrete surfaces with wedge anchors and stainless steel bolts.

3.08 DISCONNECTION AND REMOVALS

A. All power, control and instrumentation wiring associated with equipment, panels, devices, etc. to be removed and replaced shall be identified, marked and then disconnected to facilitate their replacement and any related work. No wires shall be disconnected which have not been properly identified. Existing panels shall be removed in an orderly fashion in order to minimize plant disruptions.

B. All materials no longer used shall be removed unless otherwise directed by the Engineer. Affected surfaces shall be repaired to confirm to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner.

C. Deliver all salvaged equipment to Owner.

3.09 CONFIGURATION AND PROGRAMMING

A. Completely configure all programmable controllers, data communications equipment, and field devices supplied under other sections of this specifications.

1. Refer to Section 40 94 43 - Programmable Logic Controllers For Process Systems.
2. Refer to Section 40 96 00 - Process Control Software.

B. Network Configuration

1. Provide all programming necessary to interface the new control and communication equipment with the existing SCADA communications system.
2. Coordinate and organize the new control equipment communication addresses with the existing SCADA LAN at the plant.
3. Coordinate with Owner and ISP to provide Cable Internet WAN service.
4. Setup and configure the VoIP connection and make the HMI computer remotely accessible via Remote Desktop Services.
5. Completely configure the refresh rate and polling configuration of all nodes on the PLC and HMI LAN to optimize the transfer of data under worst case conditions.

C. I/O Coordination

1. Create, compile and install all databases required to monitor and control the system processes from any and all Operator Workstations.
2. Create and configure a variable tag for each input point and each output point for each new PLC and other input devices.
3. Configure all calculated variables required to present the desired information.
4. Coordinate all variable tag development work with the Owner's effort in upgrading the graphic display pages.

3.10 GROUNDING

A. All equipment furnished and/or installed under this Contract shall be grounded in accordance with the latest requirements of the National Electrical Code.

3.11 CALIBRATION

A. All instrumentation and control devices, furnished under this Contract, shall be calibrated by competent, qualified technicians prior to final acceptance. A copy of the calibration data shall be submitted for approval.

3.12 IDENTIFICATION

A. Nameplates shall be provided as required. Nameplates shall be black laminated plastic with white center, fastened with stainless steel screws.

B. The size and shape of nameplates and lettering shall be in pleasing proportion for each specified location.

3.13 WARNING SIGNS

A. Furnish all warning signs in conformance with NEC code and OSHA regulations.

3.14 DEFECTIVE MATERIALS AND EQUIPMENT

A. Defective material and equipment or materials and equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting the approval of the Engineer. All materials and workmanship shall be of the best quality and all work done in a thorough manner in strict accordance with the rules and regulations of the American Insurance Association (formally the National Board of Fire Underwriters,) the state, and local authorities and the electric company that will furnish the power.

3.15 TRAINING

A. Coordinate the training provided for under other sections of the specification with Owner's personnel.

B. Training shall be scheduled to the convenience of Plant Operations and shall be coordinated with the Owner or the Owner's Representative.

1. The system integrator shall not schedule any training until it has been confirmed in writing that the proposed schedule is acceptable to the Owner.
2. The system integrator shall submit the proposed schedule for each course not less than 4 weeks prior to the proposed training date.
3. If the proposed dates for training are not convenient to Owner's personnel, the system integrator shall adjust the schedule accordingly.

3.16 CLEANING AND TOUCH-UP PAINTING

A. The premises shall be kept free from accumulation of waste material and rubbish. Upon completion of work, the contractor shall remove materials, scraps, and debris from the site. Scratches, scrapes, or chips in interior or exterior surfaces of devices shall be touched-up with finishes matching as nearly as possible the type and color of the original finish.

END OF SECTION

DIVISION 40 - PRIMARY CONTROL DEVICES

SECTION 40 91 13

PROCESS INSTRUMENTATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building Protection Instruments

B. Level Instruments:

1. Ultrasonic Level Sensor

C. Flow Instruments:

1. Flow Meter

D. Miscellaneous Instruments

1. Current Transformer
2. Float Switch

1.02 RELATED REQUIREMENTS

A. Division 26 – ELECTRICAL

1.03 SUBMITTALS

A. Instrument supplier shall review the Contract drawings to verify suitability of the supplied instrument for the intended application prior to submittal process.

1. Provide verification of this review process by instrument and application.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

C. Shop Drawings:

1. Catalog Cutsheets.
2. Field wiring diagrams.
3. Construction drawings and engineering data defining materials of construction, dimensions, weights and sizes.

D. Field quality-control reports.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

F. Operation and Maintenance Manual:

1. Submit complete bound manuals for all hardware and software components assembled into 3 ring binders.
2. Include:
    a. Shop Drawing information
    b. Calibration information
    c. Configuration of each device, as configured at time of Maintenance Training.
    d. Flash Drive copies of all custom programs incorporated.

1.04 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment or components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 12 months from date of Substantial Completion

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Contractor:

1. The Contractor shall be responsible for the complete supply and installation of process instrumentation and control systems furnished by a single company regularly engaged in the manufacture of process instrumentation systems.
2. Functional system data is described herein and is augmented by accompanying product specifications. All elements shall be provided as shown and/or required. Additional elements such as power supplies, current repeaters, and other such elements as may be required to complete the system shall be provided even though not shown.
3. All material shall be new, free from defects, and of the quality specified or shown. Each type of material shall be of the same manufacturer throughout the work. All material shall be the product of established, reputable manufacturers normally engaged in the production of the particular item being furnished.

B. Instrumentation Supplier

1. All instrumentation equipment, panels, sensors, transmitters and other system components shall be supplied by one instrumentation manufacturer who shall be responsible for total system design, integration and functioning of the system and all components, including those items manufactured by others but furnished by the instrumentation supplier.
2. The instrumentation supplier must have the proven skill, experience, ability, facilities, and qualified personnel necessary to successfully, timely and properly complete the involved work. During the bid evaluation period, any proposed instrumentation supplier will be evaluated to consider their ability to satisfy the foregoing requirements.
3. The instrumentation supplier must assign sufficient qualified personnel to the project to assure the timely and proper completion of the work. Full, continuous, and detailed supervision of the work will be required.

C. Equipment Requirements

1. The product Specifications include description of instrumentation items used in systems. In certain instances, this description is followed by at least one brand name (and/or model number) and an "or equal" provision. Each product submitted under the "or equal" provision will be reviewed as to whether it is acceptable as an equal.
2. In conducting such a review, the Engineer shall consider the comparability of the specifically named products with the "or equal" products, including specifically their relative performances. Such review shall be based both on the product individually and its interrelationship with all other aspects of the instrumentation system.

2.02 PRODUCT IDENTIFICATION

A. All the equipment shall have a stainless steel name plate permanently affixed in a conspicuous place on which is plainly marked the manufacturer's name, address, model number, and loop number as stated in the Specifications and shown on the Drawings. The nameplate of a distributing agent only is not acceptable.

2.03 BUILDING PROTECTION INSTRUMENTS

A. Ambient Temperature Transmitter (TT)

1. Transmitter shall be 4/20mA loop powered assembly, with integral platinum RTD sensor and 3 ½-digit LED indication, enclosed in a NEMA 12 ABS Plastic enclosure for Utility box mounting.
2. Transmitter shall be Devar RTTI Room Temperature Transmitter or approved equal.

B. Limit Switch (ZSH)

1. Magnetic limit switch, surface mounted.
2. Enclosure Rating: IP67, NEMA 4X
3. Hermetically sealed reed switch, normally open configuration.
4. GE Sentrol 2507A-L or approved equal.

C. Outside Air Temperature Sensor

1. Temperature transmitters provide accurate temperature measurements. The temperature transmitter shall be provided with a radiation shield to prevent false measurements due to direct sunlight.
2. Gasketed cover
3. Terminal block
4. Transmitter output
5. Temperature range: -40 to 140 °F.
6. Power Requirements: 13 to 36 Vdc.
7. Output signal: 4-20 mA
8. Mounting: Wall
9. NEMA 4X Rating
10. Environment: Exterior
11. Weatherproof
12. Outside Air Temperature Sensor shall be Dwyer BTT series, Rosemount, Siemens, or approved equal.

D. Gas Detection Controller

1. Modular controller with display and colored LED indicators. Provides required DC power to remote gas detection equipment. Compatible with 4-20 mA type transmitter. RS485 Modbus communications for relaying information to the local control panel.
2. 2 or 4 channel.
3. Supply Voltage: 120V
4. Contact System: Mechanical

5. I/O's: 4-20 mA Hart, Relays
6. Operating Temperature: -20°C to 55°C.
7. Polycarbonate ABS and rated IP65.
8. Gas Detection Controller shall be Drager REGARD 3000 series, MSA Ultima, or approved equal.

E. Gas Detection Analyzer – Flammable Gasses and Vapors

1. Electrochemical sensor capable or detecting flammable hydrocarbon gasses and vapors. Constructed to endure harsh conditions with reliable performance. Onboard memory calibration and configuration information for multiple applications. The system includes self-test function for predictive maintenance. Easy to read backlot graphical display in a friendly user format.
2. Supply Voltage: 10 – 30 Vdc, 3-wire
3. Measuring range: 0 to 100% LEL
4. Sensitivity: 2% (+/-)
5. Contact System: Mechanical
6. Signal: 4-20 mA Hart
7. Operating Temperature: -40°C to 65°C.
8. Status: LED – Green, Yellow, Red
9. Cable: Shielded 3 conductor
10. Epoxy coated aluminum housing.
11. Explosion proof enclosure rated for Class 1, Div. 1.
12. Remote sensing mounting kit.
13. Gas Detection Analyzer shall be Drager Polytron 8310 series, MSA Ultima X5000, or approved equal.

F. Gas Detection Analyzer – Toxic and Oxygen

1. Electrochemical sensor capable of detecting 100 plus gasses and oxygen. Constructed to endure harsh conditions with reliable performance. Onboard memory calibration and configuration information for multiple applications. The system includes self-test function for predictive maintenance. Easy to read backlit graphical display in a friendly user format.
2. Supply Voltage: 10 – 30 Vdc, 3-wire
3. Contact System: Mechanical
4. Signal: 4-20 mA Hart
5. Operating Temperature: -40°C to 65°C.
6. Status: LED – Green, Yellow, Red
7. Cable: Shielded 3 conductor

8. Epoxy coated aluminum housing.
9. Explosion proof enclosure rated for Class 1, Div. 1.
10. Remote sensing mounting kit.
11. Gas Detection Analyzer shall be Drager Polytron 8100 series, MSA Ultima X5000, or approved equal.

G. Gas Monitor

1. Gas monitor shall be capable of detecting Hydrogen Sulfide, Methane, and Oxygen levels. The unit shall be designed for hazardous locations and applications. A remote display shall be available for mounting in accessible areas without entering a confined space. Contractor shall provide conduit, conductors, and/or cabling for power, signals, and remote connections.
2. Graphic Display showing values, unit, trend graphs, and alarms.
3. Dual channel capability
4. Backlit display
5. Auto-recognition of Smart Sensors
6. Fault supervision circuitry for detecting failed sensor.
7. Power input: 10 – 30 Vdc
8. Standard output: 4-20 mA
9. Temperature: -40°C to 60°C
10. Aluminum housing with epoxy finish
11. 3/4” NPT fittings for conduit terminations
12. Replaceable sensor
13. Gas Monitor shall be GDS. GASMAX II Gas Monitor or approved equal.

2.04 LEVEL INSTRUMENTS

A. Ultrasonic Level Transmitter (LT)

1. Basis-of-Design Product: 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. Siemens,
        1) LU240 Ultrasonic Level Transmitter
        2) LT500 Display Unit
    b. Vega
    c. Rosemount

2. Functional Description: The unit shall be a non-contact ultrasonic unit suitable for tank, basin, or channel applications. The ultrasonic sensor shall continuously monitor the liquid updating the 4-20 mA output signal and display. The unit shall be constructed using watertight gaskets or joints to protect against exterior environmental conditions.

   Level measurement controller compatible with a LU240 ultrasonic transducer. Local four-button programming and menu-drive parameters. Wall and panel mounting options.

3. Features:
   a. Location: Rated for indoor or outdoor
   b. FlangeL Universal 3” connection
   c. Ratings: Div. 1
   d. HMI: Blind Lid
4. Operating Parameters:
   a. Level: 4-20 mA
   b. Resolution: 0.12 inch
   c. Beam angle: 10 degrees
   d. Ambient Temperature: -40 to 80 degrees C
5. Construction / Design:
   a. Enclosure Material: Polybutylene Terephthalate
   b. Transducer Material: ETFE or PVDF
   c. Protection: Type 4X

2.05 FLOW INSTRUMENTS

A. Magnetic Flow Meter (FE)

1. Basis-of-Design Product: 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. Siemens Sitrans F M electromagnetic flow sensor, MAG 5100W series.
   b. Endress+Hauser Pro Mag 400
   c. Rosemount
   d. Approved Equal
2. Functional Description: Flow sensor shall be based on Faradays Law of electromagnetic induction, thereby producing an electrical voltage based on flow by which is converted to a corresponding signal indicating the velocity of liquid flow.

3. Features:
    a. Compatible pipe sizes: 1” to 48”/78”. Full bore flow sensor shall mate to pipe being served, as indicated on Drawings.
    b. Process connection flanges: ANSI B16.5 AWWA. The Division 13 Contractor shall coordinate flange requirements with other trades.
    c. Liner: Flow sensor shall be manufactured with an Ebonite Hard Rubber liner for all water applications.
        1) Installed flow sensor shall be approved for drinking water applications by local AHJ or other governing authority.
    d. Flow sensor shall accept 115 to 230 V AC or 12 to 24 V AC/DC.
    e. Communication protocol shall be HART compatible.
4. Operating parameters:
    a. Flow sensor shall be manufactured for operating temperature from -20 Deg C to 70 Deg C.
    b. Flow sensor shall be compatible for pressures up to 300 psi.
    c. Enclosure shall be rated for IP68 to EN 60529/NEMA 6P. This rating shall provide the ability for the submersion at a prescribed depth for an unlimited period of time.
5. Construction / Design:
    a. Housing and flanges shall be carbon steel ASTM A 105 with corrosion-resistant coating. Corrosivity category C4, according to ISO 12944-2.
    b. Electrode and Grounding Electrode shall be alloy C-276, strengthened nickel-molybdenum-chromium alloy with tungsten.
    c. Terminal box shall be fiber glass reinforced polyamide.
    d. Flow sensor shall be 150-lb flange mounted unless otherwise noted.
    e. Where required, cabling for remote transmitter mounting shall be provided by the manufacturer.

B. Flow Transmitter:

1. Basis-of-Design Product: 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. Siemens Sitrans F M electromagnetic flow sensor transmitter, MAG 5000 series.
    b. Endress+Hauser Pro Mag 400.
    c. Approved Equal.
2. Flow transmitter and electromagnetic flow sensor shall be from the same manufacturer.

3. Functional Description: Unit shall serve compatible with water production systems. Transmitter shall have built-in alphanumeric display with multiple languages. Signal provided from the associate electromagnetic flow sensor shall be evaluated for display on the unit or further distributed for viewing/recording by charting equipment or PC based systems.
4. Features:
    a. Unit shall provide HART compatible communications.
    b. Alphanumeric display with a minimum of 3 lines with 20 characters per line capable of displaying 11 languages.
    c. Optimum turn down ratio.
    d. SENSORPROM data automatic readability for ease of commissioning.
    e. Forward, reverse, and net flow totalizing.
    f. Comprehensive self-diagnostics for error indication and logging.
    g. Wide range of digital signal processing.
    h. Unit shall accept 115-230 V AC or 11-30 V DC or 11-24 V AC.
5. Operating parameters:
    a. Flow transmitter shall be manufactured for operating temperature from -20 Deg C to 60 Deg C.
    b. Digital Input signal:
        1) Voltage: 11 to 30 V DC at 4.4 kOhm.
        2) Activation time: 50 ms.
        3) Current Range: I at 11 V DC = 2.5 mA, I at 30 V DC = 7 mA.
    c. Analog Output signal:
        1) Signal range: 0-20 mA or 4-20 mA.
        2) Load: less than 800 Ohm.
        3) Time constant: 0.1 – 30 seconds, adjustable.
    d. Digital Output signal:
        1) Frequency: 0-10 kHZ, 50% duty cycle.
        2) Active Pulse: 24 V DC, 30 mA.
        3) Passive Pulse: 3-30 V DC, 110 mA.
6. Construction / Design:
    a. Enclosure shall be fiberglass reinforced polyamide.

2.06 MISCELLANEOUS INSTRUMENTS

A. Current Transducer – Classified Area Ventilation

1. Current transducer shall be a split core configurations with suitable ampacity to monitor the indicated equipment. The current transducer output shall be 4-20 mA using a loop powered arrangement. The enclosure shall be Contractor provided suitable housing the selected transducer.
    a. Contact System: Inductive
    b. Maximum Loads: 50A

c. Maximum Voltage: 600V
d. Operating Temperature: -30°F to 140°F
e. Enclosure Rating: NEMA 1
f. Terminals: 14 AWG to 22 AWG

2. Current Transducer shall be Functional Devices, Inc. RIB 420-RMS series, Schneider Electric, Automation Direct, or approved equal.

B. Float Switch

1. Basis-of-Design Product: 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. MJK Automation, 7030 series
   b. Conery Mfg, Inc., B8 series
   c. Dwyer
   d. Approved Equal
2. Functional Description: Float switch shall actuate an electromechanical contact system in a hermetically sealed enclosure, through orientation changes resulting from changing liquids level. Counterweight shall be incorporated to ensure the activation of electromechanical contact by submersing the float switch when liquid levels permit. Multi-point level detection assembly for tank top mounting.
3. Features:
   a. Operates without the use of mercury.
   b. Electrical mechanical contact designed for monitor liquid levels.
   c. Compatible for direct motor connections not exceeding specified ampacity and voltage.
   d. Manufacturer provided cable with oil resistant PVC insulation.
   e. Counterweight for enhanced switching.
4. Operating parameters:
   a. Contact system: Mechanical
   b. Maximum Loads:
      1) 250 V AC / 10 A
      2) Maximum Voltage 250 V AC
   c. Operating temperatures: 0 Deg to 60 Deg C
   d. Enclosure rating: IP68
   e. Cable: Customizable
5. Construction / Design:
   a. Float housing shall be polypropylene with IP68 rating.
   b. Float shall be provided with integral manufactured cable with length suitable for installation.

2.07 SPARE PARTS

A. Furnish one portable primary head simulator for calibration and testing of magnetic flowmeter signal converters.

1. The calibrator shall be furnished complete with rechargeable battery pack, test leads, spare battery pack, charger, carrying case and accessories.
2. Calibrator shall be furnished by the flowmeter manufacturer and shall be fully matched to the instrumentation furnished.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Description of Work:

1. Provide all labor, material and necessary equipment to install instrumentation and control systems and be responsible for the satisfactory operation of the entire system as specified herein and as shown on the drawings.
2. Work includes supplying erecting, testing and placing in operation the system specified.
3. Work includes the supply and installation of all process measuring elements, transmitters interconnecting wiring and process taps as specified herein and indicated on the drawings.
4. Work includes the provision and connection of all wiring to and from every electrical device furnished under this Section including 120 volt power wiring and all instrumentation and control wiring.
    a. All wiring shall be in accordance with Section NEC A1 requirements.
    b. Instrumentation and Control Wiring noted within this Specification Section includes:
        1) Circuits used to carry analog signals
        2) Circuits used to start and stop equipment
        3) Circuits used to key a control function or serve as an interlock
        4) Circuits used to indicate equipment operating status
        5) Circuits used to actuate alarms.
    c. Work includes the provision and installation of and all piping, manual shut-off valves, and mounting hardware (e.g. nuts, bolts, washers, pipe stands, or cinch anchors) associated with connecting or mounting the instrumentation, as described herein.

B. General

1. Equipment shall be located so that it will be readily accessible for operation and maintenance.
2. The Contractor shall examine the Contract Drawings and shop drawings for the various equipment in order to determine the best arrangement for the work as a whole, and shall use personnel skilled in the applicable trade for the erection of the various materials and interconnections.

C. Equipment Mounting and Support

1. Field instruments shall be mounted in the areas specified or otherwise noted.
2. Instruments attached directly to concrete shall be spaced out from the mounting surface not less than 1/2 inch by use of phenolic spacers or framing channel.
3. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces.
4. Unless otherwise noted, field instruments shall be mounted between 48 inches and 60 inches above the floor or work platform.

D. Transmitters

1. Flow transmitters shall be connected to the process piping with nipples, fittings and/or tubing of material compatible with the process fluid.
2. Where transmitters are supported from process piping, leveling saddles shall be provided.
3. Transmitters shall be oriented such that output indicators are readily visible.
4. Electrical connections to transmitters and elements mounted on process piping or equipment shall be made through liquid-tight flexible conduit.
5. The fitting materials shall be compatible with the process fluid.

E. Magnetic Flowmeters

1. Ground magnetic flow meter flow tubes and grounding rings in strict accordance with the manufacturer's recommendations.

F. Composite Sampler Installation

1. Allow complete drainage of the intake line to prevent cross-contamination between samples.
2. Install as close to the sample source as site conditions permit to increase pump tube life and optimize overall sampler performance.

3. Install above the sample source, with the intake tubing sloping downward to the sample as vertical as possible.
4. Install the probe in accordance with the manufacturer's instructions and recommendation.
5. Provide a half-day of start-up service by a factory-trained technician.

3.02 ELECTRICAL WORK

A. Signal wiring shall be carried in raceways or conduit provided in accordance with other sections of this Division of the Specifications.

1. Shielded twisted pairs carrying 4-20 mA and other low level signals shall be run in conduits or raceways separate from all other control and power wiring.
   a. All analog circuits shall be run as twisted pairs or triads.
   b. In no case shall a circuit be made up using conductors from different pairs or triads.
   c. Triads shall be used wherever three (3) wire circuits are required.
   d. Triads shall not be formed by using two (2) pairs.

2. Terminal blocks shall be provided at all instrument cable junctions, and all circuits shall be identified at such junctions.
3. Signal circuits shall, in general, be run without splices between instruments, terminal boxes or panels.

B. Shields shall, in general, be bonded to the ground bus at the control panel and isolated at all other locations.

1. Terminal blocks shall be provided for interconnecting shield drain wires at all junction boxes.

C. Alternating current power supply connections for panel mounted equipment shall be by cord and plug where practicable.

1. Field mounted units shall be wired in solid and provided with a power disconnect switch either internally or adjacent to the unit.
2. Where multiple field mounted units are fed from a single circuit breaker, each field mounted unit shall be protected by individual draw-out fuses.

3.03 FIELD QUALITY CONTROL

A. Factory Tests

1. Testing of Individual Components
   a. Each item of equipment shall be fully factory inspected and tested for function, operation and continuity of circuits.

b. Each instrument shall be factory calibrated. Calibration sheets verifying instrument accuracy shall be supplied.

2. Full System Tests
   a. An operation check of the entire system shall be performed by the instrumentation supplier at his factory. Power and manually adjustable measurement and control circuits shall be connected to the central control for simulating the functions specified within the Specification section.
   b. The Owner shall be notified at least ten days in advance of any factory systems tests and reserves the right to have its representatives in attendance.

B. Analog Instrument Calibration

1. All analog instruments shall be installed such that taps and parts, etc. are available for in-place calibration and test without removal. For those instruments where such in situ calibrations are not feasible (e.g. pH immersion electrodes, etc.), other calibration methods shall be provided subject to review by the County.
2. Field calibration shall be achieved using a minimum of five points (0, 25, 50, 75, and 100 percent) for calibration. Additional points may be required by the Owner for non-linear instruments.
3. Receiving elements such as controllers, final operators, etc. shall be observed and readings documented during transmitter exercising to demonstrate correct operation of entire control loop.
4. Other elements such as controllers, final operators, etc. shall be exercised to demonstrate correct operation.

C. Pretesting:

1. After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents.
2. Correct deficiencies observed in pretesting.
3. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved.
4. Prepare forms for systematic recording of acceptance test results.
5. After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

D. Operational Tests

1. An operation check of the entire system shall be performed by the instrumentation supplier after installation to verify operation.
2. Schedule tests after pretesting has been successfully completed.
3. Test all modes of system operation at each device.
4. Power and manually adjustable measurement and control circuits shall be connected to the control system to verify the functions specified within the Specification section.
5. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
6. Electrical Tests: Minimum required tests are as follows:
    a. Verify the absence of unwanted voltages between circuit conductors and ground.
    b. Test all conductors for short circuits using an insulation-testing device.
    c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit.
7. All conditions of operation shall be simulated to demonstrate that each system operates properly.
8. Test each initiating and indicating device for operation and proper response at local control stations, PLC panel and supervisory control station.

E. Report of Tests and Inspections:

1. Prepare a written record of tests, inspections, and detailed test results in the form of a test log.
2. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

F. Acceptance

1. The system will not be accepted until all equipment satisfies the acceptance test requirements. The complete system shall operate continuously during an acceptance test period of not less than thirty days with no down-time of the complete system resulting from failure of hardware. Downtime of the system or portions of the system resulting from the following causes will not be considered system failures:
    a. Downtime resulting from an outage of the main power supply provided that automatic shutdown and restart of the system satisfies the requirements of these Specifications.

b. Downtime of a portion of the system resulting from failure of a communications channel provided that the system operated as specified under this condition.
c. Downtime caused by operator error.

3.04 START-UP

A. Installation Assistance

1. Provide the services of a qualified factory engineer to supervise the installation, to test and make any adjustments required, and to place the completed system in operation.

B. System Operation Training

1. The Contractor shall have the instrumentation supplier provide a factory trained engineer to instruct the County's operating personnel in the use, operation, care, and maintenance of the process control instrumentation.
2. The training shall be conducted on-site and be presented in a manner to impart thorough understanding of the systems and equipment provided.
3. The training shall be given to the personnel designated by the Owner who will be responsible for operation during each work shift. The personnel shall sign a certificate presented by the Contractor that they have been trained on the plant equipment and they thoroughly understand the operation, care and maintenance of the equipment.
4. The Owner will notify the Contractor when their personnel is ready to be trained. The Contractor will then ensure that the manufacturer's representatives are available on-site to conduct the required training.

3.05 EXPENDABLES

A. One (1) year's supply of expendables shall be provided as noted within this section. Expendables (charts, ink, test chemicals, etc.) used during calibration and checkout prior to plant acceptance shall be replenished at the Contractor's expense to insure a full year supply at the time of plant acceptance.

3.06 MAINTENANCE

A. Corrective maintenance shall be performed only by a factory trained service technician specifically trained for servicing the types of equipment furnished under this Contract.

END OF SECTION

DIVISION 40 – PRIMARY CONTROL DEVICES

SECTION 40 94 43

PROGRAMMABLE LOGIC CONTROLLERS FOR PROCESS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Programmable Logic Controllers.

1.02 RELATED REQUIREMENTS

A. Section 40 95 13 - Process Control Panels and Hardware.

B. Section 40 95 33 - Process Control Networks.

C. Section 40 96 00 - Process Control Software.

1.03 REFERENCE STANDARDS

A. IEEE C37.90 - IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus; 2026.

B. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

1.04 SCOPE OF WORK

A. Provide all programmable logic controllers, operator interface terminals, and all equipment for a complete and functional PLC control panel in each area of the plant as indicated in the contract drawings.

B. Coordinate with Section 40 95 13 - Process Control Panels and Hardware for additional control panel hardware and control panel enclosures.

1.05 SUBMITTALS

A. Submit catalog cuts, shop drawings, and O&M manuals for all equipment in conformance with the requirements of Section 40 95 13 - Process Control Panels and Hardware.

1.06 WARRANTY

A. Conform with all Contract Warranty requirements specified in the General Conditions and General Requirements.

B. Provide an extended manufacturer’s warranty on all products and equipment to remain in effect for not less than one year after the successful completion of the reliability acceptance tests.

PART 2 - PRODUCTS

2.01 PROGRAMMABLE LOGIC CONTROLLERS (PLC)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1. Schneider Modicon M580 Series
2. Allen Bradley
3. Approved equal

B. Submitted Programmable Logic Controllers shall be fully compatible with Owner's existing MC80 and utilize Modbus TCP protocol.

C. Components shall be supplied by a single manufacturer.

D. Power Supply

1. Accepts AC or DC input based on System Integrators cabinet design. The power supply provides isolated backplane power for the processor and I/O modules. The power supply incorporates overload, overvoltage, and short-circuit protection and is suitable for industrial automation and process control applications.

E. Processors

1. Processor shall provide integrated EtherNet/IP and Ethernet TCP/IP communication ports, minimum 4 MB application memory, support for up to four local I/O racks, 1,024 discrete I/O points, and 256 analog I/O points. The module shall be compatible with the submitted manufacturer's PLC processor and chassis.

F. Discrete Input / Output Modules – 24 Volt DC

1. Discrete Input Module shall be 16-point discrete input module designed for 24 VDC digital signals. The module provides sixteen (16) positive-logic (sink) inputs for monitoring field devices such as pushbuttons, limit switches, auxiliary contacts, and proximity sensors. The module is compatible with the submitted manufacturer's PLC chassis.
2. Discrete Output Modules shall be sixteen (16) transistor outputs, 24 VDC positive logic, minimum 0.5 A per output channel, complete with diagnostic LEDs and integral output protection. The module shall be compatible with the submitted manufacturer's PLC processor and chassis.

G. Discrete Input / Output Modules – 120 Volt AC

1. Discrete Input Module shall be sixteen (16) isolated digital input channels for monitoring 100 to 120 VAC field signals. The module is designed for use with the Manufacturer's Programmable Automation Controllers and supports local or remote I/O installations. The module accepts AC-input devices such as auxiliary contacts, selector switches, limit switches, and other 120 VAC control signals.
2. Discrete Output Module sixteen (16) normally open (N.O.) relay output channels for switching AC or DC control circuits. The module is compatible with the Manufacturer's Programmable Automation Controllers and is designed for local or remote I/O applications. Each output can control loads operating at 24 VDC through 48 VDC and 24 VAC through 240 VAC. The module is suitable for interfacing with relays, motor starters, solenoids, annunciators, and other field devices.

H. Analog Input / Output Modules

1. Analog Input Module shall provide eight (8) individually isolated analog input channels. The module shall accept 4-20 mA, 0-20 mA, and ±10 VDC instrumentation signals and provide minimum 16-bit analog-to-digital conversion. The module shall be compatible with the Manufacturer's programmable automation controller systems and shall include configurable filtering, diagnostic indication, and installation in a standard chassis and I/O racks.
2. Analog Output Module shall provide eight (8) independently configurable analog output channels. The module shall support 4-20 mA, 0-20 mA, 0-10 VDC, and ±10 VDC output signals for control of analog field devices. The module shall be compatible with the Manufacturer's programmable automation controller systems and shall include integrated diagnostics, high-resolution digital-to-analog conversion, and mounting capability in standard chassis and I/O racks.
3. Analog Output Module shall provide eight (8) independently configurable analog output channels. The module shall support 4-20 mA, 0-20 mA, 0-10 VDC, and ±10 VDC output signals for control of analog field devices. The module shall be compatible with the Manufacturer's programmable automation controller systems and shall include integrated diagnostics, high-resolution digital-to-analog conversion, and mounting capability in standard chassis and I/O racks.

I. Network Interface Modules

1. The Network Interface Module shall provide redundant Ethernet Remote I/O (RIO) communication within a Manufacturer's control system. The module shall support redundant fiber-optic Ethernet network connections, communication with distributed remote I/O drops, automatic fault recovery, network redundancy, and diagnostic indication. The module shall be fully compatible with the Hot Standby programmable automation controller systems.

J. Slot Expansion Rack

1. The Slot Expansion Rack shall be a modular rack for mounting and interconnecting with the Manufacturer's automation system components. The rack shall provide power distribution and backplane communications for processor, power supply, communication, and I/O modules and shall be fully compatible with the Manufacturer's local and remote I/O architectures.

K. Expansion Module

1. Expansion Module for multi-rack programmable automation controller systems. The module shall provide backplane bus extension and communications between local expansion racks and shall support the installation of additional I/O, communication, and specialty modules. Module shall be fully compatible with the Manufacturer's automation systems and associated backplanes and expansion cables.

L. I/O Rack Expansion Cable

1. The Expansion Cable shall provide interconnection of the Manufacturer's automation system racks. The cable shall provide communication between backplane expansion modules and support multi-rack controller architectures. Cable assemblies shall be furnished with factory-installed SUB-D connectors and shall be compatible with the rack expansion modules and backplanes.

2.02 SPARE PARTS

A. Provide the following spare PLC equipment:

1. One (1) spare DI I/O Modules
2. One (1) spare DO I/O Modules
3. One (1) spare AI Modules
4. One (1) spare AO Modules

PART 3 - EXECUTION

3.01 CONFIGURATION AND PROGRAMMING

A. Configure each new programmable logic controller (PLC) for all inputs and outputs.

B. Configure and program the new programmable logic controllers to allow monitoring and control from the control system.

C. Configure the new PLC to communicate with the control system I/O servers via Ethernet connections.

D. Coordinate and document PLC LAN Node numbering and IP addresses with Plant personnel before installation.

E. Qualified representatives of the PLC manufacturer or a qualified systems integrator shall perform all configuration and programming.

F. Completely configure and program each PLC as required outlined in Section 40 96 00 - Process Control Software.

END OF SECTION

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DIVISION 40 – PRIMARY CONTROL DEVICES

SECTION 40 95 00

SCADA SYSTEM SEQUENCE OF OPERATION

PART 1 – GENERAL

1.01 GENERAL

A. The SCADA System Sequence of Operation specification section provides general operational requirements and criteria for development of the process control program.

1. Programming code and databases shall be developed for all I/O. The control strategies shall be developed for each I/O point regardless of whether or not it is listed in the individual 'SCADA System Descriptions' specification sections.
2. The 'SCADA System Descriptions' are not intended to define all of the required interlocks, timing functions, and control sequencing required to obtain an operating system. The System Integrator (SI) shall provide the required programming functions to meet the general operation objectives defined in the 'SCADA System Descriptions'.

B. The SCADA System Descriptions are organized with the following general format:

1. Equipment Description Tables
   a. The process control system descriptions include 'Equipment Description Tables' for major process equipment and instruments. The 'Equipment Description Tables' include general operational parameters which shall be used to develop the programming code for the system. Information includes the following general categories:

Equipment Tag:	Lists the tag number associated with the equipment and for similar equipment.
Location/Area:	Describes the building, structure, or area which the equipment is located.
Control Equipment:	Identifies whether the equipment is being controlled by a local equipment manufacturer's control panel or the SCADA System (SCADA System).

Local Control:	Refers to whether a control station or panel is located adjacent to or near the unit (i.e., HOA switch).
SCADA System Monitoring:	Describes general monitoring functions that the SCADA System is required to perform such as: Status Monitoring (On/Off), Alarm Function Monitoring, etc.
SCADA System Manual Control:	Defines if the Manual Operator Control will be performed by an Operator at a workstation or HMI.
SCADA System Auto Control:	Lists general control functions and algorithms which the SCADA System will perform to automatically control the equipment.
Inputs/Outputs:	Refer to the Process Interconnect Diagram for a summary list of inputs and outputs associated with each unit.
Set Points	Define specific set points that may be required for system operation.
Graphic Displays:	List applicable types of graphic displays required to identify equipment.
Secondary Displays:	List applicable standard or specific parameter displays required to provide appropriate information for equipment or instruments.

b. The equipment descriptions are intended to outline the general operational functions for equipment and instruments. Additional requirements may be included in the 'SCADA System Control Description' section of each process control system description specification section.

C. Unit SCADA Description Summary

1. Headworks Screening System
2. Headworks Influent Flow Rate
3. Sludge Holding Tank Systems
4. Mechanical Dewatering System

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 PRIMARY SCREENING SYSTEM

A. Primary Screen Control Panels (OEM Control Panel)

Equipment Tags:	SC-DS-101 (Screen #1) SC-DS-102 (Screen #2) SC-CR-103 (Compactor #1) SC-CR-104 (Compactor #2)
Location/Area:	Screen Room
Motor Control Equip:	Manufacturer's Control Panels (OEM)
Local Control:	Hand-Off-Auto Forward-Off-Auto Reset-Pushbutton
SCADA System Monitoring:	Alarm Monitoring - Common Status – Screen Running (No.1 & No.2) Status – Compactor Running (No.1 & No.2)
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable
Graphic Displays:	Screen and Compactor Graphic
Secondary Displays:	Equipment Parameter Display

1. The Primary Screening Systems shall include control panels to provide for fully automatic operation of the screens and compactors. If applicable, graphic displays shall mimic graphic displays by the screen vendor.
2. The SCADA system shall monitor the Primary Screening System alarm conditions. In the event that any of the alarms are activated, the SCADA system shall also generate an alarm condition. The specific alarm information shall be made available at the SCADA system.
3. The SCADA system shall start and stop the Primary Screening systems in coordination with the entire plant and in the event of power outage, emergency load priority sequencing.

3.02 HEADWORKS INFLUENT FLOW RATE

A. Headworks Influent Flow Meter (Existing)

Equipment Tag:	Headworks Influent Flow Meter
Location/Area:	Screen Room
Motor Control Equip:	Not Applicable

Local Control:	Not Applicable
SCADA System Monitoring:	Continuous Flow Monitoring
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable
Graphic Displays:	Flow Sensor Instrument Graphic
Secondary Displays:	Trending Headworks Influent Flow (Daily, Weekly, Monthly)

3.10 SLUDGE HOLDING TANK SYSTEMS

A. Sludge Holding Tank Blowers

Equipment Tag:	Sludge Holding Tank Blower #1 Sludge Holding Tank Blower #2 Sludge Holding Tank Blower #3
Location/Area:	Dewatering Building
Motor Control Equip:	Integral Blower VFD
Local Control:	HOA in MCC
SCADA System Monitoring:	Mode – Auto Status – Running Status – Elapsed Run Time Status – Speed Feedback Alarm – VFD Fault Alarm – SCADA System Generated "Fail to Start" Alarm – SHT #1 Low Tank Level Alarm – SHT #2 Low Tank Level SCADA System Mode – [HAND-OFF-AUTO]
SCADA System Manual Control:	• HAND – Blower runs continuously with speed set based on Manual Speed Setting on Equipment Parameter Popup Display • OFF – Blower is removed from service • ALARM RESET – Manual reset of above Alarms • Manual Speed – Blower speed is set based on Equipment Parameter Popup Display • Equipment Control Interlocks: Max 2 of 3 Blowers in operation.

	• Equipment Safety Interlocks – Blower(s) will shut down and lockout on above Alarms. Start/Stop • Standby Power Priority Sequencing Interlock
SCADA System Auto Control:	• AUTO – User-set Time Control Loop • Auto Speed – User-set Speed • Equipment Control Interlocks: Max 2 of 3 Blowers in operation. • Equipment Safety Interlocks – Blower will shut down and lockout on above Alarms. • Blower will be locked out of running at a user-set minimum tank level. • Standby Power Priority Sequencing Interlock
Inputs/Outputs:	I/O (Refer to I/O Table)
Set Points:	Min/Max Speed Reference
Graphic Displays:	Blower Graphic
Secondary Displays:	Equipment Parameter Popup Display

B. Sludge Holding Tank Blower Sequence Mode

1. The blowers shall be controlled individually at the SCADA System through a Device Control Module with [HAND-OFF-AUTO] commands to select the blower “Control Mode” at the SCADA System. The [HAND], [OFF], and [AUTO] control modes shall perform as described herein. The Operator shall be able to stop each blower at the SCADA System by placing the blower in the [OFF] mode.
2. SCADA System [HAND] Control Mode
   a. When the Control Mode is selected for [HAND] at the SCADA System, the blower shall start and run unless an alarm condition is present.
   b. The blower operating speed shall be adjusted at the SCADA System via the adjustable speed set point available at the Device Control Module. The blower speed set point can be adjusted to meet the desired air demand of each blower.
3. SCADA System [AUTO] Control Mode
   a. The AUTO control mode shall consist of controlling the blowers and the blower speed based on a user-set Time Control Function. The Time Control Function shall be configured to run the blowers for a time duration selected by the user.

b. The Time Control Function shall take a time setpoint from the user, and a delay setpoint from the user to run the blowers for a specified amount of time, at a specified frequency. This will command the on-line blower to start when triggered by the time frequency setpoint.

c. When the runtime is exceeded, the blower shall shutdown for the specified frequency time setpoint.

4. Blower Alternation Modes

Blower Stop: SCADA System shall automatically alternate blower to the next blower when the current blower shuts down.

Run Time: SCADA System shall automatically alternate blower to next available blower when the blower exceeds a run time set point.
Adjustable Set Point: **48 hours**.

Time of Day: SCADA System shall automatically alternate the blower sequence to the next available blower based on a 24 hour time clock set point.
Adjustable Set Point: **24 Hours**

Selection Matrix: Manual selection by operator. If activated, the blower sequence shall shall determined manually by the selection matrix shown below

Blower Selection Matrix		
Blower	Blower Sequence	
	LEAD	STANDBY
Sludge Holding Tank Blower No. 1	●	
Sludge Holding Tank Blower No. 2		●
Sludge Holding Tank Blower No. 3	●	
Note:	Selection Matrix shall include interlocks to only allow certain combinations of blowers from operating at a given time to accommodate the differences in blower capacity. This shall be coordinated with the Engineer during construction.	

a. The matrix shall be configured to prevent activation of multiple unwanted conditions (i.e., Three blowers cannot be selected for LEAD operation at the same time, an individual blower cannot be activated for both Lead or Standby Sequence at the same time, or more than two blowers' maximum operation at the same time.)

b. Selection of “Out of Service” shall remove the blower from the Blower sequence (fail-over, alternate, etc.). The SCADA System shall include a blower fail-over sequence.

c. Out of Service shall be illuminated if the HOA selector switch at the Blower VFD is not selected for “Auto”.

C. Sludge Holding Tank Level Sensors (Ultrasonic)

Equipment Tag:	SL-LE/LIT 201 SL-LE/LIT 202
Location/Area:	Sludge Holding Tank(s)
Motor Control Equip:	Not Applicable
Local Control:	Not Applicable
SCADA System Monitoring:	Continuous Level Monitoring Alarm – Signal Out of Range
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	SHT #1 High Level Alarm SHT #1 Decanter Minimum Elv. SHT #1 Low Level Alarm SHT #2 High Level Alarm SHT #2 Decanter Minimum Elv. SHT #2 Low Level Alarm
Graphic Displays:	Sludge Holding Tank(s) Level Graphic
Secondary Displays:	Trending Level Device Parameter Setup

D. Sludge Holding Tank Level Switches (Floats)

Equipment Tag:	SL-LSH-203 – SHT #1 High-High Level SL-LSL-204 – SHT #1 Low-Low Level SL-LSH-205 – SHT #2 High-High Level SL-LSL-206 – SHT #2 Low-Low Level
Location/Area:	Sludge Holding Tank(s)
Motor Control Equip:	Not Applicable
Local Control:	Not Applicable
SCADA System Monitoring:	Alarm – SHT #1 High-High Level Alarm – SHT #1 Low-Low Level Alarm – SHT #2 High-High Level

	Alarm – SHT #2 Low-Low Level
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Control Override in Pump Control
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points/Functions:	Not Applicable
Graphic Displays:	Wet Well Level Graphic
Secondary Displays:	Not Applicable

3.13 MECHANICAL DEWATERING SYSTEM

A. Belt Filter Press System

Equipment Tags:	Belt Filter Press
Location/Area:	Dewatering Building
Motor Control Equip:	Manufacturer's Control Panel (OEM)
Local Control:	Manufacturer's Control Panel (OEM)
SCADA System Monitoring:	Status – Press Running Alarm Monitoring – Press Fault Alarm Monitoring – Sludge Conveyor Fault Elapsed Run Time
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable
Graphic Displays:	Belt Filter Press Graphic
Secondary Displays:	Equipment Parameter Display

B. Sludge Transfer Pump System

Equipment Tags:	Sludge Transfer Pump No. 1 Sludge Transfer Pump No. 2
Location/Area:	Dewatering Building
Motor Control Equip:	VFD @ MCC
Local Control:	Belt Filter Press Manufacturer's Control Panel (OEM)
SCADA System Monitoring:	Status – Run Elapsed Run Time
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable

Graphic Displays:	Pump Graphic
Secondary Displays:	Equipment Parameter Display

C. Polymer Feed System

Equipment Tags:	Polymer Feed System
Location/Area:	Dewatering Building
Motor Control Equip:	Belt Filter Press Manufacturer's Control Panel (OEM)
Local Control:	Belt Filter Press Manufacturer's Control Panel (OEM)
SCADA System Monitoring:	Status – Run
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable
Graphic Displays:	Pump Graphic
Secondary Displays:	Not Applicable

D. Sludge Flow Meter

Equipment Tag:	SL-FE/FIT-101 – Sludge Flow Meter
Location/Area:	Dewatering Building
Motor Control Equip:	Not Applicable
Local Control:	Not Applicable
SCADA System Monitoring:	Continuous Flow Monitoring
SCADA System Manual Control:	Not Applicable
SCADA System Auto Control:	Not Applicable
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable
Graphic Displays:	Flow Sensor Instrument Graphic
Secondary Displays:	Trending Sludge Flow (Daily, Weekly, Monthly)

3.10 SLUDGE CONVEYOR SYSTEM

A. Sludge Conveyors

Equipment Tag:	Sludge Conveyor #1 (SL-C-114) Sludge Conveyor #2 (SL-C-115) Sludge Conveyor #3 (SL-C-116)

Location/Area:	Dewatering Building/Sludge Greenhouse(s)
Motor Control Equip:	FVNR @ MCC
Local Control:	HOA in Control Panel
SCADA System Monitoring:	Mode: Auto Status – Running (#1, #2, #3) Alarm – Emergency Stop Switch (#1, #2, #3) Alarm – SCADA System Generated "Fail to Start" Alarm – Loss of Rotation (#1, #2, #3) SCADA System Mode – [HAND-OFF-AUTO] Alarm – All Sludge Outlet Slide Gates Closed Status – Belt Filter Press Run Signal
SCADA System Manual Control:	• HAND – Selected Conveyor runs continuously. • OFF – Selected Conveyor is removed from service • ALARM RESET – Manual reset of above Alarms • Equipment Safety Interlocks – Conveyor(s) will shut down and lockout on above Alarms. Start/Stop • Standby Power Priority Sequencing Interlock
SCADA System Auto Control:	• AUTO – Operation based on Belt Filter Press Run Signal • Equipment Safety Interlocks – Conveyor(s) will shut down and lockout on above Alarms. • Standby Power Priority Sequencing Interlock
Inputs/Outputs:	I/O (Refer to I/O Table)
Set Points:	Min/Max Speed Reference
Graphic Displays:	Sludge Conveyor and Gate Graphic
Secondary Displays:	Equipment Parameter Popup Display

B. Sludge Conveyor System Sequence Mode

1. The conveyors shall be controlled individually at the SCADA System through a Device Control Module with [HAND-OFF-AUTO] commands to select the conveyor "Control Mode" at the SCADA System. The [HAND],

[OFF], and [AUTO] control modes shall perform as described herein. The Operator shall be able to stop each conveyor at the SCADA System by placing the conveyor in the [OFF] mode.

2. SCADA System [HAND] Control Mode
   a. When the Control Mode is selected for [HAND] at the SCADA System, the selected conveyor shall start and run unless an alarm condition is present.
3. SCADA System [AUTO] Control Mode
   a. In AUTO control mode, the conveyors shall be controlled based on the Belt Filter Press (BFP) Run Status signal. When the BFP is running, Conveyors No. 1, No. 2, and No. 3 shall operate.
   b. Upon loss of the BFP Run Status signal, Conveyors No. 1, No. 2, and No. 3 shall continue to operate for an operator-defined run-on period. This time delay shall be adjustable via the Control Panel Operator Interface Terminal (OIT).
   c. At the expiration of the configured run-on period, all three (3) conveyors shall stop.

C. Sludge Outlet Slide Gate Actuator(s)

Equipment Tag:	SL-G-117 (Greenhouse #1) SL-G-118 (Greenhouse #2) SL-G-119 (Greenhouse #3) SL-G-120 (Greenhouse #4)
Location/Area:	Sludge Greenhouses (#1 - #4)
Motor Control Equip:	Not Applicable
Local Control:	Sludge Conveyor Control Panel
SCADA System Monitoring:	Status – Gate Open Status – Gate Closed Status – Local Operation Status – Gate Position (Open/Close) Alarm – Failure to Open Alarm – Failure to Close Alarm – Signal Out of Range
SCADA System Manual Control:	Manual Position Adjustment (Open/Close) Emergency Closed
SCADA System Auto Control:	Dewatered sludge shall be conveyed from the Belt Filter Press (BFP) to the Sludge Greenhouses. Prior to initiating dewatering operations at the BFP, the operator shall select the designated receiving Greenhouse via the SCADA system. The Control Panel Operator Interface Terminal (OIT) shall provide a graphical display depicting the sludge conveyance system

	and associated slide gates. The interface shall allow the operator to select and command individual slide gates to open or close to direct flow to the desired Greenhouse. Slide gate positions shall remain in their last commanded state until modified by the operator or overridden by defined system interlocks or fault conditions (if applicable).
Inputs/Outputs:	I/O (Refer to Process Interconnect Diagram)
Set Points:	Not Applicable
Graphic Displays:	Sludge Conveyor and Gate Graphic
Secondary Displays:	Equipment Parameter Display

*** END OF SECTION ***

DIVISION 40 - PRIMARY CONTROL DEVICES

SECTION 40 95 13

PROCESS CONTROL PANELS AND HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Equipment enclosures.

B. Control panel components.

C. Power supplies and UPS.

1.02 RELATED REQUIREMENTS

A. Section 40 95 33 - Process Control Networks.

B. Section 40 96 00 - Process Control Software.

1.03 REFERENCE STANDARDS

A. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

B. NFPA 79 - Electrical Standard for Industrial Machinery; 2021.

C. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

1.04 SCOPE OF WORK

A. Design, Supply and Install all hardware and software products required to provide a complete and fully functional control system as shown on the Contract Drawings and/or herein specified.

B. Design the control panels and field wiring interfaces required to implement the control equipment.

1. All control panels shall be designed and manufactured in accordance with UL 508A, Standard for Industrial Control Panels, and NFPA 79, Electrical Standard for Industrial Machinery.
2. All components shall be UL recognized.

C. Connect and test all input and output field wiring to and from the control equipment.

D. Provide all manufacturer's services required for installation, startup, calibration, inspection, and training.

E. Provide all coordination required for system integrator's services as specified in Section 40 96 00 - Process Control Software.

F. Provide all equipment specified elsewhere for a complete and operable system.

1.05 SUBMITTALS

A. Submit the following information involving proposed hardware for the control system:

1. A detailed written description of the control system outlining the purpose and capabilities of each component.
2. Catalog information, shop drawings, and descriptive literature for each component of the control system.
3. Shop drawings and catalog cuts for all panels and enclosures.

B. Submit complete detailed shop drawings, working drawings and descriptive literature for control panel equipment, cabinets, and components. As a minimum the shop drawings and working drawings shall include the following:

1. Bill of Materials
2. Power load calculations verifying capacity of power supplies and UPS units to carry the panel load.
    a. Provide a minimum of 20% spare capacity on DC power supplies.
    b. Provide 10 minutes of no power operation on UPS units.
3. Heat rise calculation of each enclosure.
4. Front panel, back panel and panel schematic wiring diagrams.
    a. Submit detailed drawings showing proposed arrangement of equipment within each enclosure, proposed locations of all equipment and enclosures, and proposed arrangement of all conduits and conductors that will enter each enclosure.
    b. Provide a minimum of 20%, but no less than two (2), installed spare I/O for each type of I/O present in the panel. All I/O are to be factory wired out to field terminal strips in the panel. These spare I/O are to be in addition to the material to be supplied under the Spare Parts section of this specification.
    c. Provide a minimum of 20%, but no less than two (2), spare (open) module slots on the controller I/O back plane.
5. Interconnection wiring diagrams showing all component and panel terminal board identification numbers and external wire numbers, including existing equipment and equipment furnished by others.
6. Provide field wiring diagrams showing the connection of the wiring out to all new and existing monitored and controlled field devices. Field wiring diagrams include:
    a. Point-to-Point Field Interconnection Diagrams.

1.06 WARRANTY

A. Conform with all Contract Warranty requirements specified in the General Conditions and General Requirements.

PART 2 - PRODUCTS

2.01 EQUIPMENT ENCLOSURES

A. Wall Mounted Enclosures

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. Hoffman; Bulletin A12-series.
   b. Approved Equal.
2. UL 508A listed, wall mount, single door, hinged with quick-release latch enclosures with minimum dimensions as indicated on the drawings.
3. Provide enclosures at installed locations with the following environmental ratings.
   a. Indoor, Dry and Clean Locations: NEMA EN 10250, Type 12.
   b. Indoor, Damp or Wet Locations: NEMA EN 10250, Type 4.
   c. Indoor, Subject to Corrosive Liquids or Gases: NEMA EN 10250, Type 4X, 316 stainless steel.
   d. Outdoor Locations: NEMA EN 10250, Type 4X.

2.02 UNINTERRUPTIBLE POWER SUPPLY (UPS)

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. Square D; a brand of Schneider Electric
2. PULS Dimension.
3. Approved Equal.

B. 24VDC Din Rail Mount UPS:

1. Output: 12VDC, 5A and 24VDC, 10A.
2. Input Voltage: 24VDC.
3. Temperature Range: -10 ºF to 120 ºF.
4. Output Power Capacity: 360W in Normal Mode, 240W in Buffer Mode.

C. UPS shall be UL 508 Listed.

D. Warranty: 3 years.

E. Provide 12VDC battery, sized appropriately per backup requirements.

1. Allowed Batteries: 3.9Ah to 40Ah VRLA Lead Acid.

2.03 DC POWER SUPPLY

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. PULS Dimension.
2. SOLA Hevi-Duty.
3. Approved Equal.

B. Din Rail mounted power supply housed in rugged narrow metal case with large, rugged, accessible, multiple connection screw terminations.

1. Power supply shall be enclosed and completely finger safe. Open power supplies shall not be acceptable.
2. Input: Auto Select 115/230 VAC, 50/60 Hz single phase.
3. Adjustable Voltage Output: 24 Vdc – 28 Vdc.
4. Temperature Range: -10 ºF to 120 ºF operation without derating.
5. Indefinite short circuit, overvoltage and overtemperature protection.
6. Highly efficient greater than 90% switching technology.
7. Power supply shall be UL 508 listed.
8. Warranty: 3 years.

2.04 SELECTOR SWITCHES, PILOT LIGHTS, ILLUMINATED PUSHBUTTONS

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. Square D, 9001 Series;
2. Allen Bradley, 800 Series;
3. Approved Equal.

B. Selector switches, pushbuttons and indicator lights unless otherwise noted shall be round style, 30mm, heavy-duty, oil-tight type and shall have nameplate lettering as noted on the Drawings.

1. Miniature style units shall not be acceptable unless otherwise noted on the Drawings.

C. Operator mechanism including locking ring and legend plate shall be a corrosion resistant material.

D. Switch contacts shall be arranged for the configuration and duty as indicated, and operating handles shall be easily operated by hand without the use of tools.

E. Pushbuttons shall be momentary or maintained contact type as indicated.

F. Switches and pushbuttons located remotely from the controller shall be provided with lockout features.

G. Indicator light lenses shall be polycarbonate type with color as noted.

H. Indicator lights shall be LED type and push-to-test.

I. Lamp replacement shall require removal of the front mounted lens cap only.

2.05 SIGNAL ISOLATORS

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. Action Instruments.
2. Allen Bradley.
3. Approved Equal.

B. Signal conditioner with AC powered re-transmitter.

C. Single or Dual channel DC input, as required for the application.

D. Signal Isolation: 2000VAC isolation between Input, Output and Power.

2.06 RELAYS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Square D.
2. Allen Bradley.
3. Approved Equal.

B. Interposing Relays:

1. Miniature plugin relay with Din rail mounting socket.
2. 10A resistive rating.
3. Double throw C-Form contact output.
4. UL Listed.

5. Coil Voltage and contact count as required for the application.
6. LED indicating light for energized state.
7. Mechanical override lever.

C. Power-On Relay:

1. Miniature plugin relay with Din rail mounting socket.
2. 10A resistive rating.
3. Double pole, double throw C-Form contact output.
4. UL Listed.
5. Coil Voltage: Equal to panel incoming power.
6. Coil to be wired to panel incoming power.
7. Contact output to be wired to receiving device as indicated in other section of these specifications or as shown on the drawings.
8. LED indicating light for energized state.
9. Mechanical override lever.

2.07 TERMINAL BLOCKS

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. Allen Bradley; 1492 Series Terminal Blocks.
2. Approved Equal.

B. Terminal blocks shall be one-piece molded plastic blocks with screw type terminals and barriers rated for 300 volts.

C. Terminals shall be double sided and supplied with removable covers to prevent accidental contact with live circuits.

D. Terminals shall have permanent, legible identification, clearly visible with the protective cover removed.

E. Terminal blocks shall be fused type where indicated on the drawings.

F. Analog signals shall be terminated on modular narrow form factor terminal blocks intended for the protection of a floating double conductor (4-20 mA analog) signal.

G. Two-stage surge protection for one operated floating double conductor.

H. Disconnect knife on both signal paths.

I. Separate ground connection.

J. Screw terminal connections.

K. Nominal voltage: 24 V DC.

2.08 POWER DISCONNECTS

A. Panel disconnects

1. Provide NEC compliant panel disconnects. Disconnect and shall be interlocked to the control panel door handle.

2.09 MISCELLANEOUS EQUIPMENT

A. Wiring

1. All wiring shall be in accordance with the applicable requirements of Division 26.

B. Nameplates and Name Tags

1. Panel mounted tags shall be plastic; field mounted tags shall be stamped stainless steel.
2. Nameplate shall be engraved, rigid, laminated plastic type with adhesive back. Unless otherwise noted, color shall be black with white letters and letter height shall be 3/16 inch.

2.10 SPARE PARTS

A. Terminal Blocks: Provide 20% spare blocks of each type used, installed

B. Fuses: Provide 10% spares for all types used (no less than one each).

C. Panel Lights: Provide 10% spares for all types used (no less than one each).

PART 3 - EXECUTION

3.01 DISCONNECTION AND REMOVALS

A. All power, control and instrumentation wiring associated with equipment, panels, devices, etc. to be removed and replaced shall be identified, marked and then disconnected to facilitate their replacement and any related work.

B. All materials no longer used shall be removed unless otherwise directed by the Engineer. Affected surfaces shall be repaired to confirm to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner.

3.02 CONTROL PANELS

A. Control panels shall be completely fabricated, instruments installed and wired in the manufacturer's factory and tested prior to delivery to the site. The control panels shall be factory assembled with all input and output devices.

1. All wiring and equipment shall be completed and tested prior to shipment.
2. All external connections shall be by way of numbered terminal blocks.
3. Install spare terminal blocks on backpanel.

B. Panel instrumentation arrangement shall be as shown, with minor modifications as required by the particular equipment furnished. Modifications shall be subject to the approval of the Engineer.

C. All back panels shall be secured with all the appropriate zinc plated mounting hardware.

D. All devices and wiring shall be properly labeled.

1. Front panel devices shall be identified by laminated nameplates
2. Panel mounted devices and wiring shall be identified by a permanent marking system.

E. All circuit breakers, terminal strips, and related devices required to provide a complete, safe, and neat installation shall be provided.

F. Wiring:

1. Wires shall be 600-volt class, PVC insulated stranded copper and shall be of the sizes required for the current to be carried, but not below 14 AWG enclosed in either sheet metal raceway or plastic wiring duct.
2. Wiring for signal circuits shall be twisted shielded pairs not smaller than No. 18 AWG, and be separated at least 6-inches from any power wiring.
3. All wires shall be identified as per the requirements of Division 26 specifications.
4. Provide wiring channels as required.
5. All interconnecting wires between panel mounted equipment and external equipment shall be brought out to numbered external wiring terminals and terminated.
6. All wires shall be numbered and identified.

G. Terminal Blocks:

1. Wires shall be terminated at the terminal blocks with crimp type, pre-insulated, ring-tongue lugs.
2. Lugs shall be of the appropriate size for the terminal blocks screws and for the number and size of the wires terminated.
3. Fused terminal Block shall be used for power distribution.

H. Nameplates and Name Tags:

1. All components provided under this Section, both field and panel mounted, shall be provided with permanently mounted name tags bearing the entire tag number and description of the component.

3.03 INSTALLATION

A. All items shall be installed in accordance with the manufacturer's recommendations.

B. The Contractor shall furnish and install all material and hardware required to supply a complete and functional installation.

C. Notify Owner personnel prior to disconnect any existing signals.

3.04 TESTING

A. Test the hardware and software using simulated inputs and outputs prior to installation.

1. The Contractor shall retain the services of a system integrator to provide detailed test plans and procedures to demonstrate and document that all equipment has been properly installed and configured for a full functional system which meets all contract requirements.
2. See Section 40 96 00 - Process Control Software.

B. Test the complete installed system by demonstrating that all signals are properly received and sent and that the control system operates as intended.

3.05 CLEANING AND TOUCH-UP PAINTING

A. The premises shall be kept free from accumulation of waste material and rubbish. Upon completion of work, the Contractor shall remove materials, scraps, and debris from the site. Scratches, scrapes, or ships in interior or exterior surfaces of devices shall be touched up with finishes matching as nearly as possible the type and color of the original finish.

B. All material, equipment, and workmanship shall be subject to inspection by the Engineer or his representatives. In the event the Engineer finds the materials or workmanship not in accordance with these Contract Documents, the work or materials shall be removed and replaced, or corrected, by and at the expense of the Contractor.

3.06 TRAINING

A. Provide all on-site and off-site training as specified in Section 40 96 00 - Process Control Software.

END OF SECTION

DIVISION 40 - PRIMARY CONTROL DEVICES

SECTION 40 95 33

PROCESS CONTROL NETWORKS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fiber Optic LAN Equipment.

B. Ethernet LAN Equipment.

C. Fiber Optic Cable

1.02 RELATED REQUIREMENTS

A. Section 40 95 13 - Process Control Panels and Hardware

B. Section 40 94 43 - Programmable Logic Controllers For Process Systems

1.03 REFERENCE STANDARDS

A. IEEE 802.1Q - IEEE Standard for Local and Metropolitan Area Networks – Bridges and Bridged Networks; 2018.

B. IEEE 802.3 - IEEE Standard for Ethernet; 2022 (Corrigendum 2024).

C. IEEE 1588 - IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems; 2019, with Amendment (2024).

1.04 SCOPE OF WORK

A. Provide all network equipment for a complete and functional SCADA system.

1.05 SUBMITTALS

A. Submit catalog cuts, shop drawings, and O&M manuals for all equipment in conformance with the requirements of Section 40 95 13 - Process Control Panels and Hardware.

1.06 WARRANTY

A. Conform with all Contract Warranty requirements specified in the General Conditions and General Requirements.

PART 2 - PRODUCTS

2.01 COMMUNICATION WIRING AND MATERIALS

A. For premises wiring cable see applicable sections of Division 26.

2.02 FIBER OPTIC LAN EQUIPMENT

A. Fiber/Ethernet Switch:

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. Cisco.
   b. Hirschmann, a Belden Brand.
   c. Approved Equal.
2. Fiber/copper managed Ethernet switch.
3. Temperature Range: -40 ºF to 155 ºF.
4. Dual Ring Topology support and suitable for any harsh industrial environment.
5. Compact, DIN Rail Mounting.
6. Support for EtherNet/IP, PROFINET, and Modbus TCP protocols.
7. Provide power supplies as required.
8. Refer to contract drawings for number of Copper/Fiber ports required at each location.
   a. Provide 20% spare capacity of each type of port.

B. Ethernet Media Converter:

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. Black Box Hardened Media Switch.
   b. Approved Equal.
2. Heavy Duty, hardened, sealed steel enclosure, DIN rail mounted, Ethernet fiber to copper media converter.
3. 2k MAC Address.
4. Ports:
   a. ST 100Mbps multi-mode fiber port.
   b. (2) RJ-45 10/100Mbps copper ports.
5. Maximum Fiber Distance: 1.2mi.
6. LED Indicators: Power, LK/ACT, F/H, 10/100.
7. Standards: IEEE 802.3, IEEE 802.3u, IEEE 802.1p/q.
8. CE Approved.
9. Temperature Rating:
   a. Storage: -40 ºF to +185 ºF.
   b. Long-term operating: -13 ºF to 140 ºF.
10. Humidity: 5–95%, noncondensing.

2.03 ETHERNET LAN EQUIPMENT

A. Virtual Private Network (VPN) Router:

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. Phoenix Contact, mGuard Secure Cloud.
   b. Cisco.
   c. Approved Equal.
2. Provide a VPN router with all required hardware, software and accessories for a complete and functioning system. Include the following features:
   a. Interface: Ethernet.
   b. Ports: Six RJ45.
   c. Transmission speed: 10/100 Mbps.
   d. 24VDC supply voltage.
   e. Features: Intelligent firewall, integrated 4-port managed switch, VPN, CIFS Integrity Monitoring, metal housing, slot for SD memory card, extended temperature range, high-performance firewall/VPN: up to 124 Mbps / 40 Mbps.
   f. Din rail mounting.
   g. Status and diagnostic indicators: LEDs: P1, P2, Fault, State, Error, LAN, WAN.
   h. Security Functions:
      1) Dynamic Host Configuration Protocol (DHCP) support: Server or Relay Agent.
      2) Network Time Protocol (NTP) client.
      3) Link Layer Discovery Protocol (LLDP): As per protocol 802.2.
      4) Encryption methods: DES, 3DES, AES-128, -192, -256.
      5) Data integrity: MD5, SHA-1, SHA 256, SHA-512.
      6) Firewall rules: Configurable stateful inspection firewall with full scope of functions.
      7) Filtering: MAC and IP addresses, ports, protocols.
      8) Protection against IP spoofing, DoS and Syn Flood Protection.
      9) Standard routing, NAT, 1:1-NAT, port forwarding.

B. Managed Ethernet Switch:

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. Moxa EDS-508A Series 8-port managed Ethernet switch.
   b. Approved Equal.

2. Standalone 8-port managed Ethernet switch with Ring topology support and suitable for any harsh industrial environment.
    a. IPv6 Ready logo awarded (IPv6 Logo Committee certified).
    b. IEEE 1588 PTP (Precision Time Protocol) for precise time synchronization of networks.
    c. DHCP: Option 82 for IP address assignment with different policies.
    d. Modbus/TCP industrial Ethernet protocol supported.
    e. Turbo Ring and Turbo Chain (recovery time less than 20 ms at full load), and RSTP/STP (IEEE 802.1w/D).
    f. IGMP snooping and GMRP for filtering multicast traffic.
    g. Port-based VLAN, IEEE 802.1Q VLAN and GVRP to ease network planning.
    h. QoS (IEEE 802.1p/1Q) and TOS/DiffServ to increase determinism.
    i. Port Trunking for optimum bandwidth utilization.
    j. RMON for efficient network monitoring and proactive capability.
    k. SNMPv1/v2c/v3 for different levels of network management.
    l. IEEE 802.1X, HTTPS, and SSH to enhance network security.
    m. Bandwidth management prevents unpredictable network status.
    n. Lock port function for blocking unauthorized access based on MAC address.
    o. Port mirroring for online debugging.
    p. Automatic warning by exception through e-mail and relay output.
    q. Works with MXview industrial network management software.
    r. Temperature range: -40 ºF to 165 ºF.Fiber optic cable.

2.04 FIBER OPTIC CABLE

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. Corning Inc., ALTOS Loose Tube series
2. Belden
3. CommScope
4. Approved Equal

B. Description: Heavy-duty, non-armored, loose-tube optical fiber cable designed for outside plant (OSP) campus backbone applications in conduit duct bank. All-dielectric central strength member, stranded gel-free buffer tubes containing 50/125 µm laser-optimized multimode fibers, water-swellable tape materials, and a UV-resistant polyethylene outer jacket.

C. Features:

1. Quick-stripping buffer tubes
2. Water-swellable tapes and yarns
3. Non-metallic design
4. Buffer tubes are reverse-oscillated
5. Superior resistance to solar radiation, moisture, temperature extremes, and mechanical abrasion

D. Operating Parameters:

1. Fiber Type/Core Size: 50/125 µm Laser-Optimized Multimode (OM3)
2. Operating Wavelengths: 850 nm / 1300 nm
3. Maximum Attenuations: ≤ 3.0 dB/km at 850 nm; ≤ 1.0 dB/km at 1300 nm
4. Maximum Transmission Distances: 1 GbE (1000BASE-SX): Up to 1,000 m
5. Temperature (Operating): -40°F to +158°F (-40°C to +70°)
6. Rating: OSP

E. Construction:

1. Central Strength Member: Solid dielectric (FRP - Fiber Reinforced Plastic) core element for axial support and buckling resistance.
2. Fiber Identification: Individual color-coded fibers adhering strictly to TIA-598-D standard color coding (Blue, Orange, Green, Brown, Slate, White, Red, Black, Yellow, Violet, Rose, Aqua).
3. Buffer Tubes: 2.5 mm outer diameter polybutylene terephthalate (PBT) loose tubes color-coded per TIA-598-D, filled with water-swellable dry yarns for moisture resistance.
4. Core Waterblocking: Water-swellable tape wrapped helically around the central member and stranded buffer tube core.
5. Ripcord: Integrated high-tensile aramid ripcord(s) beneath the outer jacket for clean, tool-free longitudinal stripping.
6. Outer Jacket: Black, UV-resistant, linear low/medium-density polyethylene (LLDPE/MDPE) jacket extruded over the waterblocked core.

2.05 SPARE PARTS

A. Patch Cables: Provide 10% spares for all types used (no less than one each).

B. One spare 4 Port Fiber/8 Port Copper managed Ethernet switch.

PART 3 - EXECUTION

3.01 CONTROL SYSTEM COMMUNICATION COORDINATION

A. Modify LAN cabling, fiber optic cabling and patch cords and network hubs/switches throughout the plant via new and existing conduit systems, as shown on the contract drawings.

B. Establish communications between the Human Machine Interface (HMI) server and each programmable logic controller (PLC) as they become available, and verify monitoring of I/O data points.

C. Establish communications between the PLC programming workstation and each programmable logic controller (PLC) as they become available, and verify programmability, upload and downloading functions.

D. Cutover PLC data points to the SCADA monitoring system.

E. Ethernet Patch Cables:

1. Provide and install copper and fiber optic patch cords to connect from patch panels to network switches, hubs, media converters, and other network devices.
2. Coordinate and supply suitable connectors for each patch cable as required for each application.

F. Refer to Section 40 96 00 - Process Control Software for additional programming and system integration requirements.

END OF SECTION

DIVISION 40 - PRIMARY CONTROL DEVICES

SECTION 40 96 00

PROCESS CONTROL SOFTWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Programming Software.

B. General Functional Descriptions.

1.02 RELATED REQUIREMENTS

A. Section 40 95 33 - Process Control Networks.

1.03 DEFINITIONS

A. PLC: Programmable Logic Controller - Purpose built industrial control hardware that controls a process.

B. I/O: Inputs/Outputs - Analog or digital connections between the PLC and process equipment.

C. Discrete: Binary signal represented as 0/1, On/Off, etc.

D. Analog: Variable Signal representing an integer or real number value.

E. Communications: Means by which PLCs can share information digitally with each other or certain equipment. Communications can vary by protocol and media.

F. Communications Protocol: The language that a PLC communicates with other equipment. Modbus is an example of a communications protocol.

G. Serial Communications: Name given to a type of communications where data is passed in series. This type of communication can be either one to one or one to main (via daisy chained wiring). A relatively slower form of communications that utilizes a variety of protocols.

H. Ethernet: Family of wired communications that utilizes a variety of commercial and Industrial communication protocols. Relatively fast form of communications that hardwired IT networks utilizes.

I. SCADA: Supervisory Control and Data Acquisition - Control system architecture comprising computers, networked data communications and graphical user interfaces for high-level supervision of machines and processes.

J. HOA: Hand - Off - Auto

K. OIT: Operator Interface Terminal – Touch screen terminal device located on PLC control panels or near the process. OITs allow the operator to make changes locally to the equipment.

L. Safety: Condition that prevents a piece of equipment from running in Hand or Auto mode. Safeties are generally alarms that could damage the equipment or create a hazard. E.g. hi pressure alarm.

M. Interlock:

1. Condition that prevents a piece of equipment from running in Auto mode. Interlocks are generally used to prevent unwanted process conditions. E.g. Hi level alarm.
2. Condition that prevents an alarm from occurring. E.g. a Lo flow alarm is interlocked with a pump to prevent nuisance alarms from occurring.

N. UPS: Uninterruptible Power Supply - continual power supply that provides battery backup power to the PLC Control Panel.

1.04 SUBMITTALS

A. Product Data:

1. Programming software.

B. SCADA and OIT screen shots.

C. Sample reports.

D. Test and Evaluation Reports.

E. Field Quality-Control Submittals:

1. Field quality-control reports.

F. Maintenance Contracts:

1. Maintenance service.
2. Software service agreement.

G. Operation and Maintenance Data.

H. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

I. Software and Firmware Operational Documentation:

1. Software operating manuals.
2. Program Software Backup: On USB media.
3. Device address list.
4. Printout of software application and USB graphic screens.

1.05 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace equipment that fails in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PROGRAMMING SOFTWARE

A. All Programming shall be performed using version and edition of the programming software currently owned and maintained by the Owner.

B. All Programming shall be performed using the latest version and edition of the programming software being installed on the Owner's Desktop computer.

C. The Contractor's System Integrator shall be responsible for maintaining their own version of the programming software for their own purposes, and shall not be permitted to use or work with the Owner's software for the execution of the work required under this Contract.

PART 3 - EXECUTION

3.01 PROGRAMMING

A. Programmable Logic Controller (PLC) Programming:

1. Programming for the control algorithms shall be performed with the equipment vendor’s latest configuration software using the IEC ladder diagram configuration.
   a. All Programming shall be done in ladder logic format; function blocks, structured text, or other programming methods shall not be acceptable.
2. Configure the new PLC equipment to monitor and control the field devices indicated described in the Function Description.
3. Map each hardwired discrete input I/O point to a series of consecutive registers in the PLC CPU.

4. Map each hardwired analog input I/O point to a series of consecutive registers in the PLC CPU.
    a. Program a second set of analog values, stored in a series of consecutive registers, representing the engineering value of each of the input and output signals.
    b. Multiply the raw numerical value by the engineering scale, plus the zero offset
5. Program the control logic required for the analog outputs and discrete outputs as indicated under Function Description.
6. Program the control logic required to generate and maintain a calculated value to be passed to the HMI system.
    a. Provide calculated values for all functions indicated in this and other sections of these specifications.
7. Program the control logic required to allow operator override control of all PLC outputs passed from the HMI system.
    a. Provide programming necessary for the HMI to monitor and control every data point that the PLC is monitoring and controlling.

B. Operator Interface Terminal (OIT) Programming:

1. The OIT will convey all operating information available from the PLC control system through custom graphic screens.
2. Provide an overview display to show a comprehensive display of important system operating conditions and access all subsequent screens.
3. Program function screens as outlined in the functional descriptions for each system process.
4. Provide setpoint screens to allow the operators to change user adjustable operating parameters.
5. Provide historical trend screens to show a limited graph of datapoints for the system.
6. Alarms will be stored in OIT memory and displayed both in a current alarm summary and a historical alarms screen. Provide a user acknowledge and reset function for all alarms.

C. OIT Data Logging:

1. The OIT will be set up to log historical data to a USB flash drive.
    a. Data will be recorded at 1 minute intervals.
    b. Data will be saved to a plain text file that can be opened by any computer.

D. OIT Graphical Animation:

1. Equipment status will be show with the following color codes:
   a. Green – Motor Running, Valve Open
   b. Red – Motor Stopped, Valve Closed
   c. Gray, Flashing – Valve in Travel State
   d. Yellow, Flashing – Alarms States
2. Analog readings will be displayed in real time in the following decimal formats and units:
   a. Level - ##.# ft.
   b. Pressure - ###.# psi
   c. Flow - ### gpm
   d. Run Hour Meters - ###,###.# Hrs.
   e. Daily/Monthly Flow Totalizers - ###,###.# kGal

E. OIT Security:

1. The user can view all the screens of the OIT without logging in. They will not be able to change any setpoints.
2. The operator can log into the OIT with the preset four-digit pin number. This pin can changed from the OIT.
   a. When Logged In the operator will be able to change any setting in the system.
   b. The user can log out from the security screen.
   c. The user will automatically be logged out 15 minutes after their initial login.
3. All security shall be the Microsoft Corporation “Local Users and Groups” configured in Windows computer management window and shall be active for any remote access.
   a. Provide three (3) levels of operational access for the supervisory control system as follows:
      1) Operator Access - limited to access required for system operation.
      2) Supervisory Access - access to system characteristics & alarms.
      3) Engineer Access - unlimited access.

3.02 GENERAL FUNCTIONAL DESCRIPTIONS

A. Software Hand-Off-Auto:

1. Software Hand-Off-Auto (HOA) switches will be provided for all motorized equipment. The equipment will follow these guidelines for each mode unless otherwise specified.
   a. The Software HOA switch will only work if the equipment is in 'Auto' at the local motor starter. If feedback from that switch is available, the PLC will never attempt to start the motor if it is not in 'Auto'.
   b. Hand – The equipment will run regardless of system conditions. If a defined Safety is active the PLC will not engage equipment to run.
   c. Off – The PLC will not engage the equipment to run.
   d. Auto – The PLC will start and stop the motor based on the defined system conditions. If a safety or interlock condition exists, the equipment will not run.
2. For variable speed motors in 'Hand' the PLC will run the motor at a 'Hand Speed' setpoint. In 'Auto' Mode the speed will be determined by the defined logic. Switching the motor from 'Hand' to 'Auto' will be "bumpless", meaning that the motor will automatically hold the last speed when switched into 'Hand', and vice versa.

B. Software Off-Auto:

1. Software Off-Auto (OA) switches will be provided for all chemical pumps. The equipment will follow these guidelines for each mode unless otherwise specified.
   a. The OA switch will only work if the equipment is in 'Auto' at the local motor starter. If feedback from that switch is available, the PLC will never attempt to start the motor if it is not in 'Auto'.
   b. Off – The PLC will not engage the chemical pump to run.
   c. Auto – The PLC will start and stop the chemical pump based on the defined system conditions.

C. Software Open-Close-Auto:

1. Software Open-Close-Auto (OCA) switches will be provided for all open/close valves. The equipment will follow these guidelines for each mode unless otherwise specified.
   a. The Software OCA switch will only work if the equipment is in 'Auto' at the valve. If feedback from that switch is available, the PLC will never attempt to move the valve if it is not in 'Auto'.
   b. Open – The PLC will open the valve.
   c. Off – The PLC will close the valve.
   d. Auto – The PLC will open and close the valve based on the defined system conditions.

D. Software Manual-Auto:

1. Software Manual-Auto (MA) switches will be provided for all modulating (i.e. position controlled) valves. The equipment will follow these guidelines for each mode unless otherwise specified. Switching the valve from manual to auto will be “bumpless”, meaning that the valve will automatically hold the last position when switched into Manual, and vice versa.
    a. The Software ‘MA’ switch will only work if the equipment is in ‘Auto’ at the valve. If feedback from that switch is available, the PLC will never attempt to move the valve if it is not in ‘Auto’.
    b. Manual – The PLC will open the valve to the position set in the ‘Manual Position’ setpoint provided for the valve.
    c. Auto – The PLC will position the valve based on the defined system conditions.

E. Alarming:

1. Introduction:
    a. This section will describe typical alarm configurations and details. Unless noted elsewhere the alarms will behave as described in this section.
2. Digital Alarms – Digital alarms are generated based on an on/off input.
    a. Alarms will be on a timer to prevent nuisance alarms.
    b. Time delays will be in seconds and operator adjustable.
    c. Alarms will automatically reset when the alarm condition clears.
    d. Alarms will have an enable/disable that is operator selectable. If an alarm is disabled it will not activate or clear and will not reactivate unless it is re-enabled.
3. Analog Alarms – Analog alarms are generated based on an analog reading. Alarms are characterized as either hi or lo alarms. A Hi alarm will activate if the reading is greater than or equal to the alarm setpoint. Lo alarms will activate if the reading is less than or equal to the alarm setpoint.
    a. Alarms will be on a timer to prevent nuisance alarms.
    b. Time Delays will be in seconds and operator adjustable.
    c. Hi alarms will automatically reset when the value drops below the setpoint minus a deadband.
    d. Lo alarms will automatically reset when the value rises above the setpoint plus a deadband.
    e. Alarms will have an enable/disable that is operator selectable. If an alarm is disabled it will not activate or clear and will not reactivate unless it is re-enabled.

4. Singal Fault – Alarm indicating that a signal is outside of normal range, indicating the signal is in a fault condition.
    a. Analog Readings will generate an alarm if the signal is +/- 2% of full scale out of normal range.
    b. Signal Faults will clear when the signal returns to the normal signal range.
    c. Alarms will be on a time delay hard coded to five seconds.
    d. Alarms will have an enable/disable that is operator selectable. If an alarm is disabled it will not activate or clear and will not reactivate unless it is re-enabled.
5. Motor Failure to Run – Indication that a motor was called to run and is not operating.
    a. When a motor is called to run and the PLC doesn't receive run feedback a timer will start.
    b. Variable speed motors will alarm based on run feedback and speed feedback. If speed feedback differs from the speed command by more than 5% a motor failure to run will be activated.
    c. Timer Delays will be operator adjustable in seconds.
    d. Alarms will latch and require a manual reset to clear.
    e. Alarms will have an enable/disable that is operator selectable. If an alarm is disabled it will not activate or clear and will not reactivate unless it is re-enabled.

F. Run Hour Meters

1. The PLC will track the number of run hours for each motor.
2. Run hours will be displayed in hours.
3. Run hour meters can be manually reset by the operator.
4. Run Hour Meters will automatically rollover at 999,999.9 hours.

3.03 FIELD QUALITY CONTROL

A. Factory Acceptance Test (FAT): Once fabrication and programming of the control panel(s) is complete, an FAT will take place at the system integrator's facility or a facility otherwise approved by the Owner. This testing will include a demonstration of complete functionality testing of the configured PLC, RTU, and the OIT equipment prior to delivering the equipment to the site.

1. Unless otherwise approved in writing, all testing shall be performed in the presence of authorized Owner personnel.

B. Site Acceptance Test (SAT): Perform the SAT as part of the start-up services as described in the following section.

1. Submit test plans and procedures, including test forms, to the Engineer for review and approval 30 days prior to testing.
2. Unless otherwise approved in writing, all testing shall be performed in the presence of authorized Owner personnel from both Operations and Maintenance.
3. Include demonstration of all control loops in normal operating conditions. All safeties and interlocks to be demonstrated.
4. SAT should not be considered complete until 30 days of uninterrupted automatic operation.

C. Test forms shall be prepared and submitted by the contractor prior to scheduling each test.

1. These forms shall be completed at the time of witnessed testing and signed by both the contractor and Owner's representatives.

3.04 SYSTEM STARTUP

A. Perform the check out of field signals.

B. Perform or assist in the performance of all field tests listed in other sections of these contract specifications.

C. Perform startup service and SAT:

1. Demonstrate that each network connected device installed under this contract is properly installed and functioning.
2. Demonstrate that the SCADA software has been installed and is functioning as intended.
3. Demonstrate that the SCADA software is properly communicating with each I/O point on each PLC or other devices and that the field data is available at all network nodes.
4. Demonstrate that all displays, trends, alarms, and reports have been configured and are properly operating.
5. Demonstrate that all real-time data is being collected as historical data and is accessible from PCs on the LAN.

6. Demonstrate that all control system configuration software is properly operating on the HMI servers, workstations, and clients, and that the final configuration files can be uploaded, modified, and downloaded into the network attached control equipment.
7. Demonstrate secure remote offsite accessible to the SCADA system. Ensure that industry cybersecurity best practices are being followed.

D. At the completion of the start-up:

1. Document the IP Addresses, Usernames/Passwords, configured services, and configuration files for all devices on the LAN.
2. Red-line the control panel drawings and update the control panel electronic drawing files to create a record set.
3. Provide AutoCAD files and PDF files of the control panel record drawings to the client.
4. Provide the final, as-programmed, programs to the client.

3.05 MAINTENANCE SERVICE

A. Beginning at Substantial Completion, verify maintenance service includes three months' full maintenance by the System Integrator or manufacturer's authorized service representative. Include monthly preventive maintenance, reprogramming or adjustment of defective processes or components, and adjusting as required for proper control system operation.

3.06 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, provide software support for two years at no additional cost to Owner.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within one year(s) from date of Substantial Completion. Verify that upgrading software includes operating system and new or revised licenses for using software.

C. Upgrade Notice: No fewer than 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

D. Written Report: Prepare report after each update, documenting upgrades installed.

END OF SECTION

DIVISION 41 – MATERIAL PROCESSING AND HANDLING EQUIPMENT

SECTION 41 12 13.36

SCREW BULK MATERIALS CONVEYORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals to install, test, complete and ready for operation, shaftless spiral conveying equipment, as shown on the Contract Drawings and as specified herein.

B. The conveying equipment shall be of the shaftless type, specifically designed for the conveyance of dewatered sludge, and as manufactured by SPIRAC (USA) INC, Alpharetta, Georgia or approved equal.

1.02 RELATED SECTIONS

A. Section 01 87 13 – Equipment General Provisions

B. Section 46 76 21 – Belt Filter Press

C. Section 40 95 00 – SCADA System Sequence of Operation

1.03 PERFORMANCE AND CONDITIONS OF OPERATION

A. The shaftless spiral conveyor system shall be fabricated to meet the performance and design requirements outlined in the “Design Table A” of this specification. Conveyor selection design standards and requests to deviate from these specifications, shall be based on the operational experience of the manufacturer with shaftless spiral conveyors. Designs and deviations shall not be based on shafted conveyor experience, formulae or parameters.

B. Conveyor rotational speeds shall not be greater than specified unless availability of the reducer ratio requires slight adjustment (+ 3rpm). Deviations from specified speed shall not be utilized to reduce the specified conveyor trough and spiral size.

C. The interior of the Greenhouse Drying Beds is a Class 2 Div 1 environment. All motors subject to this environment must conform to the requirements of this environment.

1.04 SUBMITTALS

A. The equipment Supplier shall, as a minimum, submit the following information for review and approval by the Engineer:

1. Descriptive literature regarding the conveying equipment to be supplied.
2. Reference information and certifications as required under subsection 3.
3. Detailed specifications for the Equipment proposed
4. Manufacturer's certification confirming that the proposed Equipment fully complies with these specifications, including paragraph 2.3.2 of this section.
5. General arrangement drawing(s) for the proposed Equipment.
6. Cut sheets for electric motors and ancillary items manufactured by others.
7. Conveyor torque requirement calculations.
8. Torque calculations for the gear reducer and reducer motor.
9. Horsepower calculations for the drive motor(s).
10. Spiral strength calculations, including deformation calculations.
11. Complete schematic diagrams for electrical control panel(s) if applicable.
12. Operation & Maintenance Manual (not a generic sample, but a complete and specific O&M), with factory and field testing forms left blank as required.

B. Submittal documents shall be transmitted in searchable, archivable electronic format, and made available in bound hard-copy at the request of the reviewing authority.

C. The shaftless spiral conveyor supplier will provide detailed, scalable layout drawings to the installing contractor, in order to assist in coordinating the layout and minimizing conflicts. Supplier will make available mechanical, structural, & electrical drawings and schematics, and work with the contractor to incorporate interconnections and site measurements for a detailed and complete conveyor submittal.

1.05 QUALITY ASSURANCE

A. Fabrication and assembly of all equipment under this section shall be in full conformity with this specification as shown in the contract drawings.

B. Equipment shall be furnished complete with all supports; all mechanical equipment required for proper operation, including complete drive units; all steel and other metal construction specified herein; and all additional materials or fabrications as required by the supplier's design.

C. Shop welding shall conform to the latest standards of the American Welding Society (AWS).

D. Unless otherwise noted:

1. Equipment included in this section shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and the satisfactory operation of the system.

2. Spirals furnished with the shaftless conveyor(s) shall be produced and finished by the conveyor supplier, from spiral forming equipment owned and operated by the supplier. Spirals purchased from third party vendors shall be accompanied by certification of compliance to the requirements of this specification, from the third party vendor or vendors, as well as the conveyor supplier.

E. Shaftless spiral conveyor manufacturer shall provide evidence of at least fifteen (15) years demonstrable experience in the design and manufacture of shaftless spiral conveyor systems.

F. Conveyor manufacturer shall have at least twenty-five (25) shaftless spiral conveyor systems operating successfully for at least five (5) years in North America. Valid reference installations include only those designed and furnished under the suppliers own name. Equipment which was otherwise bought and re-sold, or supplied under a license or marketing agreement, shall not be considered to meet the experience clause.

1.06 WARRANTY

A. The manufacturer shall warranty the equipment furnished under this section to be free from defects in material and workmanship for a period of twelve (12) months after the equipment was first placed into operation at the jobsite or eighteen (18) months after the equipment was first delivered to site, whichever date occurs first. Any warranted material defects found to exist shall be corrected (repaired or replaced) at no cost to the Owner.

B. The shaftless spiral and replaceable wear liner shall be warranted for a period of three (3) years from site start-up against wear.

1. Spiral: Excessive wear on the screw shall be indicated by loss of more than 50% of the height of the main outer screw section over 30% of the total length of the screw. If excessive screw wear is found the conveyor supplier shall provide new screw to replace the screw in the conveyor that has excessive wear.
2. Liner: For a wear indicator (two color) liner, excessive wear shall be indicated by appearance of the bottom indicator layer (second color) along more than 30% of the conveyor length during the first three years of service. If these wear indications occur the conveyor supplier shall provide new formed and banded liner to replace all the liner in the conveyor that has excessive wear.
3. Liner: If a one color liner is approved, excessive wear shall be indicated if the thickness of the liner, at three points over a 30% long section of the conveyor, is less than ¼” thick at the thinnest point of the liner, during the first three years of service. In addition, as single color liner prohibits a simple visual inspection to confirm wear, the conveyor manufacturer shall perform the annual inspections. Conveyor supply shall supply a field

technician to the jobsite on the annual acceptance date for three consecutive years, to analyze the liner and demonstrate to the owner satisfaction that a minimum of ¼" of liner is remaining. If excessive liner wear is found the conveyor supplier shall provide new formed and banded liner to replace all the liner in the conveyor that has excessive wear.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. The conveying system shall be of the shaftless type as manufactured by SPIRAC (USA) INC, Alpharetta, Georgia, or equal.

2.02 MATERIALS

A. Materials used in the fabrication of the equipment under this section shall conform to the following, as further detailed in the "Design Table A" at the end of this section:

1. Chutes, Troughs, End Plates, and Covers shall be of AISI 304SS sheet and plate.
2. Supports shall be AISI 304SS, minimum 1/4" thick, structural shapes.
3. Spiral Flighting shall be of High Tensile Micro Alloy Steel (HTMAS).
4. Wear Liner shall be of Ultra High Molecular Weight Polyethylene (UHMW-PE) and modified for wear applications.
5. Fasteners, except for power transmission or drive components, shall be of 18-8/304SS.

B. Gear Reducers, Motors, and other ancillary items shall be designed and rated for the severe environment of this application.

C. Power supply to the equipment will be 480 volts, 60 Hz, 3 phase. Power supply for controls and control devices, shall be 120 volts, 60 Hz, single phase.

D. All electrical equipment shall conform to applicable standards of the National Electrical Manufacturers Association (NEMA) and the National Electrical Code (NEC).

2.03 FABRICATION

A. The shaftless spiral conveyor equipment shall include the following as defined and described within this specification section:

1. Troughs, Liners & Covers, and fabrications defined within this specification.
2. Spiral Flighting
3. Chutes
4. Drive Motor & Gear Reducer

5. Mounting and Support Structure
6. Safety or electrical items defined within this specification
7. Spare Parts

B. All welds to be continuous unless otherwise specified. Facing surfaces of field-welded components shall be beveled and match marked.

C. Sharp corners of all cut and sheared edges shall be made smooth by edge grinding.

2.04 SURFACE PREPARATION AND COATING

A. All iron and mild steel surfaces to be painted shall be dry abrasive blasted in accordance with SSPC-SP6, and in accordance with the painting section of these specifications. Surfaces shall be painted or hot dip galvanized within 24 hours to prevent rusting and surface discoloration.

B. After surface preparation, ferrous metal surfaces, if any, except for the spiral flighting shall receive a minimum of one (1) coat of epoxy primer. Provide a total minimum dry film thickness of 3 mils prior to shipment to jobsite. Primer shall be compatible with the paint system specified for the equipment under “Painting” section of these specifications. Finish coats shall be applied at the jobsite by the General Contractor.

C. Stainless steel shall be cleaned with mild abrasive wheels and/or nonferrous blast media to remove heavy scale and welding carbon and/or passivated with stainless steel cleaner then rinsed. Stainless steel surfaces do not require painting.

D. Spirals shall be furnished with one coat of shop primer only.

E. Electric motors, gear reducers, electrical control panels, and other purchased sub-components shall be furnished with the manufacturer’s standard finish.

2.05 SHAFTLESS SPIRAL

A. Spiral flighting for the shaftless screw conveyors shall be designed to convey material without a center shaft or hanger bearings.

B. Spiral flights shall be formed from corrosion resistant HTMAS (High Tensile Micro Alloy Steel) and shall be concentric to within +/- 2mm.

C. Spiral shapes shall be cold formed from continuous bar, in two distinct stages, in order to achieve optimum hardness. Shaftless spiral flighting shall not be fabricated from plate.

D. For increased efficiency, a second, inner spiral, concentric with the outside spiral shall also be provided.

E. Spiral strength calculations shall be supplied by the manufacturer, to show that torsional ratings of completed spirals exceed the torque load produced within the trough at 150% of the design load.

F. Spiral deformation calculations shall supplied by the manufacturer. Calculations shall be based on the formula for cylindrical helical springs of rectangular cross section, found in the latest edition of Marks' Standard Handbook. Calculations cannot rely on use of a correction factor for close coils and must result in demonstrating a "spring effect" of the completed spiral which does not exceed +/- 1/8" per linear foot of spiral under maximum loading conditions.

G. The minimum outer spiral thickness shall be 0.75" for spiral diameters up to 9" and 1" for spiral diameters exceeding 9".

2.06 SPIRAL WELDING

A. Spiral flighting shall have full penetration welds at all splice connections, to present a continuous and complete spiral upon installation.

B. Field welds at the jobsite by the installer may be necessary when any overall conveyor length presents shipping or handling constraints.

C. When welding spiral sections in the field during installation, the installing contractor shall be provided with complete instructions from the spiral manufacturer. Spiral ends requiring field welding shall be prepped and match marked by the spiral manufacturer prior to delivery.

2.07 SPIRAL MOUNTING

A. The driveshaft with integral coupling disc, shall penetrate the end plate through a guarded, serviceable, gland packing housing prior to insertion to the gear reducer. The coupling disc shall be machine faced after fabrication, to include centering hub for spiral mounting and alignment.

B. The connection of the spiral to the drive system shall be through fastening of the driveshaft and spiral coupling discs. Fasteners shall be readily accessible and of a corrosion resistant high strength material.

C. The spiral coupling plate shall be reinforced with a welded gusset, shaped and formed to provide a transition of load forces from the plate to the spiral. Connections which use torsion arms with point load connections to the spiral shall not be acceptable.

D. The drive shaft assembly shall incorporate a grease lubricated labyrinth seal, serviceable from the exterior of the conveyor, which is shaft mounted internally between the back plate and spiral coupling connection.

2.08 HORIZONTAL AND INCLINED TROUGHS (LESS THAN 35 DEGREE)

A. U-shaped troughs shall be formed of sheet or plate similar to the dimensional standards of CEMA 300 and to CEMA enclosure classification IIE.

B. Troughs shall be constructed with formed upper faces integral to the body of the trough in order to provide optimum sealing of the gasketed connection between lid and trough. Designs incorporating structural angle welded to the trough body for the upper faces, shall be fully welded and ground smooth on the inside, with stitch welding on no greater than 6inch centers on the outside.

C. Troughs shall be flange-joined when any section exceeds 24 foot in length.

D. Non-drive ends shall be provided with flanged bolted end plates, where not axially connected to following equipment.

E. On inclined conveyors, a drain outlet shall be integral to the conveyor trough, in order to facilitate cleaning. Drain outlet shall be located as shown on the contract drawings. Drain flushing connections shall be provided if and where specified by the contract drawings. The drain outlet shall be piped to a drain as shown on the drawings. The Contractor shall furnish all labor and materials to connect the conveyor drain and/or flush water to the plant water and drain system.

F. Each trough shall be equipped with inlet and/or discharge openings as shown on the contract drawings. If required, each inlet and discharge opening shall be flanged suitable for interconnection to other devices. Any interconnecting devices such as chutes or hoppers shall be fabricated from the same grade of material as the troughs and with a gauge thickness to suit the application requirements.

G. Bolted covers shall be furnished for any portion of each trough that is not covered by the filling chute. Covers shall be manufactured in maximum five (5) foot lengths to allow for ease of access during replacement of the (shorter) sectioned wear liner. Quick opening covers will not be allowed unless they are also bolted, in order to discourage direct access to the shaftless spiral during normal operation.

H. Inlet and discharge hoppers or chutes shall be provided of the same construction material as the conveyor troughs, as shown on the contract drawings. Flanges shall be a minimum 0.25” thick.

I. Safety Labelling shall be CEMA severe duty style, appropriate for the equipment, and affixed at the factory. In addition to warning of operation without covers, all warning labels shall include a callout for lockout of power before servicing. When indicated on the contract drawings, inspection hatches shall be provided with removable finger guards.

J. In order to avoid excessive wear and increased maintenance, the conveyors shall be designed without the use of steel hold down bars or structural steel assemblies. Hold down liner segments which do not interfere with the flow of material are acceptable. Acceptable placement shall be limited to the underside of lids. Segments shall be removable without welding and incorporate leading and trailing beveled edges.

2.09 REPLACEABLE WEAR LINER

A. Conveyor troughs shall be lined with ultra-high molecular weight polyethylene (UHMW-PE) based material, which has been specifically modified for the reduced friction and wear requirements of the application. The wear liner for a shaftless conveyor system is of primary importance to functionality and maintainability. Unmodified UHMW or material not specifically designed for the application will not be considered.

B. Wear liner shall be supplied in maximum 4ft sections, in order to provide for ease of replacement during servicing.

C. Each section of liner shall be a single piece, formed and bonded with two (2) layers of the same material, each of a different color, to provide a visible indication when the liner is nearing the end of its useful life.

D. Each layer shall have been modified to have the same properties for reduced friction and wear. Liners which bond a second layer of unmodified UHMW can be readily dislodged after the primary layer is worn through and will not be acceptable.

E. The liner shall be held in place with stainless steel cleats, permanently welded to the inside of the trough. No fasteners or penetrations through the trough wall shall be allowed.

F. Liner thickness shall be 3/8” for vertical conveyors; 1/2” for spirals up to 14” diameter, and 5/8” for larger spirals. On all sizes, the wear indicating color shall be at least 1/8” thick, in order to provide the strength to be retained in the trough while showing wear.

G. Replacement liner shall be readily available and stocked in the United States by the shaftless spiral conveyor equipment manufacturer.

2.10 CONVEYOR SUPPORTS

A. Conveyors shall be furnished complete with supports suitable for mounting as shown on the contract drawings.
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B. Conveyor supports and support mounting brackets, shall be of stainless steel structural plate and shapes, all a minimum 0.25” thick.

C. Supports shall be fabricated, assembled and fit to the conveyor prior to its delivery to the jobsite. Supports and conveyor segments shall be clearly match marked by the manufacturer, for ease of installation by the contractor.

D. For design of floor supports with imbedded anchors, manufacturer shall allow for up to 1 inch of grout beneath each support foot pad for the Contractor to compensate for unevenly poured elevations.

E. All hanging supports furnished by the conveyor manufacturer shall be up to 6 inches longer than required for field fit and levelling by the Contractor during installation.

F. Conveyor supports shall not be restricted to flange joint locations.

G. Supports shall be coordinated and designed with the installing contractor and located along the conveyor trough so as to avoid interference with other equipment, site features, or equipment supports.

H. The Contractor shall be responsible for all floor and hanging support anchoring fasteners.

2.11 GEAR REDUCTION UNIT

A. All gears shall be AGMA Class II, single or double reduction, constant speed gear reduction units, with high capacity roller bearings.

B. Bearings shall be designed for the thrust loads of the application and shall have a minimum Bearing Service Life L_{10} of 30,000 hours (or L_{50} of 150,000 hours), as defined by the American Bearing Manufacturers Association (ABMA).

C. Manufacturer shall provide bearing service life calculations compiled by the gear reducer supplier. Results shall be based on the specific design load of the application, as calculated by the manufacturer. Bearing life shall not be based on a modified value from the specific drive manufacturer.

D. The reducer will be air-cooled unit with no auxiliary cooling requirement. The gear reducer shall be sized with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor nameplate at the driven shaft speed, whichever is greater.

E. Conveyor gear reduction units shall be powered by direct coupled motors. Drive systems incorporating V-belts or separately supported drives and motors, shall not be acceptable.

F. Drives shall be completely supported by direct mounting to a dual flanged bellhousing adapter, providing connection to the drive end plate of the shaftless spiral conveyor.

G. Bellhousing adaptors shall set off the drive from the trough, in order to allow seepage of any material from the conveyor trough to atmosphere rather than onto the output seal of the gear reducer/ motor drive unit. Directly attaching the gear reducer to the drive end plate of the conveyor will not be acceptable.

H. The drive unit mounting to the end of the trough shall require no additional supports, and there shall be no visible "wobble" movement under any operating condition.

I. To allow for system upset, the drive system shall be designed at a minimum, to operate the conveyor with a trough filled to 1.5x the theoretical design load.

2.12 DRIVE MOTORS

A. All motors shall be 230/460 volt, 60 Hz, 3 phase, comply with the motor specification and be rated for the operational area noted in the contract drawings.

B. Motors shall be of energy efficient design meeting or exceeding the most current edition of NEMA MG1-Table 12-10.

C. Motors shall have a 1.15 nameplate service factor, a TEFC enclosure, and be designed with torque characteristics in accordance with NEMA MG1-12.35 and 12.38.

2.13 ELECTRICAL ACCESSORIES

A. Electrical items shall conform to the applicable standard of the National Electrical Manufactures Association (NEMA) and the National Electrical Code (NEC). Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower.

B. Motion (Rotation) Sensor Probe. A non-contacting rotation sensor shall be lid or trough mounted on the conveyor, away from the drive. Sensor shall be rated for the environment of the application and shall not require a trough penetration for proper operation. Sensor shall be a model MSP-12 by Siemens Milltronics, or approved equal.

C. Motion (Rotation) Failure Alarm Unit. Each probe shall be provided with a motion failure alarm controller, to report spiral or drive shaft failure. The Motion Failure Alarm shall be housed in an enclosure suitable for the environment. The unit shall be a model MFA-4P by Siemens Milltronics, or approved equal.

D. Emergency Pull Cord Switch

1. Conveyors shall be furnished with emergency pull cords. The cords shall activate a dual relay, trough mounted emergency stop switch, intended to provide a signal to immediately stop the conveyor, and any feeding devices, when activated.
2. Pull cords shall run the full length of the conveyor in a straight path, guided through eyebolts spaced on not greater than 12ft centers. Cording shall be orange colored, nylon coated, corrosion resistant safety cabling.
3. The pull cord switch shall be housed in an enclosure suitable for the environment. The unit shall be a model RS by Conveyor Components Company, or approved equal.

2.14 SPARE PARTS

A. All Spare Parts shall be provided in protective packaging for long-term storage.

B. Manufacturer shall clearly identify and furnish any special tools required for routine service and maintenance of the equipment. Special Tools shall be provided in packaging designed for storage and repeated use.

C. The following spare parts shall be supplied, as a minimum:

1. One (1) Packing gland set, for each conveyor supplied
2. One (1) complete set of liner for all conveyors if the second color of the liner is not the same material as the base liner.

D. Conveyors shall be supplied by the manufacturer fully and completely lubricated and ready to be placed into operation. No spare lubricant shall be required for the gear reduction units within the warranty period.

2.15 ACTUATED SLIDE GATE

A. The conveying equipment shall be provided with actuated slide gates on discharges as shown on the contract drawings and described below. Slide gate shall be designed for positive seating of gate blade when closed, to prevent dripping of material when closed. Due to limited ready access to the discharge points, roller gates or gates which require periodic lubrication shall not be acceptable.

1. Gates shall be designed with clear openings at least the width of the trough.
2. Gate design shall prevent solids from remaining in an opening after moving from the fully closed to the fully open position.
3. Construction material for the slide gate assembly shall be minimum 3/16” thick stainless steel construction.
4. Slide rails shall be high wearing UHMW-PE, with machined groove for fit to gate blade.
5. Main gate blade shall be a minimum 0.25” thick stainless steel.
6. Entire gate assembly shall be designed to be attached to the equipment discharge, without a need for external attachments, bracing, or structure.

B. Actuated Slide Gates shall be electrically operated.

1. Electric actuator shall be fixed to the gate frame, requiring no additional support.
2. Actuator shall be as specified and include internal limit switches for position reporting.

2.16 ELECTRIC ACTUATOR

A. The conveyor manufacturer shall provide an electric actuator, model IQ by Rotork or approved equal.

B. The actuator shall be rated for the specified environment, include internal adjustable limit switches, and a manual override hand wheel.

C. The actuator shall be powered with 230/460V 3phase power and have integral controls to allow for switching to and controlling with local operation.

PART 3 – EXECUTION

3.01 PREPARATION

A. The conveyor manufacturer shall furnish the services at site of a factory-trained representative for a period of two (2) days in no more than one (1) trip to the jobsite.

B. Services shall be provided by the manufacturer after the Contractor has installed the equipment. Upon completion, the manufacturer shall provide:

1. Certification that the equipment has been properly installed.
2. Confirmation that functional and safety items are correct, and that the equipment is ready to operate.
3. Training of the Owner's personnel in the safe operation, servicing, and maintenance of the equipment.

C. Field services at the jobsite shall be performed during normal daylight working hours from Monday – Friday; legal holidays accepted. Manufacturer's personnel shall not be expected to work overtime unless agreed to in advance.

D. The installing contractor shall coordinate the manufacturer's technical services in a timely professional manner.

1. A minimum of two weeks' notice shall be provided the manufacturer for travel planning purposes unless agreed to by the manufacturer.
2. To avoid project delays and maintain control of costs, every effort should be made to coordinate inspection, commissioning, and training in as few trips as practical. If required to make trips in excess to the specified amount due to lack of coordination, planning or efforts of the contractor, the contractor shall be responsible for additional costs incurred by the manufacturer.

E. After completion of Field Services, the manufacturer shall furnish a written report certifying that the equipment has been properly installed, is ready for full load operation,

and is fully and completely warranted. Any outstanding items shall be documented, and the full report shall become a part of the final Operation and Maintenance (OM) Manual.

PART 4 – PERFORMANCE AND DESIGN

4.01 PERFORMANCE AND DESIGN TABLE

Item No.	BFP CNV	CNV1	CNV2
Conveyor Model No.	OK320-SPX/SS	U250-SPX/SS	U250-SPX/SS
Conveyor Length (ft)	26	112.5	112.5
Inclination (degrees)	30	0	0
Connects to	CNV1	Greenhouse Discharge	Greenhouse Discharge
Trough & lid Mat'l	304SS	304SS	304SS
Trough Thickness	11ga	12ga	12ga
Lid Type / Length	Bolted / 5ft max	Bolted / 5ft max	Bolted / 5ft max
Lid Thickness	11ga	12ga	12ga
Liner Type	Duraflo SPX	Duraflo SPX	Duraflo SPX
Liner Thickness	5/16 in	5/16 in	5/16 in
Inlet Qty	1	1	1
Outlet Qty	2	2	2
Material			
Conveyed Material	Dewatered Sludge	Dewatered Sludge	Dewatered Sludge
Vol. Flowrate (ft3/hr)	100	100	100
Bulk Density (lb/ft3)	62.4	62.4	62.4
Fill Factor	50	51	51
Spiral			
Spiral Type	AB	FB	FB
Spiral Material	HTMAS	HTMAS	HTMAS
Spiral Dia/Pitch (in)	290/180 mm	215/245 mm	215/245 mm
X-section (mm)	60x15/35x8	50x20/40x20/30x12	50x20/40x20/30x12
RPM	16	14	14
Drive			
Drive Type	Helical Gear	Helical Gear	Helical Gear
Gearset Model	FA77	FA87	FA87
Motor hp	3	5	5
Power Supply	460v/3/60	460v/3/60	460v/3/60
Transport Direction	Push	Push	Push

END OF SECTION

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DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

SECTION 43 11 33

ROTARY POSITIVE DISPLACEMENT BLOWERS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete, ready for operation and field-test three (3) new rotary positive displacement blowers and appurtenances, as shown on the Drawings and as specified herein.

B. The entire blower package and its components shall comply with all applicable safety and environmental regulations.

1.02 RELATED WORK

A. Valves, except as otherwise specified herein, are included in Section 40 05 52 – MISCELLANEOUS VALVES AND APPURTENANCES.

B. Instrumentation work, except as otherwise specified herein, is included in Division 40.

C. Electrical work, except as otherwise specified herein, is included in Division 26.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES, copies of all materials required to establish compliance with this Section. Submittals shall include at least the following information:

1. Certified general arrangement drawings showing materials, details of construction, dimensions and connections.
2. Complete Blower Performance Data including:
    a. RPM.
    b. Capacity – scfm and icfm.
    c. Discharge pressure.
    d. dB(A) noise pressure level.
    e. Maximum gear to tip speed and rotor tip speed (fpm).
    f. HP required at rated capacity and pressure.
    g. Rated maximum pressure rise of blowers.

3. List of recommended spare parts broken down into on hand parts and long term for 2 years operation and 3 to 5 years operation.
4. Descriptive brochures.
5. Performance curves.
6. Motor data.
7. Valves.
8. ISO-1217 Factory Test Results. Slip test results are unacceptable as an alternate. Manufacturer must provide documented results for the purchased machines. Typical or average data shall not be acceptable.
9. ISO-8573-1 Class Zero Oil Free Certificate.
10. Declaration that confirms the blowers will provide PFAS free air.
11. Declaration of Conformity, per Machinery Directive 2006/42/EC, Annex II, No.1 A.

B. Complete blower package operating and maintenance instructions professionally published, hard copy and electronic copy, shall be furnished for all equipment included under these specifications in accordance with Section 01 33 00.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Package shall be Aerzen Generation 5 Delta Blower Model GM 10 S, or equal.
2. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings.
3. The blower(s) shall be covered by a warranty for 24 months from date of commissioning, or a maximum of 30 months from date of shipment.
4. The performance data and manufacturing methods shall achieve a Declaration of Conformity, per Machinery Directive 2006/42/EC, Annex II, No.1 A.

1.05 BLOWER PERFORMANCE CRITERIA

A. General

1.	Quantity of Machines:	3
2.	Design Inlet Temperature:	100˚F
3.	Site Elevation:	7 ft
4.	Design Inlet Pressure:	14.69 psia
5.	Design Relative Humidity (%) :	80%
6.	Design Flow:	230 scfm per machine
7.	Design Discharge Pressure :	7.8 psig
8.	Brake Horsepower (Max):	12.1 bHp
9.	Motor Size (Max):	15 Hp

10. Free Field Noise Guarantee: 70 dB(A) at 1 meter (at design point)
    a. Package BHP to include pressure loss through a clean inlet filter / silencer, pressure loss of the exhaust silencer and check valve.
    b. Package Performance shall be guaranteed to ISO 1217 with a tolerance is ±5% on volume flow and ±5% on package horsepower. Manufacturer of blower must provide data for purchased machine.
    c. Sound data shall be from an ISO 2151 method of measurement, in an ISO 3745 qualified test facility. Sound data shall be compliant with a Declaration of Conformity assessment standard.

1.06 DELIVERY, STORAGE AND HANDLING

A. All equipment shall be completely factory assembled, skid mounted, crated, and delivered to protect against damage during shipment.

B. All exposed flanges shall be covered and sealed with shrink-wrap to prevent the entrance of moisture. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

C. All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

1.07 MAINTENANCE

A. Spare Parts

1. Furnish the following spare parts for each blower package specified:
    a. Complete set of matched V-belts.
    b. One filter element.
    c. One volume of oil for first service interval.
2. Spare parts shall be properly bound and labeled for easy identification without opening the packaging.

PART 2 – PRODUCTS

2.01 GENERAL

A. Blower packages shall be designed to minimize the life-cycle costs and maximize plant reliability. The design and the selection of the components shall be based on a minimum useful life of 15 years and a Mean Time Between Overhauls of 5 years of continuous operation. Bearing life must be submitted by manufacturer of service life, based on specified conditions.

B. No special foundations shall be required. The blower packages will be installed directly on a concrete slab without grouting the base frame. There shall only be 4 easily accessible anchor points.

C. Manufacturer shall guarantee that the rotary lobe blower shall oil-free operation and be certified to ISO 8573-1 Class Zero.

D. Manufacturer shall guarantee that the air flow on the outlet side of supplied machines is free of PFAS (per- and polyfluoroalkyl substances) and that there is no direct contact of the conveying medium (air) with PFAS.

E. Blower Casing:

1. The blower casing shall be of one-piece construction, with separate sideplates that are bolted and pinned to the housing.
2. Materials shall be close-grained cast iron ASTM A48 suitably ribbed to prevent distortion under the specified operating conditions.
3. Minimum blower casing pressure rating shall be 36 psig.
4. Inlet and outlet shall be flanged connections.
5. The casing shall incorporate a proven means of pulsation cancellation which achieves 90% of better reduction in vibration. Systems without a means of pulsation cancellation shall not be accepted.
6. The vibration level as measured at the blower casing, in the X/Y planes of the bearings, shall not exceed ½ "/ sec RMS when operating at the specified maximum operating pressure and speed in the actual blower package.

F. Factory Testing:

1. Each blower stage shall be factory tested in accordance with ISO 1217 performance test to verify flow and brake horsepower at blower maximum conditions. A slip test shall not be acceptable, nor is average data for the manufactured size.
2. The acceptance criteria are +5% tolerance on power and –5% tolerance on flow regardless of the size of the machine.

G. Rotors:

1. Each rotor shall be of the "stiff" design with first lateral critical speed at least 120% of the maximum allowable operating speed.
2. The rotors shall be of the straight, three-lobe type, and shall operate without rubbing or liquid seals or lubrication.
3. Rotor/shaft shall be forged in one single piece. Cast, hollow rotors shall be capped, dust tight. Open rotors ae not acceptable.
4. The rotors shall be statically and dynamically balanced per ISO1940/ANSI S2.19 G6.3.

H. Bearings:

1. Each rotor/shaft shall be supported by anti-friction bearings and fixed to control the axial location of the rotor/shaft in the unit.
2. Regardless of theoretical bearing life calculations, the bearings shall be sized for a minimum expected life of 5 years between overhauls. Calculated bearing life shall be submitted, based on specified operating conditions.

I. Timing Gears:

1. The rotors shall be timed by a pair of single helical AGMA 12 quality gears with hardened and ground teeth; minimum AGMA service factor of 1.70. Spur cut gears are not acceptable.
2. Gears shall be mounted onto the shafts with a tapered interference fit and secured by a locknut. Pinned gears are not acceptable.

J. Seals:

1. Seals shall be designed to prevent lubricant from leaking into the air stream as well as to prevent oil from leaking out of the machine.
2. Four rotary piston ring shaft seals, an oil slinger and an O-ring seal shall be provided at the point where the shaft passes through the sideplates.
3. Further provision shall be made to vent the rotor side of the oil seal to atmosphere to eliminate any possible carry-over of lubricant into the air stream.

K. Lubrication:

1. The timing gears and the bearings shall be splash lubricated. Grease lubrication shall not be acceptable.

L. Oil Sight Glass:

1. A recessed oil sight glass must be provided on each oil sump.
2. Protruding sight glasses shall not be acceptable.

M. Painting:

1. Painting shall be per supplier’s standard meeting the following criteria:
    a. Except for machined sealing and machined mounting surfaces, the package shall be painted dark blue.
    b. Aluminum, stainless steel, and brass shall not be painted.
    c. The supplied motor shall not be over sprayed and will be supplied with the motor manufacturer’s standard protection and paint color.

d. Painted Cast Iron and Carbon Steel shall be Alkyd Resin Primer and Final coat with a total dry film thickness of 70□m. Surface preparation SSPC10 or better.
e. Sound enclosure shall be powder-coated polyester base total dry film thickness 80□m.
f. Galvanized components shall only be painted with appropriate surface preparation.

2.02 BLOWER ACCESSORIES

A. Inlet Filter / Silencer:

1. Each package shall be supplied with one combination inlet filter silencer.
2. The inlet filter silencer shall be mounted directly to the inlet flange of the blower.
3. The filter media efficiency must meet the requirements of ASHRAE 52.2 MERV7 50-70% @3-10 microns corresponding to EN779 G4.
4. The silencer portion shall be located upstream of the inlet filter.
5. Filter and silencer performance losses shall be included in the blower performance calculation.
6. The filter element shall be designed to trap dirt on the inside so that upon changing, dirt does not fall into the machinery. Filters where dirt accumulates on the external surface of the filter will not be permitted.

B. Base Frame / Discharge Silencer:

1. Each package shall be supplied with one combination base frame / discharge silencer.
2. The silencer shall be a chamber type design for maximum sound attenuation and shall not use fibrous or absorption materials of any kind. Internal absorption material has been shown to degrade and internally foul diffusers and will not be permitted.
3. The silencer shall be fabricated of a single shell of pressure vessel quality steel with continuous welds.
4. The silencer must be subject to a pressure test for tightness and strength at a minimum of 1.65 times the maximum blower operating pressure.
5. The silencer shall have a machined inlet connection where the discharge flange of the blower stage bolts directly to, with no intermediary pieces. Threaded connection between the compressor stage and the discharge silencer is subject to leakage and misalignment and will not be permitted.
6. Discharge silencer performance losses shall be included in the blower vendor in the blower performance calculation. This is another reason the blower accessories must be supplied by the manufacturer of the blower stage.

7. The base frame shall be constructed from welded carbon steel or cast iron that shall be designed to maintain alignment of the blower internal components and the drive during operation.
8. The base frame shall be designed to resist distortion while being installed on vibration isolating mounts.
9. The blower manufacturer shall supply a stainless-steel grounding lug fully welded to the base.

C. Flexible Connectors:

1. Each package shall be connected to the plant piping via flexible connector(s) located downstream of the discharge silencer and upstream of the inlet silencer.
2. Flexible connectors shall prevent the transmission of noise and vibrations from the blower package into the piping.
3. Flexible inlet connectors shall be a reinforced silicone sleeve secured by four (4) stainless steel clamps and terminating with a standard epoxy coated steel ANSI flange connection.
4. Flexible discharge connectors shall be Proco Style 240, Type EE, EPDM, with a standard ANSI flange discharge connection, rated for 300°F at 20 psig.

D. Electric Motor:

1. Each package shall be supplied with a WEG manufactured TEFC motor that shall operate on 460 Volts, 3 Phase, 60 Hertz current, 1800 RPM.
    a. Torque NEMA B
    b. Temperature Rise Class B
    c. Dust tight enclosures (Severe Duty)
    d. Class F inverter rated insulation with Class H applied varnish
    e. 3:1 constant torque
    f. All cast iron construction, including frame, end bells, conduit box and fan cover
    g. NPT threaded and gasketed F3 top mounted conduit box
    h. Copper windings
    i. Regreasable bearings, positive pressure lubrication system with automatic drawn plugs – pressure compensated (Frame sizes 254T and larger).
2. All frame sizes shall be NEMA standard, suitable for overhung belt drive and with the conduit box location on top of the motor. IEC frame motors shall not be allowed.
3. The motor shall be mounted on a pivoting base to provide automatic tensioning of the belts.
4. The motor nominal rating after any corrections for ambient conditions shall be 10% above the maximum operating bHp.
5. The motor shall have a 1.15 service factor.

6. Motor windings shall be supplied with a normally closed thermostat, one per phase, wired in series to form a fail-safe motor protection circuit for the external fault circuit of the motor controller.
7. If the motor is VFD driven, the motors shall be equipped with an Aegis ring to mitigate the effects of stray motor currents. If the motor is 125 HP or greater than an insulated NDE bearing shall also be provided.
8. Blower manufacturer shall be responsible for coordinating the starting torque requirement of the blower and the motor.

E. V-Belt Drive:

1. Each package shall be supplied with a V-belt drive that shall be of the high-capacity type, oil and heat resistant. Drive shall be designed for a minimum service factor of 1.4 times operating power (bHp), or 1.1 times the motor nameplate Hp, whichever is larger to allow a minimum of 1.4-service factor based on the maximum blower bHp.
2. Belt tensioning shall be automatic without the use of any devices or interaction on the part of the operator. Neither slide rails nor load-adjusting springs shall be used.

F. Belt Guard:

1. The belt drive shall be guarded in compliance with OSHA regulations.
2. Portions of the guard shall be easily removable allowing for belt inspection and replacement.
3. Guard material shall be perforated galvanized carbon steel.

G. Vibration Isolators:

1. Each package shall be supplied with vibration isolating feet with a minimum efficiency of 80%.
2. Blower manufacturer shall be responsible for attenuating noise and vibration in the package such that no special installation base shall be required, nor shall any additional measures be required to reduce vibrations from the blower package being transmitted to the base or the piping.

H. Pressure Safety Valve:

1. Each package shall be supplied with a single pressure safety valve on the discharge side of the blower mounted downstream of the discharge silencer and upstream of the check valve.
2. The safety valve shall be set to protect the blower from exceeding its maximum pressure rating and shall be sized to pass 100% of the design flow.
3. The safety valve shall be field adjustable, spring loaded, and have a certificate of conformity to PED.

4. The pressure relief valve shall be housed by the sound enclosure and shall relive into a segmented section of the sound enclosure. Weighted relief valves inside the enclosure are not permitted.
5. The valve shall be manufactured by Aerzen.

I. Check Valve:

1. Each package shall be supplied with one check valve that shall be installed on the discharge line.
2. The check valve shall be of the full-bore low pressure-drop, flapper type design with a steel body, and steel flap embedded in EPDM with full-contact seal.
3. The valve shall be removable without disturbing the piping. Pressure losses produced by the check valve shall be included in the blower performance calculation. Check valves requiring installation in the discharge piping shall not be considered unless installation cost of the external valve is included in supplier's proposal.
4. Pressure losses produced by the check valve shall be included in supplier's proposal.
5. The valve shall be manufactured by Aerzen.

J. Local Control Panel:

1. Each package shall be supplied with the following control functions and features:
    a. Intuitive TFT color touch screen display.
    b. Display, monitoring, alarm, and shutdown of inlet pressure, discharge pressure, discharge temperature, enclosure cooling fan thermal overload, main drive motor thermal overload, and oil temperature.
    c. Display run hours.
    d. Log errors and first out indication.
    e. Track and log maintenance.
    f. E-Stop button mounted on front of blower enclosure.
    g. Operation of enclosure cooling fan motor starter and oil demister.
    h. Ability to transfer measured values, fault and status messages, as well as remaining times of the service intervals to the customer control system via Ethernet IP. Controllers that use a non-industrial protocol such as CAN shall not be allowed.
    i. Permissive control function of customer start and stop signals to a motor controller.
    j. Digital potentiometer.
        i. LOCAL Operation: speed control of the VFD via the HMI screen.
        ii. REMOTE Operation: transfer of VFD speed command from external controller to the VFD.

iii. These signals can be communicated using either hard wire connection or the communication protocol.

k. The local control panel shall be provided with the following digital outputs:
   i. Common alarm.
   ii. Common fault.
   iii. Ready to run.
   iv. Transfer of external start/stop command.
   v. Status remote.
   vi. Maintenance required.
   vii. Alternatively, these outputs can be obtained using the communication protocol .

l. The local control panel shall be provided with the following digital inputs:
   i. Remote start/stop.
   ii. Motor controller fault.
   iii. Customer E-stop.
   iv. Alternatively, these inputs can be supplied using the communication protocol

2. Control Enclosure:
   a. IP54 suitable for indoor/outdoor installation.
   b. NEMA 12.
   c. Factory installed, integral to sound enclosure.
3. Control Supply Power:
   a. 460 VAC, 10 Amp feed with 24 VDC transformer.
4. Monitoring Sensors:
   a. Inlet Pressure Transducer.
   b. Discharge Pressure Transducer.
   c. PT 1,000 Discharge Temperature RTD.
   d. PT 1,000 Oil Temperature RTD.
5. Local control panel shall be the Aerzen AERtronic Digital Controller.

K. Each blower shall receive its initial oil filling at the factory. The synthetic oil shall be rated for a minimum of 16,000 hours.

L. Acoustical Sound Enclosure:

1. Each package shall be supplied with a sound enclosure covering the entire blower package.
2. The enclosure shall provide suitable protection for outdoor installation under wind loads of 40 mph and snow loads of 25 lbs/ft^2.
3. The enclosure shall be designed so as to be able to install them side-by-side with all maintenance done from the front or back of the package.

4. Details shall be as follows:
    a. Panels shall be made of galvanized steel sheet, powder coated in a light reflecting, blue color per RAL 5001. The skid shall be of the same color.
    b. The enclosure and the blower package shall both be mounted on a skid / oil-drip pan designed for meeting environment protection standards and for easy transportation and installation.
    c. A grounding strap shall be installed between the blower base and the package skid to bypass any vibration isolating mounts.
    d. Quick release panels, each less than 50 lb (as mandated by OSHA) must provide easy and quick access for routine maintenance of the blower and the package components.
    e. Enclosure Cooling Fan:
        i. A high efficiency blower shaft driven ventilation fan shall provide ventilation and cooling integral to the sound enclosure.
        ii. Cooling fan shall be sized for sufficient heat removal from the sound enclosure, even when the blower is operated with a VFD.
        iii. Motor driven ventilation fans shall be permitted as long as the blower manufacturer provides a factory installed and prewired system which includes the fan motor, motor starter, wiring and NEMA 4X stainless steel, fan control panel. Fan shall operate on sufficient HP motors of 230/460-3-60. Fan control panel shall only allow the main blower motor to run after ventilation fan operation is confirmed.
    f. Electrical components, instrumentation and instrument connections shall not be mounted or interface with moving panels of the sound enclosure.
    g. Both blower oil sumps shall be piped to a common fill and drain, located at the front of the package for easy maintenance. An oil level indicator shall be mounted on the outside of the enclosure, which gives an accurate oil level indication while the blower is in operation. All oil lines to be hydraulic hose with fittings. No plastic tubing with compression fittings is allowed.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The Manufacturer shall conduct a coordination conference call with the Contractor and Design Engineer to review the integration and installation requirements of the equipment after the Submittal documentation has been approved and prior to installation of the equipment.

B. The Contractor shall install the blowers in accordance with the Manufacturer's written instructions.

C. The Contractor shall make all electrical and process connections to the blower package prior to the arrival of the manufacturer's representative.

D. The Contractor shall complete and return the Manufacturer's installation check list prior to having a Manufacturer's representative come onsite.

E. Representatives of the blower manufacturer shall verify and adjust blower and motor alignment.

3.02 FIELD TESTING

A. After installation of all equipment has been completed and as soon as conditions permit, the manufacturer shall provide one (1) trip for a total of two - (2) 8-hour days to verify the installation, conduct an acceptance test under actual operating conditions and training.

1. The Manufacturer shall perform a physical check of the blower installation, perform safety checks, power up the equipment and perform functional testing.
2. The functional test shall consist of 4 hours of operation of each blower with vibration, temperature, and pressure readings as well as motor amp readings taken and recorded at 60-minute intervals.
3. Installed noise measurements shall be taken to compare the installed noise values with the factory free field ISO 2151 measurements.
4. The Manufacturer shall provide operations and maintenance training to the plant personnel. The training shall consist of 1 hour of classroom training using the Operation and Maintenance Manual for reference and 2 hours of hands-on training at the blower package.

B. If required, Contractor shall make any changes, at his own expense, to the installation that may be necessary to assure satisfactory operation. Contractor shall be held liable for changes needed in the installation.

C. Manufacturer shall provide a written field test / start up report after completion of testing.

D. The blower manufacturer shall have rental blower packages available that can be onsite within 24 hours.

END OF SECTION

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

SECTION 43 23 58

ROTARY LOBE PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The equipment covered by these Specifications shall be of standard units of proven ability as manufactured by reputable company having long experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings.

B. All equipment shall be designed and built for 24-hour continuous service at any and all points within the specified range of operation, without overheating, without cavitation, and without excessive vibration or strain.

C. The pumping units required under this section shall be complete. All parts shall be so designed and proportionated as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustments shall be provided.

D. Stainless steel nameplates giving the name of the MANUFACTURER, the pump serial number and material code and all other pertinent data shall be attached to each pump, motor, and control panel.

E. All working parts of the pumps and motors, such as bearings, wearing rings, shaft, sleeves, etc., shall be standard dimensions built to limit gauges or formed to templates, such that parts will be interchangeable between like units and such that the OWNER may, at any time in the future, obtain replacement and repair parts for those furnished in the original machines.

F. The nameplate ratings of the motors shall not be exceeded, nor shall the design service factor be reduced when the pump is operating at any point on its characteristic curve at maximum speed.

G. Mechanical equipment, including drives and electric motors, shall be supplied and installed in accordance with applicable OSHA regulations. The noise level of motors, unless otherwise noted, shall not exceed 85 dBA measured three (3) meters from the unit under free field conditions while operating on utility power.

H. All lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housing, or guards.

I. Manufacturer shall provide a pressure protection assembly that includes, but is not limited to isolation rings, pressure gauge, and pressure switch. Assembly shall be interconnected with the operation of the PD pump.

J. Warranty: Rotary Lobe Pumps supplied under this section shall be warranted to be free from defects in workmanship, design and materials for a period of two (2) years from shipment. If any part of the equipment should prove to be defective during the warranty period, the MANUFACTURER at no expense to the OWNER shall replace the part.

1.02 RELATED SECTIONS

A. Section 01 87 13: Equipment General Provisions.

B. Section 46 76 21: Belt Filter Press.

PART 2 – PRODUCTS

2.01 PUMPS

A. General

1. The Rotary Lobe Pumps shall be designed to be abrasion resistant for applications in wastewater treatment plants. The pump shall have a minimum displacement of 226.2 gal / 100 rev. (FL 776)
2. The ratio of the axial length of the lobe as compared to the lobe diameter (length/diameter) shall not exceed 1.0.
3. The pumps shall be of the positive displacement, rotary lobe type, designed to pump primary and secondary wastewater sludge as manufactured by Boerger, or Equal.
4. All fluid-wetted parts including the mechanical seal shall be replaceable through the quick release front cover without disassembly of coupling, drive unit or the pipe system.
5. The pumps shall be designed to temporarily run dry and to operate in either direction. Oil-quench for protection of the mechanical seal is mandatory. Seal water flush systems are not acceptable.
6. The pumps shall be constructed with an oil-filled intermediate chamber between the pump casing and the gearbox with the following functions:
    a. Oil-Quench (Lubrication and cooling) of the mechanical seals.
    b. Detection of seal failures
    c. Buffer zone to the sealed timing gear

7. Oil drain of gearbox and intermediate chamber shall be easily accessible with side mounted drain screw. Oil drain under the pump is not acceptable.
8. The rotor/shaft connection shall be oil-lubricated fed by an intermediate chamber and shall not come in contact with the pumped fluid.

B. System and Fluid Conditions

Fluid Name	Waste Activated Sludge
Solids Content	1-3%
Capacity	300 gpm
Discharge Pressure	60 psi
Suction Condition	Flooded
Temperature	Ambient
pH Value	Neutral
Specific Gravity	1.0
Duty	Intermittent

C. Pump Unit

Model	FL776
Drive Type	Geared Motor with Flexible Couplings
Drive Configuration	Inline
Motor Power	30 HP
Pump Speed	192 rpm
Suction Flange	6” ANSI 150lb
Discharge Flange	6” ANSI 150lb

D. Pump Construction

1. The pump casing shall be manufactured in a single block construction (Cast iron ASTM A48 grade 40, Brinell hardness 264 Brinell). Multiple Piece Design Pump Casings held together by screw connections are not acceptable.
2. The rear of the pump casing and the front cover shall be protected with replaceable wear plates with a hardness of 550 Brinell. The front cover protection plate shall be reversible. The pump casing shall be equipped with radial pump casing protection plates, which are less expensive and will eliminate the pump casing as a spare part for reduction of the Life Cycle Costs of the pump unit. Pump casings without radial liners are not acceptable.
3. The quick release cover shall be held in place by four eye nuts. The stationary threaded studs shall keep the front cover on the same level as the pump casing in the process of opening the pump for easy handling.

FL Series Rotors shall be tri-lobe screw rotor design with individually replaceable tips, and the tips shall consist of a cast iron core coated with abrasion-resistant Buna-N. The contour of the rotor shall be such that the outside radius of the rotor and the inner radius of the pump casing or radial liner are identical over a minimum 2" sealing line. Stacking of lobes is not acceptable. Rotors without tips shall not be acceptable. Rotors shall be keyed to the shaft with a cylindrical bore.

4. The shafts shall be non-sludge wetted. The rotor/shaft connection shall be lubricated with quench fluid of the intermediate chamber. The shafts shall be timed in their rotation by straight cut timing gears running in a separate oil chamber, which also contains the ball and roller bearings for each shaft. Sludge wetted rotor/shaft connections are not acceptable. The shafts shall be constructed from AISI 4140 carbon steel.
5. The pumps shall be fitted with maintenance free, quenched mechanical seals with duronit seal faces. The seals shall be operating in a common oil-filled intermediate chamber (Quench for lubrication and cooling). Purge systems for the seals are not acceptable. The rotating holding bush shall be locked in a fixed radial position by a keyway that also holds the rotor in place. Seal designs that open during rotor replacement are not acceptable. No sleeves shall be necessary for the mechanical seal set up. Design of the pump shall allow removal and replacement of the seal via the front cover.
6. Bearings and timing gear shall be located in a common oil-filled cast iron gearbox, fitted with a built-in sight glass to monitor oil level. The timing gear shall maintain non-contact between the rotors. Bearing life to be designed for L-10 bearing life rating of 100,000 hours at design conditions.
7. Suction and discharge connections from galvanized steel shall be ANSI 150-lb flanges.
8. Pump and drive fitted on common base, made from galvanized steel.

2.02 SPARE PARTS

A. One (1) set of mechanical seals and O-rings for each pump.

B. One (1) set of lobes or rotor tips and O-rings for each pump.

C. One (1) set of axial protection plates for each pump model.

D. One (1) set of radial liners (if applicable) for each pump model

E. One (1) set of special tools for each pump model.

2.03 MOTORS

A. Each unit shall consist of a pump with a gear reducer and 1800 rpm electric motor.

B. The motor shall be 3-phase, 60 Hz, 460 V with 1.15 SF and Class F Insulation.

C. All motors shall be built in accordance with latest NEMA, IEEE, ANSI and AFBMA standards where applicable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall install the rotary lobe compressors in accordance with the manufacturer's written instructions.

B. The Contractor shall make all electrical and process connections to the pumps prior to the arrival of the manufacturer's representative.

C. Manufacturer's authorized service technician shall verify, in person, proper installation, electrical connections and equipment alignment prior to start up.

D. Manufacturer shall provide a written field test / start up report after completion of testing.

END OF SECTION

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DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

SECTION 43 36 00

FLOATING DECANTER

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Under this specification, the contractor shall furnish and install the Gravity Decanter(s) per the following specifications that direct attention to certain required features of the design package but are not intended to cover all details required to design, fabricate, and/or install the equipment. The contractor shall furnish and install the decanters complete in all details and operable under all normal conditions.

B. The Floating Gravity Decanter supplier shall be responsible for providing the entire unit, consisting of:

1. 304 Stainless Steel Float with Support Legs
2. 304 Stainless Steel Weir/Discharge Assembly
3. Hinged Arm discharge System with S/S Flanged Connection at Discharge Source
4. 304 Stainless Steel Vertical Mooring Post Assembly

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C. Each Decanter shall be designed for a maximum flow discharge rate of 220 GPM by gravity.

PART 2 – PRODUCTS

2.01 DESCRIPTION

A. General

1. Decanter Assembly: S/S Float with Support Legs, Discharge Weir assembly, and Evacuation Hose.
2. Weir: Used to collect and re-direct the water to be evacuated into the Discharge System.
3. Discharge System: Consisting of Flexible Hose with S/S Flanged hose connection barb and clamps, used to evacuate the water collected by the Discharge Weir.

4. Float: The 304S/S Float assembly is located just above the Discharge Weir, which contains the buoyancy volume to support the Decanter and Discharge System.
5. Support Legs: An integral part of the Float that are used to support the Decanter when it stands on the floor.
6. Vertical Mooring Post System: Used to hold the Decanter in place in the basin and allows the unit to follow the water level variation.

2.02 FLOTATION

A. Each unit shall be equipped with a one-piece float fabricated of 304 stainless steel. The float shall be filled with two component polyurethane foam of the closed cell type. Floats shall be constructed as a single unit, filled with closed cell polyurethane foam having a minimum density of 2.0 pounds per cubic foot, and shall be completely sealed watertight. Fiberglass floats shall not be allowed.

B. The float shall be circular, square or rectangular shaped and shall be larger in size than the intake weir in order to prohibit all floating material from being sucked into the overflow weir.

C. The overflow weir shall be attached to the float by means of 4 connection bars.

D. An anti-vortex plate shall be mounted in the overflow weir.

E. The float shall have three support legs to allow the unit to stand on the bottom of the basin when the basin is emptied. No side supports shall be needed.

2.03 STABILITY

A. The unit shall have its center of gravity below the water line.

2.04 LOCATION & MORRING

A. The floating decanter shall be located as shown on the engineer's drawings and shall be moored by two (2) S/S vertical mooring posts. The vertical mooring post assembly shall be supplied as based upon the Contract Drawings.

B. The vertical mooring system is provided to hold the Decanter in place in the basin and to allow the unit to follow the changes in water level.

C. All mooring hardware shall be stainless steel 304.

2.05 DISCHARGE HOSE

A. The contractor will provide hose connection tailpiece and flange for connection of 4" hose to discharge source.

2.06 MANUFACTURER

A. The Floating Decanter shall be the AQUA TURBO® AQUA DECANT™:, or equal.

Model AD-50-G

AQUATURBO SYSTEMS, INC.
1754 Ford Ave.
Springdale, 72764 Arkansas
USA.
Tel: 479-927-1300
www.aquaturbo.com.

PART 3 – EXECUTION

3.01 WARRANTY

A. The manufacturer shall warrant that the Decanter(s) will be free from defect in workmanship and materials for a period of 12 months from date of startup ex-works Aquaturbo Systems, Inc., or 18 months from ship date, whichever comes first.

B. The Manufacturer shall provide all services as outlined in Section 01 87 13.

END OF SECTION

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DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

SECTION 43 41 11

BOLTED STAINLESS STEEL TANK

PART 1 – GENERAL

1.01 DESCRIPTION

A. LIQUID TECH TANK SYSTEMS, INC., or equal shall offer a new tank structure of 304 stainless steel, completely fabricated in the United States using local materials as follows:

1. MODEL: 24-17
2. ACTUAL DIMENSIONS: 24.616’ Diameter & 16.583’ Tall
3. GALLONS: 55,473 gallons w/1’ freeboard

B. The LIQUID TECH TANK SYSTEMS liquid storage tank is of bolted stainless steel construction. The LIQUID TECH storage tank was developed using sound engineering fundamentals utilizing design approaches from API Standard 650, ANSI/AWWA Standard D103, UBC-91 and ASME Boiler and Pressure Vessel Code.

PART 2 – PRODUCTS

2.01 STANDARD SPECIFICATIONS

A. Shell Composition of Type 304 Stainless Steel, cold worked, exceeding certification to ASTM-A-240 / ASME-SA-240 (documentation available upon request), with a minimum yield strength of 45,000 psi.

B. Structural Shapes and Web Trusses of ASTM-A-36 structural steel with a hot dipped galvanized coating to ASTM A-123-53 specifications.

C. Sealant used on all bolted lap joints is SikaFlex-1A, a premium grade, high performance, moisture cured, one component, polyurethane base, non-sag elastomeric sealant. Meets Federal specification TT-S-00230C, Type II, Class A. Meets ASTM C-920 Type S, Grade NS, Class 25. USDA approved: Chemically acceptable to the U.S. Department of Agriculture for use in meat and poultry processing area. Jet fuel resistant. NSF and EPA approved for potable-water contact. Squeeze-out of sealant will be filleted on interior and exterior seams. This acts as a pre-cure seal. The fillet may or may not come off during the normal operation of the tank. This will not affect the

lap-seam seal. SikaSwell S2 is a one component, polyurethane based, solvent free, hydroswelling mastic, for the seal between the concrete and tank shell. High temperature sealants are available.

D. Bolts on Lap joints will be 1/2” -13 UNC thread, 304 stainless steel with a minimum tensile strength of 90 KSI.

E. Lap joint bolts shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior. Lap joint bolts shall be properly selected such that threaded portions will not be exposed in the “shear plane” between tank and sheets. Bolt lengths shall be selected to achieve a neat and uniform appearance.

F. Nuts And Washers on lap joints are to be 18-8 stainless steel.

G. Design Loads:

1.	Empty Tank Wind Load	115 MPH velocity pressure
2.	Allowable Soil Bearing Capacity	2,500 psf
3.	Earthquake Seismic Zone	0
4.	Specific Gravity of Tank Contents	1.0

2.02 TANK DESIGN CRITERIA

A. Reinforced concrete ring wall foundation with leveling plate, anchor bolt, and seal assembly. Footer: 18” wide by 24” deep, with 10 strands of #5 re-bar, #4 ties on 48” centers.

B. Reinforced concrete floor slab. Floor: 8” of 3000 psi concrete with 1 1/2 pounds of fiber mesh per cubic yard (consisting of polypropylene fibers, provided by the concrete company) on top of 1-5” crushed stone. Double mat of #4 re-bar on 12” centers. Two strands #4 re-bar inside starter ring and two strands #4 re-bar in curb. Power troweled smooth surface.

C. Bolted stainless steel foundation sheet assembly. Foundation sheets will be .090” sheet thickness

D. Bolted stainless steel shell assembly, with required hardware and joint sealant. First ring - .090" sheet thickness, second, third, fourth and fifth rings - .090” sheet thickness as designed by the structural engineer.

E. Required galvanized web trussing and hardware for wind girders. 1/4” galvanized flat steel construction.

2.03 OPTIONS

A. Manway: 28” diameter round shell manway of 304 stainless steel construction.

B. Flanged connections: All pipe connections will be field located with bolt on Stainless Steel flanges. Where connections are shown to pass through tank panels, we shall utilize an interior and an exterior flange assembly. SikaFlex 1A joint sealant shall be used for flange connections.

C. Nameplate: Manufacturer’s nameplate including the serial number, model number, capacity, and installation date.

D. Ladder: Exterior galvanized ladder, caging, and step off platform, per OSHA requirements.

E. Logo Sheet: Liquid Tech Tank Systems, Inc. logo sticker (approximately 6’ long x 3’ high), applied to sheet prior to shipment.

F. Covers: 22-degree stainless steel roofs shall be utilized

PART 3 - EXECUTION

3.01 INSTALLATION

A. Site Conditions: Deliver tank to site. Contractor will provide a suitable, clear, safe, dry, level compacted unloading and staging area adjacent to the tank foundation and provide and maintain a graveled or hard surface access roadway from a public road to the erection site so that loaded trucks can be driven to and adjacent to the tank foundation.

B. Erection: Soil must have a minimum of 2,500 psf bearing capacity; this must be obtained by others, prior to the arrival of the tank and erection crew. Footing designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturer’s standard shall be the responsibility of others based on tank live and dead loading data provided by the tank manufacturer. Finish floor elevation must be within 1’ of finish grade. If higher or on structurals, price will be adjusted. It is the Contractor’s responsibility to provide a level and true site that is graded to finish floor elevation minus 10”; unless otherwise agreed to in writing. Contractor is responsible for establishing centerlines on foundations and structures. LTTS will erect tank shell and install all required options.

C. Exclusions: This Contract does not include installation of other systems unless stated as being included in the quotation. Provisions for any piping for tank unless specified in contract. Also excluded are costs from delays caused by others, local construction licenses or fees, permits, taxes, or any items or services not specifically

included. LTTS will not be responsible for damage to personnel, automobiles, or machines within 100 feet of the erection site.

D. Contractor's Responsibility: Contractor will supply 480-volt 30-amp AC current at no cost within 50 feet of tank foundation. Contractor will supply necessary utilities including, but not limited to, the necessary sanitary facilities and potable drinking water as required for the performance of this Contract. Contractor will locate tank parts adjacent to tank foundation without interfering objects. Erector shall be allowed access for a truck to be placed and operated at the construction site. If winter erection requires heating tank interior to cure sealer, it shall be furnished by Buyer. Foundation shall be clean and clear of any obstruction, material, and/or equipment. Adequate clearance shall be provided around the tank foundation as well as overhead. Minimum clearance of 2' 6" is required between tanks, 8' overhead. Contractor will not engage any of LTTS personnel or Erector's workmen to do any work elsewhere unless approved in writing by LTTS prior to commencement.

3.02 ENGINEERING

A. This structure and foundation engineering will be by a Structural Engineer with experience the design of the foundations, structural components and accessories of bolted Stainless Steel Tanks for use in water and wastewater applications. Engineer will be a Professional Engineer licensed in the State of Maryland. Required documentation will be provided by the Tank Manufacturer with the Project Submittal data and drawings sealed by the engineer.

3.03 WARRANTY

A. Seller warrants its product against defects in workmanship and material for a period of one (1) year from the date of installation or delivery (but not to exceed 15 months from date of delivery of the product to the site upon which it is to be erected). Buyer must provide written notice of any claim under this warranty within 30 days after they become aware of the defect and must provide access to the product for Seller's investigation.

B. This warranty only applies to the original purchaser and only to equipment manufactured by the Seller. It does not apply to components used in conjunction with the Seller's product that was not manufactured by the Seller. Seller will have sole discretion to approve warranty coverage. The warranty also does not apply to the erection or installation of Seller's products, which are not factory-trained installers.

C. Any replacement part or accessory provided in accordance with this warranty will carry a warranty for the balance of the period of warranty applicable to the part it replaces. The Seller will supply the replacement part F.O.B. the Seller's factory, or the Seller, at its option will repair or allow credit for such part. The Seller does not cover corrosion rust through in applications that are not within the guidelines of 304/316

Stainless Steel Corrosion Limits, or if there is evidence of abuse, due to periods of high concentrations of highly corrosive chemicals.

END OF SECTION

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DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 21 33

ROTARY DRUM SCREENS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. There will be furnished two (2) model RDS6072EZ Rotoshear PF EZ-Care units, manufactured by Parkson Corporation, Vernon Hills, IL. Each rotating drum screen will consist of a screen cylinder, base frame, tub headbox and distribution pan, splash guards, hood and support structure, trunnion wheel assemblies, spray wash system, cylinder stabilizer and positive drive assembly.

B. The unit will also be provided with the following optional features: drain pan with support legs, discharge end enclosure with chute, controls.

C. The equipment will be of the latest design and will be fabricated of the specified materials and in a fashion that will fully perform the functions described in these specifications.

1. The EZ-Care Screen requires zero hours for drive system or chain and stabilizer pad lubrication. Rotating drum screens that do not meet this criteria are not acceptable.
2. The Parkson Rotoshear PF EZ-Care screen has been designed to facilitate quick and easy replacement of typical wear parts, as shown below. Rotating drum manufacturers requiring additional time are not acceptable.

Replacement Item	EZ-CARE Replacement Requirement
Chain and Sprocket	2 Hours
Trunnion Wheel, Qty 4/unit, Time for one (1) wheel	0.5 Hours
Stabilizer Pad	0.5 hours

1.02 RELATED WORK

A. The following sections shall apply to the work in this section, except where noted specifically noted elsewhere.

1. Section 01 87 13 – Equipment General Provisions
2. Section 46 21 73 – Screenings, Washing and Compacting Equipment
3. Section 40 95 00 – SCADA System Sequence of Operation

1.03 REFERENCE STANDARDS

A. The design, manufacture and installation of this equipment shall meet or exceed the applicable provisions and recommendations for the following current editions of codes and standard authorities, except where otherwise noted:

1. AGMA, American Gear Manufacturers Association
2. ASME, American Society of Mechanical Engineers
3. ASTM, American Society of Testing and Materials
4. ANSI, American National Standards Institute
5. NEC, National Electric Code
6. ABMA, American Bearing Manufacturers Association

1.04 EXPERIENCE

A. The screen manufacturer will have 20 years design and manufacturing experience with internally fed-fed drum screens, with no less than 100 similar units installed in the U.S.

1.05 SUBMITTALS

A. Complete submittal drawings, quality control and product information shall be submitted. As a minimum, the following information shall be submitted:

1. A letter of compliance, which confirms any variances with the contract plans and specifications and provides further explanations where necessary to adequately define the scope of supply.
2. Dimensional plan and section drawings of the equipment mounted in the structure, showing all utility connections and requirements, and anchor bolt locations. Where applicable, drawings shall show connection to associated equipment provided by others.
3. Approximate weight of each component or piece of equipment.
4. Manufacturers' catalog information, descriptive literature, specifications, and identifications of material of construction.
5. Power and control wiring diagrams, including terminal layout with numbers, panel construction and panel layout drawings, and control schematics diagrams. Control diagrams shall also include a description of operation.
6. Manufacturers' performance data for all drives.
7. Installation, operation, and maintenance manuals, which shall be submitted for approval after final approval of the equipment. A spare manual shall be shipped with the unit to allow for proper installation and operation of the equipment prior to the release of all final installation, operation, and maintenance manuals.

1.06 SPARE PARTS

A. See Section 3.03

1.07 BASIS OF DESIGN

A. Equipment Layout: The contract documents and specifications are based on the Parkson Rotoshear PF EZ-Care unit.

B. Standard Designs: Where a manufacturer's standard equipment and/or model number is listed, the equipment will be provided as modified to conform to the performance, function, features, and materials of construction as specified herein.

1.08 PERFORMANCE AND DESIGN REQUIREMENTS

A. The Rotoshear PF EZ-Care unit will be capable of the following performance.

1. The liquid/solids mixture to be screen will be introduced to the internal surface of the screen cylinder with the solids being conveyed to the discharge end of the cylinder by diverters arranged in a helical pattern. Solids discharge out of the cylinder are directed into a collection device. The screened fluid passes through the perforated cylinder and is directed on to the next process.
2. The unit will be installed indoors, in a Class 1 Division 2 Area.
3. The unit's controls will be installed indoors, in a Class 1 Division 2 area.
4. The unit will be suitable for installation and operation in the designated environment.
5. The unit will be capable of treating a peak flow of 1.85 MGD (1,285 GPM) with a maximum suspended solids concentration of 200 mg/l.

1.09 WARRANTY

A. See Parkson's standard one-year warranty.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer.

1. The Rotoshear PF EZ-Care unit will be manufactured by Parkson Corporation, Vernon Hills, IL and will be a Model RDS6072EZ.
2. Or Equal

2.02 QUALITY ASSURANCE

A. The equipment will include all necessary safety devices, such as machinery guards, emergency stops, warning labels, and similar items.

B. Threaded fitting will have a standard tapered pipe threads complying with ANS/ASME B1.20.1.

C. Bearings will conform to the standards of ABMA.

D. Gear reducer selections will comply with AGMA standards and gear reducer's recommendations.

E. Nameplates will be engraved stainless steel and stamped and fastened to the equipment with stainless steel rivets.

F. The equipment will be factory assembled and tested for a minimum of one (1) hour at the U.S. factory prior to delivery. The Engineer and/or owner may witness the factory test, at their own option and expense.

G. The equipment will be delivered to the site as fully assembled as possible. Some components may be removed from the unit after shop testing to prevent damage during shipment; these components must be re-assembled on the unit by the Contractor.

2.03 MATERIALS OF CONSTRUCTION AND FABRICATION

A. The Rotoshear PF Screen will be constructed of 304 stainless steel except where other materials are called out in that section.

1. Screen Cylinder: The screening element will be a cylinder constructed of stainless steel perforated panels, reinforced by a substructure and full continuous internal flight. Each end of the screen element will be fitted with a stainless steel end ring welded to the screen substructure throughout the circumference. One end ring will be considered the drive end and provide the necessary attachment of the drive sprocket. The other end ring will be considered the discharge end and be designed with an extended bell mouth to provide the effective discharge of dewatered solids away from the base of the unit.
2. The screening element will be made of perforated sheet. The sheet will have 1 mm diameter perforations. Each longitudinal end of the perforated sheet will be bent outward to form a mounting lip. These bends will not be perforated, but will be provided with a mounting hole pattern to allow the sheets to be fastened to the substructure.
3. The substructure will include four equally spaced longitudinal reinforcing bars welded to the screen end rings. A full continuous flight will be welded

to the interior of the reinforcing bars. The flight will be made of 3/4” diameter type 304 stainless steel pipe, with a pitch of 24.00 inches.

4. Stainless steel diverters will be welded to the interior of the end rings to facilitate conveying of screened solids. The diverter height will be a minimum of 1/2 inch.

B. Base Frame: The base frame of the Rotoshear PF EZ-Care unit will be fabricated of stainless steel. The base frame assembly will be accurately fabricated to provide a mounting surface for the screen assembly. The frame will be designed to withstand the loads imposed by the headbox structure and rotating screen cylinder. The base will also be designed to allow for 4-point support at each corner without undue deflection throughout its length.

C. Medlow Headbox and Distribution Pan: The headbox and distribution pan will be designed to receive the incoming flow and distribute the flow to the screen cylinder.

1. The incoming flow will be introduced into the headbox by a 14.00 inch diameter inlet pipe. Inlet piping must be sized to ensure that the flow entering the inlet pipe does not exceed 5 ft/sec. The flow will be baffled in the headbox to reduce forward velocity and provide momentary flow equalization.
2. The flow will be directed from the headbox into the distribution pan, which is cantilevered into the center of the screen cylinder. The pan is provided with an open tapered header that controls and equally distributes flow. The final distribution of the flow onto the screen cylinder will be made by a Lexan curved weir located on each side of the distribution pan.
3. The headbox and distribution pan will be fabricated with minimum 10 gauge stainless steel components. The headbox will have a removeable cover. The headbox and distribution pan will be provided with a cleanout and drain ports for maintenance purposed.
4. The influent pipe will be provided with a stainless steel face ring and a 14.00 inch nominal diameter stainless steel loose back-up flange having a 125/150# class flange bolt pattern.

D. Splash Guards: External splash guards will be designed to contain and direct flow thought the base discharge opening. The splash guards will be constructed of minimum 16 gauge type stainless steel and be fitted on each side of the screening element.

1. The splash guard will be fastened on the sides of the hood support structure. The guards will be designed to be removed for maintenance purposes.
2. The splash guards will allow maximum access for routine inspection and maintenance of the trunnion wheels, spray bars and other moving parts.
3. Viewing ports will allow guarded viewing of the operating trunnion wheels for routine inspection. No view port will be provided on the drive side.

E. Hood and Support Structure: A hood will be supplied to enclose the top of the screen cylinder for misting and odor retention. It will be fabricated of minimum 14 gauge type stainless steel welded to a support structure. The support structure will be fabricated of stainless steel formed structural shapes.

F. Trunnion Wheel Assemblies: The unit will be provided with four (4) trunnion wheel assemblies. Trunnion wheel assemblies with be accurately mounted to the base frame to provide positive horizontal placement of the screen cylinder.

1. Trunnion Wheel: Each trunnion wheel shall be constructed of nylon with an outside diameter of 8 inches. The wheel shall be counter bored for mounting inboard stainless steel bearings. All trunnion wheel bearing shall be greaseable 400 series stainless steel. Bearings are protected from the environment by external mounted seal housing and shaft mounted lip seals. The bearings are designed to receive lubrication thru the support shaft. Grease lines will be run to the exterior of the screen for greasing bearings thru an Alemite grease zerk fitting for ease of lubrication.
2. Support Shaft: The support shaft will be stainless steel having a minimum diameter of 1-1/2 inches. The shaft will be mounted in the screen bearings and accurately positioned and secured by the trunnion wheel support bracket.
3. Trunnion Wheel Support Bracket: The bracket will be designed to locate the trunnion support shaft and support the loads imposed by the cylinder. The bracket will include a shaft cradle, which is designed to align and hold the position of the shaft, and to facilitate quick removal and installation of the trunnion wheel and shaft. Trunnion wheel brackets without quick release functionality are not acceptable.
4. Trunnion Wheel Replacement Tool: Each screen will be provided with one removeable (1) trunnion wheel replacement tool, which will lift the screen cylinder when the trunnion wheel requires replacing.
5. Screens supplied without a trunnion wheel replacement tool are not acceptable.

G. Spray Wash System

1. External Spray: An external water spray system will be provided to clean the screen cylinder from the outside. The spray header will be constructed of 1-1/2 inch Schedule 40 stainless steel pipe and will be drilled and tapped to provide the means to mount spray nozzles. Tapped hole will have a minimum five (5) effective threads to ensure proper engagement of the nozzles into the header and prevent stripping or galling of the tapped hole threads. Header designs with tapped holes having less than five (5) effective threads are not acceptable.
2. The nozzles will be spaced to provide complete coverages of the screen, and spray at the angle of 90 degrees relative to the screen surface to ensure spray penetration through the cylinder openings. The nozzles will be made

of plastic and will be a quarter-turn quick disconnect design to facilitate easy removal of the nozzle tip for cleaning. Designs without quarter-turn nozzles are excluded due to the risk of thread stripping and galling of the tapped holes or the nozzles.

3. The external spray system requires a clean water supply of 19 gpm at minimum 80 psi. Clean water must be filtered to a minimum of 60 mesh / 250 microns.
4. Internal Spray: An internal water spray system will be provided to clean the screen cylinder from the outside. The spray header will be constructed of 1-1/2-inch Schedule 40 stainless steel pipe and will be drilled and tapped to provide the means to mount spray nozzles. Tapped hole will have a minimum five (5) effective threads to ensure proper engagement of the nozzles into the header and prevent stripping or galling of the tapped hole threads. Header designs with tapped holes having less than five (5) effective threads are not acceptable.
5. The nozzles will be spaced to provide complete coverages of the screen, and spray at the angle of 15 degrees below horizontal. The nozzles will be made of plastic and will be a quarter-turn quick disconnect design to facilitate easy removal of the nozzle tip for cleaning. Designs without quarter-turn nozzles are excluded due to the risk of thread stripping and galling of the tapped holes or the nozzles.
6. The internal spray system requires a clean water supply of 12 gpm at minimum 80 psi. Clean water must be filtered to a minimum of 60 mesh / 250 microns.
7. Internal Deflector: An internal deflector will be provided to cover the internal spray bar assembly. The deflector will be designed so as not to interfere with the spray pattern yet provide adequate protection from solid that may otherwise accumulate on the spray bar and nozzles. The deflector will be constructed of minimum 16 gauge stainless steel.

H. Cylinder Stabilizer: A cylinder stabilizer assembly will be provided at the discharge end of the screen cylinder to maintain proper cylinder position along the longitudinal axis of the unit.

1. The cylinder stabilizer assembly will be include a plastimeric guide, which straddles the flange on the discharge head of the screen cylinder and limits cylinder movement to +/- 1/8 inch. The replaceable guide will not require lubrication.
2. The guide will be mounted in an easily accessible stainless steel mounting bracket.
3. Stabilizer mechanisms that have moving parts, require any type of periodic lubrication, or are mounted under the screen cylinder are not acceptable.

I. Positive Drive Assembly – Classified Environment

1. The screen unit will be equipped with a motor and gear reducer to provide rotational motion to the cylinder. The motor will be a 230/460 voltage, 3 Phase, 60 Hz, 1 HP motor. The motor will have a 1.0 service factor and will be rated for Class 1, Division 1 Hazardous Environment. The motor will be close coupled to a foot mounted parallel helical gear reducer via an AM adaptor. The reducer output shaft will be keyed to accept a drive sprocket and produce an output speed of 26 rpm. The drive will be mounted on an adjustable base, which will allow the adjustment need to maintain proper chain tension.
2. Chain & Sprocket: The screen will have a chain and sprocket positive drive system that will eliminate the periodic lubrication requirement.
    a. Screen drive assembly will consist of a hybrid Nylon 6 chain, a hybrid UHMW drive sprocket, and a non-metallic UHMW driven sprocket. Hybrid assembly of the chain will minimize the friction coefficient between the sprocket teeth and the chain rollers, and eliminate the need for grease or oil lubrication. A drive system that requires periodic lubrication (oil or grease) is not acceptable.
    b. The drive sprocket will be manufactured in the following three (3) pieces for ease of installation and maintenance:
        - Stainless steel hub, mounted on the drive output shaft.
        - Replaceable non-metallic sprocket plate.
        - Stainless steel keeper plate and fasteners.
    c. The design of the drive sprocket assembly will allow the replacement of the drive sprocket plate without removing the hub from the drive output shaft. This design will minimize downtime of the unit when replacing the drive components.
    d. All positive drive system components will be made of corrosion resistant materials due to the highly corrosive environment. Drive systems made completely of metallic components (carbon steel or stainless steel) that are subject to corrosion and frequent replacement are not acceptable.

J. Discharge End Enclosure: The discharge end enclosure, fabricated of minimum 12 gauge stainless steel will be provided to enclose the discharge end of the screen cylinder, control misting, and direct screenings into a screens chute or receptacle. The enclosure will be provided with a flanged end connection to properly to direct screenings from the discharge end enclosure into the washer compact unit.

K. Drain Pan and Legs: A drain pan, fabricated of minimum 12-gauge stainless steel, will be provided to collect liquid effluent and direct it into the discharge piping (provided by others). The drain pan will be bolted to the underside of the unit base frame and will be provided with a side-mounted16-inch OD pipe connection. The depth of the drain pan will be sufficient to prevent overflowing at the specified peak flow rate, assuming a free discharge condition.

1. The drain pan effluent will be provided with a stainless steel face ring, and a 16-inch nominal diameter stainless steel loose back-up flange having a 125/150# class flange bolt pattern.
2. Four (4) 40” tall support legs will be provided to elevate the unit and allow proper fit of the drain pan.
3. The drain pan and legs will be shipped loose for field assembly.

L. Anchor Bolts: Eight (8) ½”-13 UNC x 5-1/2-inch-long stainless-steel expansion anchors will be provided by the contractor to secure the drain pan support legs to the concrete structure.

M. Fasteners: All fasteners will be type 18-8 stainless steel.

N. Surface Finish

1. The Rotoshear screens units are fabricated in the all-stainless area of the manufacturing facility. All stainless steel shall be cleaned, chemically descaled (pickled), and passivated at the mill before being shipped. All light gauge stainless steel is paper covered by the mill for protection during shipment and inventory. The paper covered stainless therefore remains cleaned, chemically descaled (pickled), and passivated by the mill and in the fabrication facility. The paper cover is removed when fabrication and welding begin.
2. Following welding, larger stainless steel items and assemblies are blast with virgin glass beads in an area dedicated to stainless steel, to remove weld stain, discoloration and surface impurities. Smaller welded items are either mechanically treated by grinding disks or belts and mechanically polished with pads to remove weld discoloration and surface impurities or blasted as mentioned above.
3. Motor, rear reducer will be provided in manufacturers standard finish.
4. Plastic parts will remain unfinished.

O. Electrical Devices: In addition to the drive motor, the following electrical devices will be furnished with the unit:

1. Interlock Switch: A NEMA 7f interlock switch will be fitted on each side splash guard. Interlock switch will be rated for use in a 120 volt circuit and provided with a 72 inch long 18/2 lead.
    a. The unit will be provided with a total of four (4) interlock switches.
    b. Each switch will be wired to the control panel to cause the unit to completely stop rotating upon opening of the guard. Switches will be powered through intrinsically safe relays in the control panel, which requires wiring in conduit separate from the 120 volt or 480 volt wiring. Proper wiring from the switches to the control panel will be the responsibility of the contractor.

2. Emergency Stop Local Push Button Station: A NEMA 7 cast aluminum emergency stop push button station will be mounted to the headbox. E-Stop will be rated for use in a 120 volt circuit and provided with a ¾ inch conduit opening.
    a. E-Stop will be wired to the control panel to cause all unit functions to cease upon pressing the E-Stop. Proper wiring from the E-Stop to the control panel will be the responsibility of the contractor.
3. Spray Solenoid Valve: While the unit is in operation, each water spray will be actuated by a normally closed solenoid valve. Each solenoid valve will have a brass body with 1-1/2 inch NPT pipe connections.
    a. Each solenoid valve requires 115 volt, 60 Hz, single phase power and will be provided with an 18 inch long 18/3 lead. Electrical housing will be rated NEMA 7 and provide with a ½ inch NPT conduit connection. Each solenoid valve will be shipped loose and field installed by the contractor in the respective wash water supply line. Proper wiring from the solenoid valve to the control panel will be the responsibility of the contractor.

2.04 CONTROLS

A. The following controls will be provided for EACH unit.

1. A 460 volt UL listed primary control panel will be provided in a NEMA 7 type 304 stainless steel enclosure suitable for wall mounting. It will contain the following logic devices for proper operation of the equipment.
    a. Main disconnect switch.
    b. Soft starter with overload protection.
    c. 460 to 120 volt transformer.
    d. Programmable relay to monitor equipment mounted electrical devices to perform necessary logic functions & water sprays.
    e. E-Stop Push Button
    f. Control power light (White)
    g. Motor Hand-Off-Auto Selector Switch
    h. Spray Wash Hand-Off-Auto Selector Switch (2)
    i. Running Light (Red)
    j. Screen Fault Light (Amber)
    k. Fault Reset Push button
    l. Elapsed Time Meter
    m. Auxiliary dry contacts for customer use:
        i. Screen Running
        ii. Screen Fault

B. Sequence of Operations (Overview)

1. Hand Operation: When HAND mode is selected, the unit will run continuously. When either spray wash HAND is selected, the respective spray wash will run continuously.
2. Automatic Operation: The drive motor and spray wash will be controlled automatically when the selector switches are placed in the AUTO position.
   a. The unit motor starts after the remote customer start contact closes. It continues to run until the customer start contact opens, then the unit motor will continue to run for an adjustable time period as per the settings on the off-delay timer.
   b. The external and internal spray solenoids will cycle per the settings on their own repeat timer whenever the unit motor is running. (Initial settings for each spray wash will be 1 min ON – 10 min OFF). The sprays will run continuously during the screen off delay cycle.
3. Emergency Stop: The unit can be stopped at any time by pressing either the control panel mounted or unit mounted Emergency Stop push buttons. The unit will also be stopped whenever the splash guard is opened (as detected by a splash guard interlock switch).
4. Fault Conditions: Excessive motor current will trip the starter overload relays and immediately stop the drive motor. Pushing the reset button on the motor starter thermal overload will reset this fault.
5. Refer to project-specific Control Panel drawings for additional control logic design specially for this project.

2.05 CONTRACTOR RESPONSIBILITIES

A. The contractor will be responsible for reviewing the design of the equipment provided by the manufacturer, so that it fits properly in the structure and interfaces properly with associated equipment provided by others.

B. The contractor will be responsible for receiving the equipment, unloading it from the common carrier, and storing it safely until it is ready to be installed.

C. The contractor will install the manufacturers equipment in accordance with the manufacturer's Equipment Drawings and Installation, Operation and Maintenance instructions.

D. The contractor will provide all field wiring between the electrical devices on the screen (motors, switches, valve, etc.) and the control panel. Contractor will also provide all required local disconnects and junction boxes.

E. The contractor will provide all field piping, fittings, isolation valves, gauges (0 – 100 psi), strainers/filters (at each spray header), and any other components necessary for a complete and functional water spray system which supplies the required spray water detailed in Section 2.03, G.

F. The contractor will provide a portable steam cleaner or pressure washer to be available for use by plant personnel for periodic cleaning of the screen cylinder. Frequency of use will be dependent upon amount of fats, oils, greases and unexpected solids in the incoming flow.

PART 3 - EXECUTION

3.01 INSTALLATION AND OPERATING INSTRUCTIONS

A. In addition to the normal Installation, Operation and Maintenance Manuals required by contract, a spare manual will be shipped with the unit in order to allow for proper operation of equipment prior to release of all final Installation, Operation and Maintenance Manuals to the end user.

3.02 START-UP AND FIELD SERVICE ASSISTANCE

A. The Rotoshear PF EZ-Care unit manufacturer will provide factory service during one (1) trip to the jobsite for two (2) days for inspection of installation, equipment start up and operator training.

3.03 OPTIONS

A. Spare Parts – the following spare parts will be furnished.

Four (4)	Trunnion Wheels (Complete)
One (1)	Trunnion Wheel Shaft
One (1)	Drive Chain
One (1)	Non Metallic Drive Sprocket Plate
Ten (10)	Spray Nozzles

B. Zero Speed Switch

1. A zero speed switch will be provided to detect the loss of motion to the screen assembly. The assembly will consist of the following items:
   a. A NEMA 7 probe will be mounted on the unit to receive signals from ferrous blocks mounted to the inlet head of the screen assembly.
   b. A NEMA 7 amplifier will receive the signals from the probe and provide alarm contacts for remote indication.
   c. The unit mounted amplifier will be pre-wired to the NEMA 7 probe.
   d. Amplifier requires 115 volt, 60 Hz, single phase power. Proper wiring from the amplifier to the control panel will be the responsibility of the contractor.

END OF SECTION

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 21 73

SCREENINGS, WASHING AND COMPACTING EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The manufacturer will furnish two (2) model AWP 8 – 3.5 Aqua Washpress unit(s), as supplied by Parkson Corp., Vernon Hills, IL., or equal. The Aqua Washpress unit will consist of a Main Body, Screw, Wash Sprays, Flush Sprays, Drive System, and Covers. Feed Hopper, Discharge Piping and Controls as needed.

B. The equipment will be of the latest design and will be fabricated of the specified materials and in a fashion that will fully perform the functions described in these specifications.

1.02 RELATED WORK

A. The following sections will apply to the work in this section, except where specifically noted otherwise:

1. Section 46 21 33: Rotary Drum Screens

1.03 REFERENCES STANDARDS

A. The design, manufacture, and installation of this equipment will meet or exceed the applicable provisions and recommendations of the following current editions of codes and standard authorities, except where otherwise shown or noted:

1. AGMA, American Gear Manufacturers Association
2. ASME, American Society of Mechanical Engineers
3. ASTM, American Society of Testing and Materials
4. ANSI, American National Standards Institute
5. NEC, National Electric Code
6. ABMA, American Bearing Manufacturers Association

1.04 EXPERIENCE

A. The equipment manufacturer will have a minimum of five (5) years of design and manufacturing experience with screw wash press units, with not less than one-hundred

(100) screw wash press units sold and installed in similar applications. Manufacture will include U.S. installation list with the equipment submittal.

1.05 SUBMITTALS

A. Complete submittal drawings, quality control and product information will be submitted. As a minimum, the following information will be submitted:

1. A Letter of Compliance, which confirms any variances with the Contract Plans and Specifications, and provides further explanations where necessary to adequately define the scope of supply.
2. Dimensional plan and section drawings of the equipment mounted in the structure, showing all utility connections and requirements, and anchor bolt locations. Where applicable, drawings will show connection to associated equipment provided by others.
3. Approximate weight of each component or piece of equipment.
4. Manufacturers' catalog information, descriptive literature, specifications, and identifications of material of construction.
5. Power and control wiring diagrams, including terminal layout with numbers, panel construction and panel layout drawings, and control schematics diagrams. Control diagrams will also include a description of operation.
6. Manufacturers' performance data for all drives.
7. Installation, Operation and Maintenance manuals, which will be submitted after final approval of the equipment. A spare manual will be shipped with the unit in order to allow for proper installation and operation of the equipment prior to the release of all final Installation, Operation, and Maintenance manuals.

1.06 SPARE PARTS

A. The following spare parts will be supplied with the original equipment:

1. Qty (1) Set Wear Bars with Fasteners.
2. Qty (1) Each Brush with Clips and Fasteners.

1.07 BASIS OF DESIGN

A. Equipment Layout:

1. The contract documents and specifications are based on the Parkson's Aqua Washpress Model AWP 8 – 3.5 (from Section 1.1). Any changes in layout, access platforms, piping or structural requirements for an alternative manufacturer's design will be the responsibility of the installing contractor, including the cost of the engineer to verify layout, sizing, and structural requirements.

2. The Aqua Washpress unit will be inclined at 0 degrees from horizontal. The discharge piping will be designed to direct the screenings from the unit into the designated receptacle or receiving equipment.

B. Standard Designs:

1. Where a manufacturer's standard equipment and/or model number is listed, the equipment will be provided as modified to conform to the performance, function, features, and materials of construction as specified herein.

1.08 PERFORMANCE REQUIREMENTS

A. The Aqua Washpress unit will be capable of the following performance:

1. The Aqua Washpress unit will be designed to receive and wash screenings, then reduce the volume and water content by means of a pressing action. Screenings to be washed will be gravity fed to the drainage trough and conveyed by the screw towards the washing section. Wash water is added, which back flows the screenings, while the spiral alternately stops and restarts to convey the screenings through the wash section. The wash water is then turned off and the screenings are discharged and dewatered by the backpressure generated in the discharge pipe.
2. The unit will be installed indoors in a Class 1 Division 2 area.
3. The unit's controls will be installed indoors in a Class 1 Division 2 area.
4. The unit will be suitable for installation and operation in the designated space.
5. The unit will have an inlet capacity of 35 cubic feet per hour, handling wet screenings with an approximate dry weight of not less than 8% solids.
6. Utilities
   a. Total Spray wash (max @ 60 psi): 15 gpm
      (Wash water to be filtered to 50 micron by owner or contractor.)
      See also sections 2.3 C & D.
   b. Power Supply <u>460 / 3/ 60</u>
      (total power demand indicated on Control Panel drawings)

1.09 WARRANTY

A. See Parkson's standard one-year warranty.

PART 2 - PRODUCT

2.01 MANUFACTURER

A. Acceptable Manufacturer:

1. The Aqua Washpress unit will be manufactured by Parkson Corporation, Vernon Hills, IL., or equal.

2.02 QUALITY ASSURANCE

A. The equipment will include all necessary devices, such as machinery guards, emergency stops, warning labels, and similar items.

B. Threaded fitting will have a standard tapered pipe threads complying with ANSI/ASME B1.20.1.

C. Bearings will conform to the standards of ABMA.

D. Gear reducer selections will comply with AGMA standards and gear reducer's recommendations.

E. Nameplates will be engraved stainless steel and stamped and fastened to the equipment with stainless steel rivets.

F. The equipment will be factory assembled and tested for a minimum of 30 minutes at the U.S. factory prior to delivery. The Engineer and/or Owner may witness the factory test, at their own option and expense.

G. The equipment will be delivered to the site as fully assembled as possible. Some components may be removed from the unit after shop testing to prevent damage during shipment' these components must be re-assembled on the unit by the Contractor.

2.03 MATERIALS of CONSTRUCTION AND FABRICATION

A. Main Body: The main body will consist of a drainage trough and a washer barrel, enclosed by an outer housing and a support leg at each end. The main body will be constructed of type 316 stainless steel for all welded components; to minimize corrosion in the heat affected zones, and type 316 stainless steel for all non-welded components.

1. Drainage Trough: The drainage trough will be the perforated inlet area of the unit, which captures screenings and allows liquid to drain. The inlet area will measure 11" wide x 45 inches long [see table, Section 1.1]. The drainage trough will be constructed from 12 gauge (0.11") for AWP 8 stainless steel with 0.19 inch diameter perforations.

2. Washer Barrel: The washer barrel will provide a washing zone and a dewatering zone for the incoming screenings. The washer barrel will be constructed of 0.25 inch thick stainless steel, with three distinct perforated drainage zones having 0.19 inch diameter holes chamfered to 0.38 inch diameter on the outside. The inside of the washer barrel will be provided with six (6) 0.25 inch thick by 1.50 inch wide replaceable wear bars with 400 Brinnel hardness.
3. Outer Housing: The outer housing will enclose the sides and bottom of the drainage trough and washer barrel. The outer housing will collect drained liquid from the drainage trough and washer barrel and direct the liquid to a 4.0 inch drain tube. Access panels will be provided on the outer housing in the washer barrel area to facilitate servicing of the washer barrel. The outer housing will be constructed from 10 gauge (0.135 inch) thick stainless steel.
4. Support Legs: A support leg will be provided at each end of the main body to support the main body, provide the means to mount the drive assembly (at the drive end), and provide the means to mount discharge piping (at the discharge end). Each support leg will be designed to allow the screw to be removed from either end of the main body. Each support leg will be provided with a footpad and anchor bolt holes, to secure the unit to the structure.

B. Screw: The shafted screw will be provided to convey screenings through the various stages of the unit. The screw will be constructed of carbon steel and finished with alkyd enamel paint. The spiral will be 8.00 inches OD and have minimum 0.63 inch thick flights. A replaceable 0.25 inch wide nylon brush with a stainless steel casing will be attached with bolted clips to the spiral OD throughout the inlet area to scour the perforated sheet. The brush OD will be 8.50 inches.

C. Wash Sprays: The wash zone will include a spray wash system to wash organic residue from screenings. The wash zone spray will consist of one (1) spray header, four (4) water injection points, one (1) ball valve and one (1) solenoid valve. The solenoid valve body will be of brass construction with Buna seals. The ball valve will be of brass construction with a stainless steel ball. The system will have an output of 10 GPM at 60 psi. The spray connection will be ½ inch NPT.

D. Flush Sprays: The press will include a single point spray wash system to flush organic residue trapped in the outer trough. The flushing spray will consist of one (1) spray header, one (1) ball valve and one (1) solenoid valve. The solenoid valve body will be of brass construction with Buna seals. The ball valve will be of brass construction with a stainless steel ball. The system will have an output of 15 GPM at 60 psi. The spray connection will be ½ inch NPT.

E. Drive System: The unit drive system will consist of a gearmotor mounted on a sealed drive mounting bracket and a drive shaft that connects the gear reducer output to the shaft of the screw.

1. Gearmotor: The gearmotor will be a single speed, dual voltage SEW Eurodrive motor direct coupled to an SEW Eurodrive helical gear reducer.
    a. The electric motor will be a 3 horsepower for severe duty motor with a 1.15 service factor, rated for use in a 40° C ambient temperature. The TEFC motor will be NEMA design B with Class F insulation, 1800 rpm output speed, and a 230/460 volt, 3-phase, 60 Hz power supply. The motor conduit box will have one (1) 1/2 inch NPT and one (1) 3/4" NPT conduit connection.
    b. The gear reducer will be AGMA class II (1.6 service factor) with a minimum 94% efficiency, producing an output speed of 14 rpm and an output torque of 13,900 inch-pounds. Heavy duty tapered roller bearings in the gear reducer will provide a maximum thrust capacity of 6,740 pounds.
    c. Gear reducers with service factors of less than 1.4 and efficiencies of less than 94% will not be allowed.
2. Drive Mounting Bracket:
    a. A drive mounting bracket will be provided to mount the gearmotor to the drive end support leg of the unit. The bracket will be made of type 304L/316L stainless steel.
    b. A compression type packing gland seal will be provided on the mounting bracket to seal the drive shaft. PTFE packing rings will be fitted into the seal housing, and held in place by a two-bolt stainless steel gland follower.
3. Drive Shaft: The drive shaft will be direct coupled to the spiral and constructed of carbon steel. The shaft will be painted, except in the area of the shaft that extends into the hollow bore of the reducer.

F. Inlet Hopper And Cover

1. A 12 gauge (0.105 inch) stainless steel inlet hopper will be supplied to direct screenings and liquid into the drainage trough. The chute will be flange bolted to the trough, with each side of the chute being a minimum 60 degrees from horizontal.
2. A 12 gauge (0.105 inch) stainless steel cover will be supplied to cover the remaining top of the main body.
3. A gasket will be provided to seal the feed hopper’s inspection door cover.

G. Discharge Piping: A 14 gauge (.075 inch) stainless steel discharge pipe will be fitted to the discharge end support leg to direct screenings into a customer provided receptacle. All discharge pipe flanges will be 304l/316l stainless steel. Aluminum flanges will not be allowed.

H. Pipe Supports: Pipe supports, if needed, will be supplied by Parkson.

I. Fasteners: All fasteners will be type 316 stainless steel.

J. Fabrication: Weld size, type, and procedure will provide the necessary strength and facilitate the manufacturing of the specific component.

K. Surface Finish

1. All stainless steel components will have standard mill finish and will be mechanically cleaned to remove weld discoloration and fabrication markings.
2. The screw and drive shaft will be finished with an enamel coating.
3. The motor and gear reducer will have the standard manufacturer's finish.

L. Electrical Devices And Controls: Electrical device interconnecting conduit and wiring will be the responsibility of the installing contractor. In addition to the drive motor, the following electrical devices will be furnished with the unit:

1. Solenoid Valves: Two (2) 120 volt, single phase, 60 Hz solenoid valves for the wash zone and flush spray washes housed in NEMA 7 enclosures will have 18-inch long integral leads and will have 1/2 inch NPT conduit connections.
2. Emergency Stop Local Push Button Station: A NEMA 7 polycarbonate emergency stop push button will be mounted to the end flange and will have a 1/2 inch NPT conduit connection.
3. Control Panel: A 480 volt primary U.L. listed and labeled control panel will be provided in a NEMA 7 type 316 enclosure suitable for wall mounting. It will contain the following logic devices for proper operation of the equipment:
    a. Programmable relay to monitor equipment mounted electrical devices to perform necessary logic functions.
    b. Emergency Stop push button.
    c. Hand-Off-Auto selector switches for the drive, wash and flush water sprays.
    d. Control power and spiral run incandescent indicating lights.
    e. Current monitor
    f. Fault and fault reset push button incandescent light.
    g. Run and fault auxiliary output contacts for customer use.
4. A step-down control transformer, IEC rated motor starter and fused main disconnect will be provided.

M. Sequence of Operation

1. Hand Operation: When HAND mode is selected, the screw will run continuously. When either spray wash HAND mode is selected, the spray wash will run continuously.
2. Intermittent Automatic Operation: The control panel will be equipped to control the wash cycle, screw movement and flush cycle. Each wash or flush cycle and the screw movement will be controlled independently

through the use of timers and counters. The drive motor and spray washes will be controlled automatically when the selector switches are placed in the AUTO position.

a. The press motor starts after an adjustable accumulated run time from the interlocked feeding equipment. The press motor will have a staging timer where it will run for an adjustable length of time, typically set at 0.3 seconds.
b. The press motor continues to run for an adjustable length of time (cycle on timer), typically set at 3-5 seconds. The press motor stops for an adjustable length of time (cycle off timer), typically set at 5 seconds. The wash solenoid valve opens and closes per the (wash cycle water duration timer) typically set at 8-10 seconds.
c. Motor stop/start cycle repeats for an adjustable number of counts (wash cycle counter) typically set at 4-7.
d. The press motor runs for an adjustable length of time (discharge timer), typically set at 13.5 seconds, to dewater and discharge the screenings.
e. The flush solenoid opens for an adjustable length of time after the press motor stops (flush off delay), typically set at 10 seconds. The system will reset after the flush solenoid closes.
    1) Emergency Stop: The unit can be deactivated at any time by pressing either the control panel mounted or unit mounted Emergency Stop push buttons.
    2) Fault Conditions: Motor overload or high motor current conditions will stop the motor and illuminate the fault light.
f. Zero Speed Switch: a zero speed switch will detect lack of movement of the spiral and send an alarm.

2.04 ACCESSORIES / OPTIONS

A. Gear Reducer And Explosion-Proof Motor

1. The motor will be a 3 horsepower motor rated for use in a Class I, Division 2 environment. The TEFC motor will be NEMA design B with Class F insulation, 1800 rpm output speed, and a 230/460 volt, 3-phase, 60 Hz power supply. The motor conduit box will have one (1) 3/4" NPT conduit connection.
2. The motor will fit onto the gear reducer through an SEW Eurodrive motor adapter provided on the gear reducer.

2.05 CONTRACTOR RESPONSIBILITIES

A. The Contractor will be responsible for reviewing the design of the equipment provided by the manufacturer, so that it fits properly in the structure and interfaces properly with associated equipment provided by others.

B. The Contractor will be responsible for receiving the equipment, unloading it from the common carrier, and storing it safely until it is ready to be installed.

C. The Contractor will install the manufacturer’s equipment in accordance with the manufacturer’s Installation, Operation and Maintenance instructions.

D. The Contractor will provide all field wiring between the electrical devices on the screen (motors, switches, valves, etc.) and the control panel. Contractor will also provide all required local disconnects and junction boxes.

E. The Contractor will provide all field piping, fittings, isolation valves, and components required to supply the necessary wash water to the spray system (as specified in Paragraph 1.8 A 5 a).

F. The Contractor will be responsible for providing and installing 1/2"-13UNC by 5-1/2” long type 316 stainless steel expansion anchor bolts for each unit.

PART 3 - EXECUTION

3.01 INSPECTION AND STORAGE

A. The equipment will be shipped assembled and as much as possible (depending on size of unit, drives and supports may be shipped loose). The Contractor will be responsible for inspecting the equipment upon receipt of goods at the jobsite, unloading, and storing the equipment in a reasonable manner and protecting the motors, gearboxes, and controls from the weather in accordance with the Installation Operation and Maintenance manual.

3.02 INSTALLATION

A. The Contractor will install the equipment in the structure, according to the Contract Documents and the approved submittals provided by the manufacturer, following the instructions detailed in the Installation Operation and Maintenance manual.

B. Upon completion of installation by the Contractor and startup of the equipment by the manufacturer's field service representative, the equipment will be operated under the supervision of the Contractor for a minimum of eight (8) hours to ensure that all operating characteristics are within acceptable limits.

3.03 STARTUP AND FIELD SERVICE ASSISTANCE

A. The Contractor will obtain the services of a qualified factory representative for installation inspection, startup, and training of the plant operations staff. The service representative will make one (1) trip to the site, and be on site for one (eight hours) per unit.

B. During the trip, start-up services will also be provided for accompanying equipment at one additional day (eight hours) per unit.

END OF SECTION

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 51 21

COARSE BUBBLE DIFFUSERS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section includes the design, manufacture, installation and start-up of a coarse bubble aeration system including in-basin aeration components as shown on the Drawings and as specified herein.

B. The aeration system manufacturer shall provide single source responsibility for the complete aeration system including in-basin piping, diffuser assemblies and support components.

1.02 DEFINITIONS

A. Tank: Vertical walled reactor within which aeration occurs.

B. Diffuser Unit: Wide band, nominal 24-inch-long PVC assembly.

C. Diffuser Assembly: Fabricated assembly including two diffuser units and assembly mounting components.

D. Air Drop Pipe: Vertical piping section from out-of-basin header stub to in-basin aeration system.

E. Air Subheader Piping: Air distribution piping from drop pipe to air distribution laterals.

F. Air Lateral Distribution Piping: Air distribution piping from air subheader and diffuser assemblies.

G. Air Header Piping: Out-of-basin air distribution piping from the blower building to the header stubs.

H. Blower Manifold Piping: Air distribution piping between the blower discharge and air header piping.

I. Aeration Grid: Associated piping and diffuser components connected to a single drop pipe.

J. Standard Cubic Feet per Minute (scfm): Air at 68°F, 14.7 psia and 36% relative humidity.

K. Maximum Pressure: Pressure in blower manifold piping at the specified airflow rate.

L. Oxygen Transfer Efficiency: Percent of oxygen in the air stream that is dissolved to wastewater under specified conditions of temperature, barometric pressure, airflow rate, and dissolved oxygen concentration.

M. Standard Oxygen Transfer Efficiency: Percent of oxygen in the air stream that is dissolved to clean water under conditions of 68°F, 14.7 psia, and zero dissolved oxygen.

N. Air Distribution Uniformity: Variation in air distribution between diffuser assemblies.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design in-basin air piping and diffusers to diffuse air throughout the aeration tank(s) in accordance with the specifications.
2. Design each diffuser assembly to provide uniform air release over the specified airflow range.
3. Design the aeration system to provide the minimum specified oxygen transfer efficiency at the specified airflow and operating pressure.

1.04 SUBMITTALS

A. General:

1. A detailed engineering submittal package shall be provided in sufficient detail and scope to confirm compliance with the requirements of this section. Submittals shall be complete for all required components. Partial submittals will not be accepted.

B. Shop Drawings:

1. Detailed layout drawings for in-basin aeration components. Layout drawings shall include:
   a. Layout and configuration of aeration system.
   b. Detail drawings of diffuser assemblies showing components, method of construction, and attachment mechanism to air header distribution piping.
   c. Detail drawings of all piping connections including drop to manifold, manifold to header and inline connections for manifold and headers.
   d. Detail drawings of pipe support components.

C. Product Data:

1. Detailed listing of materials and materials of construction.
2. Product literature.

D. System Design and Performance Data:

1. Include complete air headloss calculations for the aeration equipment from the top of the dropleg to the farthest diffuser bubble release point.
2. Design calculations showing uniform air distribution (+10% maximum variation) through lateral piping and diffuser element orifice system.
3. Design calculations for piping and support components.
4. Product Experience:
    a. The supplier shall have experience in the design, manufacture, supply and commissioning of coarse bubble aeration equipment identical to the type specified for this project.
    b. The equipment submitted shall be of proven design and shall be referenced by at least three installations of similar size, having been in successful operation for a period of not less than five (5) years prior to bid date.
    c. If the Contractor elects to submit a substitute aeration system that does not comply with the above experience requirements, a bond guaranteeing the replacement of the aeration system shall be provided with the submittal package.
        1) The bond term shall be for a period of five (5) years. This term shall include the specified warranty period plus three (3) additional years.
        2) If the operation of the aeration system as determined by the Owner is unsatisfactory, the Contractor shall repair, modify or replace the entire aeration system in a manner acceptable to the Owner.
        3) Normal wear or malfunctions due to neglect or abuse shall not be considered justifiable reasons for unsatisfactory operations.
        4) The presence of chemical compounds that are aggressive to the membrane material are not considered as normal wear or service.
        5) If the Contractor fails to correct deficiencies identified by the Owner within six (6) months of the date first notified in writing, the Owner shall at its own discretion make all necessary repairs or replacement and deduct all associated costs from the Contractor’s bond.
5. Guarantee:
    a. All equipment furnished under this contract shall be warranted to be free from defects in materials and workmanship for twelve (12) months from startup of the equipment or eighteen (18) months from

shipment, whichever occurs first. Defective part(s) shall be remedied by repair or replacement of the defective part(s) only shipped freight included, FOB original shipping point, by the Manufacturer. Labor is excluded in this warranty.

E. Installation Instructions:

1. Installation requirements and guidelines for all proposed equipment shall be provided and approved.
2. Information on the aeration system shall include but not be limited to:
   a. Diffuser unit assembly.
   b. Diffuser assembly attachment.
   c. Piping components and assembly.
   d. Piping support components.

F. Operation and Maintenance Manuals:

1. Operations and maintenance manual for all proposed equipment shall be provided.
2. Information on the aeration system shall include but not be limited to:
   a. Air flow balancing.
   b. Diffuser assembly maintenance.
   c. Troubleshooting Guide.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Environmental Dynamics International, Columbia, Missouri.

B. Or Equal.

2.02 MATERIALS

A. Welded Stainless Steel Components:

1. Sheets and plates of Type 304L stainless steel conforming to AISI 304L and ASTM A240.
2. Limit carbon content to 0.30% maximum.

B. Non-welded Stainless Steel Components:

1. Sheets and plates of Type 304 stainless steel conforming to AISI 304 and ASTM A240.

C. Fasteners and Anchorage Components:

1. 18-8 series stainless steel.

D. PVC Pipe and Fittings:

1. Base material shall be ASTM D-1784.
2. Pipe shall be manufactured in accordance with ASTM D-1785 and ASTM D-2665.

2.03 AERATION EQUIPMENT

A. System Performance:

1. The aeration-mixing system shall be designed to meet the following:
   a. Airflow = 158 scfm maximum
   b. Discharge Pressure = 8.95 psig
   c. Diffuser Unit DWP = 3 inches H_20 maximum
   d. Design Diffuser Submergence = 16 feet maximum

B. Coarse Bubble Diffusers:

1. The EDI MaxAir Duplex diffuser assembly shall be furnished and installed.
2. Each diffuser assembly shall be factory assembled and include two diffuser units and mounting saddle.
3. Diffusers unit shall have nominal dimensions of 3.5 inches in diameter and 24 inches long.
4. The diffuser support frame shall be approximately 24 inches long and have a full diameter mounting connection.
   a. Use of non-full diameter mechanical connections including threaded connections is not acceptable.
5. Individual diffuser units shall be provided with an internal end cap.
6. Diffuser assemblies shall be completely factory assembled with diffuser units and mounting saddle factory installed.
   a. Field solvent welding or assembly of diffuser is not acceptable.
7. Diffuser assemblies shall be shipped to the jobsite assembled and properly crated and protected for shipment and handling.
8. Diffuser saddle mount shall be ABS construction and shall be capable of withstanding an external force of 7,500 inch-pounds without structural failure of the air distribution pipe, diffuser units connection or mounting saddle.
   a. Small diameter threaded connections to attach diffusers to the air distribution header are not acceptable.
   b. Saddle mount shall fully encompass the air distribution header and reinforce the pipe section at the diffuser assembly connection.

c. An O-ring gasket shall be provided to ensure an airtight seal between the mounting saddle and air header.

9. A minimum 3 inch diameter connection shall be provided between the saddle mount and diffuser assembly.
10. Diffuser assembly shall require end diffuser supports to protect from external forces larger than 7,500 inch-pounds.
    a. Rail mounted support is acceptable and shall consist of threaded rods secured to the floor every 6 feet and adapters connecting the FRP rail to the diffuser end.
    b. Super Strut guide supports are also acceptable to mount from the floor to the diffuser end.

C. Aeration System Piping:

1. Out-of-basin air piping including blower manifold, air header, and header stubs are required and are to be supplied by the Contractor.
    a. Header stubs shall extend to the inside top of the wall and terminate with a full diameter, horizontal face, flange.
    b. Out-of-basin piping may be unlined ductile iron, galvanized steel, stainless steel, or painted carbon steel.
    c. The Contractor shall provide an isolating/balancing valve for control and distribution of air to the aeration grid and to allow isolating of the grid for inspection and maintenance on the header stub.
    d. Isolation/balancing valve shall be positioned for accessibility from the top of the tank.
2. Drop pipe shall be provided with a flanged top connection and plain end bottom.
    a. Drop pipe shall extend from the top connection to within 2 feet of the air manifold.
    b. Material of construction for the drop pipe shall be schedule 5, stainless steel.
    c. Drop pipe shall connect to air manifold piping by means of a wrap-around clamp adapter.
3. All submerged subheader and lateral components shall be Schedule 40 PVC minimum.
    a. Use of PVC piping shall only be employed when the expected mean wall temperature is less than 140°C. If temperature exceeds this limit, alternate materials shall be used or cooling loops added until the temperature is at the appropriate level.
    b. Use of PVC piping shall only be employed when diffuser mounting system reinforces pipe wall at each mounting location.
    c. Use of non-reinforced diffuser connections including threaded diffuser mounts is not acceptable.

4. Pipe supports shall be all stainless steel construction.
    a. Supports shall accommodate longitudinal movement in the piping components due to the thermal expansion and contraction over a temperature range of 100°F.
    b. Supports shall restrain the axial and rotational movement of the pipe while providing for unrestrained longitudinal movement.
    c. Supports shall allow leveling of the air piping with 2 inch minimum vertical adjustment at each support.
    d. Each pipe support shall be connected to basin floor by at least 2 anchor bolts.
    e. The integrated pipe support assembly shall be designed to withstand the associated uplift force of the piping and diffuser assemblies with a minimum design factor of safety equal to ten (10).

D. Spare Parts:

1. The Contractor shall furnish the following spare parts and store as directed:
    a. One (1) - EDI MaxAir Duplex diffuser assembly completely factory assembled.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractor shall furnish, inspect, store, and install aeration system in accordance with manufacturer's written instructions and approved submittals.

B. Diffuser assemblies on a common grid shall be installed within an elevation tolerance of ±1/2 inches.

C. Contractor shall provide all valves, air header piping, wall sleeves with seals, wall pipes, and concrete pedestals as necessary to complete the system as shown on the plans.

D. Air piping including blower manifold, header, and in-basin piping must be clean prior to delivering air up the diffusers.

E. Contractor shall be responsible for cleanliness of piping and may be required to manually clean pipe, or air or water flush piping as required.

3.02 START-UP

A. After installation is completed, the Contractor shall perform the following field tests in the presence of the Engineer and the Owner.

1. Fill the reactor to the bottom of the diffuser assemblies.

2. Adjust the pipe supports and diffuser assemblies such that all diffuser units are installed within ±1/2 inches of the design diffuser elevation.
3. Fill the reactor to a level of 2 feet above the top of the diffusers.
4. Release air to the system and inspect the system for air leaks at all piping or diffuser connections.
5. Adjust any piping or diffusers that show leaks or disproportionate amount of airflow.
6. Operate the blowers at the design air rate and observe air release and air distribution patterns.
7. All water, air, power and labor associated with testing and adjustment of diffuser assemblies are to be supplied by Contractor.

B. Manufacturer's Field Services

1. A manufacturer's representative shall be present at the job site to inspect the installation of the equipment, start-up the system, and train operations and maintenance personnel on the supplied equipment.
2. Services including a total of one (1) trip with a total of one (1) day onsite shall be provided.

END OF SECTION

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 76 21

BELT FILTER PRESS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The manufacturer shall furnish, deliver, and start-up, one (1) belt press dewatering system (referred to as "system" or "belt press system" or “dewatering system") and associated equipment as specified herein and in accordance with the Contract Documents. The belt press equipment specified in this section shall be provided by a single supplier to ensure coordination and compatibility of equipment.

B. The belt press manufacturer is advised to familiarize themselves with the overall plant process in order to evaluate the compatibility of the manufacturer's equipment to dewater the particular sludge generated.

C. The manufacturer shall provide one (1) complete Belt Press dewatering system as specified herein. The system shall include the following: belt press, polymer system, control panel, water supply booster pump, polymer system, conveyor system, filtrate recycle system and totalizing flow meter. The belt press system must be complete and integrated such that it can operate in a fully interlocked manner while achieving the performance requirements as specified in this document.

D. The dewatering system shall be designed to thicken and dewater wastewater sludge by means of a belt press with 3-belt design. The connected ancillary equipment shall be supplied by the Belt Press Manufacturer to ensure system compatibility and system responsibility.

1.02 RELATED SECTIONS

A. Section 01 33 00: Submittal Procedures

B. Division 26: Electrical

C. Section 41 12 13.36: Screw Bulk Materials Conveyors

D. Section 43 23 58: Rotary Lobe Pumps

1.03 ACCEPTABLE MANUFACTURERS

A. The contractor shall furnish and install Belt Press equipment as manufactured by BDP Industries, Inc., or equal.

B. The Contract Documents are based upon the specific dimensions and operating characteristics of the products of the manufacturer stated. Exact details of construction, operating clearances, and the like may differ between manufacturers. Provision of equivalents or substitutes, therefore, may require partial re-design or modifications of associated facilities (i.e. piping arrangement, structural dimensions, etc.), which shall be at the Contractor's own expense and shall require approval by the Engineer.

C. It is the intent of these specifications that a single manufacturer-supplier, regularly engaged in the design, manufacture, assembly, and production of dewatering equipment, shall have complete responsibility for furnishing, coordination, and supervision of all components of the system described in this section. It is also intended that such a manufacturer-supplier make all adjustments, alterations, replacements, and tests specified and required, for a complete satisfactory, and trouble-free operating installation. The single source supplier shall provide a performance affidavit stating strict compliance with the specifications and accepting system responsibility. Furnishing of the equipment other than from a single supplier will not be allowed.

D. General:

1. In order to centralize responsibility, it is required that all equipment provided under this Section be obtained from a single supplier or manufacturer who shall assume full responsibility for the completeness of the system. The supplier or manufacturer shall be the source of information on all equipment furnished regardless of the manufacturing source of that equipment.
2. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pump equipment manufacturer.

1.04 PERFORMANCE CRITERIA

A. Belt Press Operational Requirements: The Belt Press (referred to as "belt press" or "press" in the remainder of this document) shall meet the following operating parameters when processing the sludge specified.

1. The solids shall be derived from an aerobic digestor with a concentration of 1.0% to 2.0%.
2. The belt press unit shall be capable of meeting the performance criteria as set forth below:

PARAMETER	REQUIREMENT
Sludge Feed Solids (%wt)	1.0 – 2.0
Solids Loading (lbs/hr)	400
Feed Rate (GPM)	40 – 80
Maximum Polymer Dosage (act. lb/dry ton)	25
Minimum Discharge Cake Solids (%wt)	16
Minimum Solids Capture (%)	95

B. Process Performance Test and Guarantee

1. There will be a performance test for the dewatering test:
   a. Once a representative sludge has been established, the manufacturer shall operate the press at or above the required flow rate and solids loading for a minimum period of 6 hours with samples of feed, discharge cake, and filtrate collected hourly. Samples will be analyzed per ASTM standards for total suspended solids (TSS) for filtrate and total solids (TS) for feed solids, and the results averaged. The average cake solids must exceed the above requirements in order to demonstrate compliance. The average polymer dosage must be less than the above requirements in order to demonstrate compliance. Should the belt press fail to meet the minimum standards specified, the following shall occur:
2. Plant operating procedures shall be reviewed to determine that the sludge is in fact representative of normal operation and within the design specifications.
3. If it is determined that the sludge is representative and within these specifications, the manufacturer shall make any modifications necessary to accomplish the specified performance levels.
4. If the sludge can be demonstrated as representative and within specified parameters and if the manufacturer cannot meet the performance, the owner may elect to have the manufacturer remove the unit and refund any monies paid.

1.05 SUBMITTALS

A. The supplier shall submit a complete list of equipment and materials required for shop drawing or submittal approval. The term “shop drawing” as used herein shall be understood to include detailed arrangement drawings, foundation layout drawings, control drawings, hydraulic controls systems, catalog sheets and similar items. Unless otherwise required, these drawings shall be submitted in sufficient time to be reviewed by the ENGINEER, and to accommodate the construction schedule required under the contract.

B. If representative sludge is available the manufacturer shall supply written bench test reports to include in the equipment submittal that have been taken two times during a minimum of 6-month period to confirm performance of the equipment. Any equipment submittals that doesn't include the bench test reports will be returned and rejected by the engineer.

C. The manufacturer shall furnish an electronic copy or five copies of shop drawings in three ring binders to the engineer. Submitted packages shall include a complete bill of materials for all equipment, recommended spare parts list, list of any deviations from the contract documents and a statement of machine warranties.

D. Submit shop drawings and product data required to establish compliance with this Section. Submittals shall include the following:

1. Certified shop and erection drawings showing all important details of construction, sludge feed, wash water, drainage connections, wiring diagrams, itemized motor horsepower, dimensions and anchor bolts.
2. Descriptive literature, bulletins and/or catalogues of the equipment. This material shall include, but not be limited to, the following:
    a. Functional description of internal and external instrumentation and controls to be supplied, including list of parameters monitored, controlled or alarmed and testing plan.
    b. Materials of construction and of all coatings of all major components, including bearings. Include sizes of materials and thickness of coatings.
    c. Details of the drive system for belts.
    d. Details of the static sludge/polymer mixer supplied.
    e. Information on field erection requirements, including total weight of assembled components, weight of the single largest component that will require removal during the life of the unit and gross operating weight.
    f. Statement of roller, bearing, frame and belt guarantees for units furnished. Also, describe typical range of belt tension and recommended belt tension for this application.
    g. Total connected nameplate horsepower and operating horsepower for each belt press dewatering system motor. Itemize this information for each motor.
    h. Statement of water requirements (flow and pressure) and any other utility requirements.
    i. Description of gravity drainage and low, medium and high pressure stages.
    j. For the baseplate of the belt filter press, furnish the loads including all horizontal and vertical components as follows:
        1) Deadloads due to unit weight empty.
        2) Deadloads due to unit weight full of sludge, drain pans full and similar circumstances.

3) Dynamic loads.
4) Combination of 2) and 3) above.
5) Loads exerted during belt changing procedures.

k. Control panel elevation drawings showing construction and placement of operator interface devices and other elements. Control panel data to include:
1) Dimension and layout details.
2) Materials of construction.
3) Brand names and catalog literature on all control devices such as, but not limited to:
a) Fused disconnects
b) Thermal Magnetic Circuit Breakers
c) Motor starters
d) Motor Circuit Protectors
e) Terminal blocks
f) Fuse blocks
g) Variable Frequency Drives
h) Audible and Visual Alarm Indicators.
i) All switches, pushbuttons and lights
j) Timers, relays and related equipment
k) Programmable logic controllers (PLC)
l) Surge Protection Enclosures

l. A complete total bill of materials for all equipment.

m. A complete parts list, showing current price and delivery time for each part. Include manufacturer's recommended spare parts and a firm price quotation good for one (1) year after Substantial Completion.

n. A maintenance schedule, showing the required maintenance, frequency of maintenance and lubricants and other items needed at each regular preventive maintenance period.

o. Provide certified safety factor calculations as described in Paragraph 2.03 below for structural frame, every roller bearings and every roller shafts, as well as maximum roller and frame deflection based on maximum design belt tension of 50 PLI (lbs per lineal inch of belt width) or total of 280 PLI for both belts at a belt speed of 5 meters per minute. The roller calculations shall be completed on all of the rollers in the s-wrap compression section including the drive rollers and perforated roller. These calculations shall be signed and sealed by a professional engineer.

p. Complete data on motors and controls as specified in Paragraph 2.05 below.

q. Addresses for alarms/data to SCADA.

r. Cut sheets on wash water booster pump and motor.

E. In the event that it is impossible to conform to certain details of this Section due to different manufacturing techniques, describe completely all non-conforming aspects.

F. Submit to the Engineer operating and maintenance data as specified. Manuals shall be provided for all BFP related equipment specified in this or other Sections. This data shall be prepared specifically for this installation and shall include all necessary Drawings and equipment lists that are required to instruct operations and maintenance personnel unfamiliar with such equipment.

G. Operations Maintenance Manuals

1. Installation shall be in accordance with written instructions provided by the manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps and motors, but lack experience on exact equipment supplied.
2. Three (3) copies of operation and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include detailed operating and maintenance instructions and specifications relative to the following; assembly, alignment, checking, lubrication, placing in operation, adjustment, maintenance of each unit of equipment, auxiliaries furnished under this contract, together with complete parts lists, and copies of dimension drawings.
3. Documentation shall be specific to the pump supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the pump manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:
    a. Functional description of each major component, complete with operating instructions.
    b. Instructions for operating equipment.
    c. Calibration and adjustment of equipment for initial start-up, or as required for routine maintenance
    d. Support data for commercially available components not produced by the manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacture r and incorporated as appendices.
    e. Mechanical layout drawing of the equipment and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of equipment.
4. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable.

Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

H. Contract Closeout Submittals:

1. Equipment Operation and Maintenance Data.
2. Manufacturer's ·warranty
3. List of recommended spare parts and tools for an operating period of one year. The list shall describe each part, the quantity recommended, and the unit price of the part.
4. Submit a written equipment alignment report for each unit.
5. Submit a written field startup report giving the results of the required field tests.
6. Submit written report of the results of each visit by a manufacturer's serviceman, including purpose and time of visit, tasks performed, and results obtained.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of twenty years' experience producing identical equipment and shall be able to show evidence of at least ten installations of 3-belt units of 0.75m width (effective width), manufactured to 50 PLI design standards that meet the structural requirements of this specification. The reference installations must have been in satisfactory operation for at least ten years. Upon request by the engineer, the manufacturer shall provide proof of such experience by providing installation lists, including calculations supporting the 50 PLI design that are sealed by a professional engineer. These calculations shall include the frame safety factor, bearing life and roll deflection, with calculations verifying that the design exceeds the requirements of this specification.

B. These specifications include certain areas affecting process functions, operation and maintenance reliability under which no exceptions shall be allowed. These are as follows:

1. High Strength Tubular Steel Frame Construction
2. Up-Flow Feedbox
3. Variable Speed Paddle Wheel Distributor
4. Independent Variable Speed Gravity Drainage Section at Operator Level
5. Curved Wedge Zone
6. Vertical Pressure Section
7. Machined Bearing Pads
8. Double Flange Roll Construction
9. 50 PLI Self-Compensating Hydraulic Tensioning System

10. Press Drive Motors in the Pressure Section
11. Hot-Dipped Galvanized Corrosion Protection System

1.07 MANUFACTURER'S WARRANTY

A. Provide a one (1) year non-prorated warranty covering all defects in materials and workmanship. Warranty shall be in effect from the date of acceptance by the owner. Provide a three (3) year non-prorated warranty covering the frame, frame coating, rollers, roller coatings, bearings and bearing housings.

B. Warranties by the suppliers of various components in lieu of a single source responsibility by the manufacturer will not be accepted. The manufacturer shall assume prime responsibility for the warranty of the complete system.

C. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

D. In the event the component fails to perform as specified or is proven defective in service during the warrantee period, the manufacturer shall provide a replacement part without cost to the owner. The manufacturer shall further provide, without cost, such labor as may be required to replace, repair, or modify major components such as pump, pump motors, controls, etc.

E. The manufacturer shall supply the services of a factory trained technician to inspect the installation, test the equipment for proper performance start up and instruct maintenance personnel on the operation and care of the system.

PART 2 PRODUCTS

2.01 GENERAL

A. The equipment covered by these specifications is intended to be belt press dewatering equipment of proven ability as manufactured by reputable concerns having long experience in the production of such equipment. The equipment furnished shall be designed and constructed in accordance with the best practice and methods.

B. All components of the system shall be engineered for long continuous and uninterrupted service. Provisions shall be made for easy lubrication, adjustment, or replacement of all parts. Corresponding parts of multiple units shall be interchangeable. Except as otherwise specified, steel plates and shapes shall have a minimum thickness of ¼” and bolts shall have a minimum diameter of ½.”

C. All welding shall be in accordance with the latest acceptable codes of the American Welding Society ANSI/AWS D1.6.

D. All material used in the construction of the sludge dewatering equipment shall be of the best quality and entirely suitable in every respect for the service required. All structural steel shall conform to the ASTM standard specification for structural steel, designation A36-77A. All iron casting shall conform to the ASTM standard specification for gray iron casting, designation A48-76, and shall be of a class suitable for the purpose intended. Other materials shall conform to ASTM specifications where such specifications exist; the use of such material shall be based on continuous and successful use under the similar conditions of service.

E. Unless otherwise specified herein, all metal parts in contact with or subject to splashing polyelectrolyte or sludge shall be type 304L stainless steel. All fasteners, pins, and anchor bolts shall be type 304L stainless steel.

F. All fiberglass-reinforced plastics (FRP) shall be manufactured in conformance with NBS standards PS15-69.

2.02 SURFACE PROTECTION

A. All metals shall be hot dipped galvanized to the latest revision of ASTM 123 specification. Painted or flame sprayed galvanizing shall not be allowed.

B. All pre-painted purchased equipment such as electrical motors, cylinders, gearboxes, etc., shall be painted with a final coat of the below system. All miscellaneous steel items shall be sandblasted and covered with the following paint system:

1. First coat of Tnemec #66 primer epoxy of contrasting color to a minimum of four (4) dry mils thickness.
2. Second coat of UV resistant Urethane Top Coat, finished color, minimum of four (4) mils thickness. Total thickness of the two (2) coats will be a minimum of eight (8) mils dry.

C. The control panel enclosure shall be NEMA 4X constructed of type 304 stainless steel. Inside of the box will be white.

2.03 MECHANICAL DETAILS

A. Main Structural Frame

1. The frame shall be fabricated from tubular steel structural members designed to support all components and accessories. Steel shall meet the requirements of ASTM A500; all welding shall be performed in accordance with ANSI/AWS D1.1. Where frame components are bolted, stainless steel fasteners shall be used. The frame moment of inertia shall be a minimum of 17.4 $in.^4$ in the xx axis and 5.8 $in.^4$ in the yy axis. The load bearing frame member of the pressure section shall have a moment of inertia minimum of

69.0 $in.^4$ in the xx axis and 9.0 $in.^4$ in the yy axis. Channel, plate or I-beam construction will not be accepted. The above moments of inertia must be met, or the unit will not be accepted.

2. The fabricated steel frame shall be designed to withstand the maximum stresses imposed on the individual members with a safety factor of 10. Specifically, the maximum actual stress on any member, connection, plate, etc., shall not exceed 1/10 of the yield strength of the frame material used. The deflection ratio of any structural member shall not exceed L/600 where L is the member span. The tension used for the calculations shall be a minimum of 50 lbs. per linear inch of actual belt width.
3. Drip pans shall be fabricated of a minimum 14-gauge type 304L stainless steel and shall collect filtrate from all gravity and pressure sections.
4. The framework shall be constructed in such a manner that shall insure absolute plane parallelism of all rolling elements by machined bearing pads.
5. The framework shall be of welded and/or bolted construction. No disassembled component, excluding the belt filter frame, shall weigh more than 3,500 lbs.
6. Adjustable leakage seals shall be provided to contain the sludge on the belt through the gravity drainage zone. Seals shall be 304 stainless steel with rubber skirts, designed to provide an effective seal without causing wear to the belt.

B. Flocculation/Conditioning System

1. To achieve rapid contact between sludge particles and a solution of dilute polyelectrolyte provide:
    a. A static, in-line, adjustable energy non-clogging Venturi mixer shall be provided. The mixer shall be equipped with a Vortex polymer injection ring with four (4) tangentially mounted polymer injectors. The mixer shall be located upstream of the belt filter press as shown on the Contract Drawings. The belt filter press manufacturer shall recommend the proper layout of the system based on actual field conditions. The manufacturer shall provide spool pieces as required for alternate locations. The in-line Venturi mixer shall be fabricated entirely of 316L stainless steel with an adjustable open throat area. The mixer shall include a removable side plate for inspection and maintenance.
    b. The venturi mixer must be adjustable by means of an electrically actuating valve with a maximum output torque of ≥ 500 In-lbs.
    c. The venturi mixer must include a pressure indicating transmitter for automatic adjustment of the venturi mixer pressure setpoint.
    d. An up-flow feedbox shall be provided after the Venturi mixer to insure optimum sludge conditioning. This feedbox shall be vertically baffled and discharged into a stainless steel distributor. The feedbox assembly shall extend across the full width of the belt press and shall be fabricated of type 304 Stainless Steel.

C. Independent Gravity Drainage Area

1. The press shall be furnished with an independent gravity drainage area consisting of a variable speed belt designed to contain and drain conditioned sludge. An inlet distributor shall be provided to evenly distribute the conditioned sludge over the face of the moving filter belt. The inlet shall incorporate a variable speed, 6-blade paddle wheel distributor across the full width of the belt press. The feed distributor must form a uniform slurry depth over the full belt width immediately upon leaving the feed distributor of plus or minus 1/16 inch. The paddle wheel shall be driven by a 1/3 HP AC/VFD TEFC motor and gearbox. The belt system shall be sealed to prevent leakage and shall be easily accessible for operating, viewing, cleaning, and adjusting.
2. All materials in contact with the sludge in the distributor area shall be 304L stainless steel with adjustable angle furrowing plows of UHMW plastic.
3. The gravity drainage area shall have a minimum horizontal area of 18.7 ft2. The gravity drainage area shall be supported by slide strips. Supports shall be designed to prevent deflections greater than 0.05 inches with a loading of 100 lbs. per square foot. Slide strips shall be easily removable without disassembly of any components.
4. The belt support shall be a series of UHMW wear strips within a 304 stainless frame, spaced every 6" and be of a design to support and enhance gravity dewatering. The UHMW wear strips shall be supported by ¼” x 3” 304 stainless steel bar support. Each deck section shall be adjustable height to provide extended life of the wear strips and sludge containment seals. Only systems which have been demonstrated as effective in the area, shall be considered.
5. Adjustable leakage seals shall be provided to contain the sludge on the belt through the gravity drainage zone. Seals shall be neoprene rubber with 304 stainless steel deckle supports, designed to provide an effective seal without causing wear to the belt.
6. Six rows of swing up type furrowing plow devices shall be supplied in the gravity drainage section and shall be readily removable. The first two and the last two row shall be of the “Foil Doctors” design and two intermediate rows shall be an adjustable furrowing type.
7. The adjustable plows shall be mounted on a support system that can be raised for cleaning via lifting handles.
8. The Foil Doctor design shall consist of a UHMW plastic doctor blade configuration with the doctor blade held flat against the filter cloth and the knife edge pointing toward the feed box. The doctor blade shall be a minimum of 2 inches wide. Plastic supports at 12 inches spacing across the width from an overhead galvanized steel support assembly shall hold the doctor blade flat against the filter cloth. The whole assembly shall be designed to rotate up and away from the cloth.

9. Plows shall be high-density polyethylene with hot dipped galvanized support holders. Plow position shall be adjustable from 0 to 30 degrees with respect to the direction of belt travel. All plows shall be adjustable in unison for each plow row. To facilitate cleaning, each row of plows shall include a single-lifting handle; designed to raise the entire row of plows a minimum of six inches from the belt.
10. The independent gravity drainage area shall be equipped with a variable speed drive, powered and controlled from the main press panel.
11. The gravity drainage area shall incorporate an independent belt speed at operator level without the use of catwalks or rolling ladders for operations or maintenance. The gravity belt height shall not exceed four feet. All other gravity section designs shall not be permitted.
12. The independent gravity drainage area shall be provided with a hydraulic tension and tracking system as specified. Manual tensioning or tracking systems shall not be permitted.

D. Curved Wedge Section

1. The belt filter press shall be furnished with a distribution chute to receive sludge from the primary gravity dewatering section for purposes of even distribution of the sludge to the wedge section.
2. The wedge section shall be of a curved belt path design; straight belt path designs will not be allowed. The initial radius of curvature shall be a minimum of 24-inch radius and transition to a final radius of curvature of 16.5 inches. The curved section must be a minimum of 56” in length. The wedge section design shall provide gradual cake pressure through the zone to enhance dewatering. The wedge section shall be supported by construction equal to that of the gravity belt section, shall be a minimum of 2 inches wider than the width of the belt and designed to reduce belt wear.
3. Movement through the wedge section shall be designed to insure a uniform layer of sludge across the entire working width of the belt. It shall be adjustable to allow operator determination of proper relationship between belt speed and cake height, in order to insure optimum dewatering.
4. The materials in contact with the sludge and/or subject to splashing shall be fabricated from type 304L stainless steel. All fasteners, along with mounting and adjustment hardware shall be 304L stainless steel.
5. The use of vacuum assisted drainage sections shall not be permitted.
6. The wedge section shall consist of a curved wedge that shall allow for a gradual pressure increase on both belts to enhance dewatering. The wedge section shall be supported by construction equal to that of the gravity belt section, shall be a minimum of 2" wider than the width of the belt, and designed to reduce belt wear.
7. The wedge section shall have a minimum horizontal area of 15 ft2. This calculation is based on only one belt. Vertical wedges or non-curved wedges will not be accepted.

8. The curved wedge zone configuration shall include a tray beneath each roll such that the filtrate is removed from the sludge cake without filtrate hitting the return belt. Each drip pan shall be constructed of 304L stainless steel and directed to a final collection pan and piped to the sump area. The collection pans shall eliminate filtrate from landing on the returning belt.

E. Vertical Pressure Zone

1. The vertical belt filter press shall be furnished with a pressure zone following the wedge section drainage area.
2. The pressure section shall become uniform at the tangent of the first low pressure, 304L stainless steel, and perforated drainage roll. It shall be a minimum of 20” in diameter, followed by a 16” diameter reversing turn, completing a full S with each turn exceeding 200 degrees.
3. The next stage of the pressure zone shall consist of an arrangement of a minimum of five (5) rollers developing a continued 200 degree S-shaped belt travel. The rolls shall decrease from 12" in diameter to 10" in diameter.
4. The decreasing roll diameter shall provide an increasing pressure profile in the pressure zone, made adjustable by changing the belt tension.
5. The seventh and eighth roll in the pressure section shall be 10” diameter drive rollers forming the last 200 degree turn.
6. The minimum bearing size for the compression rollers in the press section shall be 85mm in diameter. The ends of each shaft on the rollers shall be equipped with support bearings as specified under bearings.
7. The pressure section shall have a minimum area of 42 ft2. This calculation shall be based on one belt in contact with the roll surface.
8. The vertical pressure zone configuration shall include a tray beneath each roll such that the filtrate is removed from the sludge cake without rewetting of the downstream cake. Each drip pan shall be directed to a final collection pan and piped to the sump area. The collection pans shall eliminate filtrate from landing on the returning belt.

F. Dewatering Belts

1. Belts shall be seamed and fabricated of monofilament polyester, wear resistant plastic material or combination monofilament polyester and stainless steel material. The mesh design shall be selected for optimum dewatering of the sludge with a minimum blinding of the filter fabric.
2. Belt selection shall be based on the manufacturer's experience obtained at other installations dewatering similar sludge’s with similar polyelectrolyte conditioning chemicals.
3. The belts shall be warranted for a minimum 2,000 hours of operation. Any belt that fails before that time, provided that the belt press has been operated per the instructions in the operation and maintenance manual, shall be replaced on a pro rata basis.

4. Each belt and connecting splice shall be designed for a minimum tensile strength equal to five times the normal maximum dynamic tension to which the belt shall be subjected. The splice shall be designed to fail before the belt.
5. Belts shall be designed for ease of replacement to minimize belt press downtime. Belt replacement shall be such that disassembly of the unit is not required.

G. Belt Wash System (Filtrate Recycle)

1. Each filter belt shall be equipped with a belt wash station. The belt wash system shall use high-pressure water spray nozzles equipped with manually operated wire brushes for internal nozzle cleaning. The spray assembly shall be housed in an enclosure in a manner that limits the spray pattern within the housing assembly. The housing enclosure and nozzle assembly shall be readily removable and shall be fabricated from type 304L stainless steel.
2. The housing shall be sealed against the belt with rubber seals. The belt shall be protected from excessive wear by the edges of the wash station housing by replaceable guide surfaces. The belt wash station shall extend over the full width of the filter belt by a minimum of 2 inches.
3. The shower box shall be designed with adjustable upper seals to maintain contact with the belt as the seals wear. The bottom seals shall be attached to sliding panels, adjustable with four bolts in slotted openings in order to maintain seal contact with the belt as the seals wear. The pans for the shower boxes shall direct the washwater into the filtrate pans for self-cleaning of the belt press. The pans will also be capable of separating washwater from filtrate to keep the two process streams independent.
4. The shower system shall include the MNR Quiet Package, including a specially designed shower box enclosure and shower pan that completely eliminates all misting and reduces the noise from the shower bar. While operating, the shower box shall have noise ratings of less than 77 dB at 3 feet from the shower box.
5. Wash water demand shall not exceed 36 GPM at 120 psig. The dewatering system manufacturer shall provide a complete pressure boosting system for the press to achieve the required pressure. The wash water and pressure boosting system shall be designed by the dewatering system manufacturer based on the system requirements.
6. The wash water system shall utilize recycled filtrate from the gravity drainage section as re-use wash water for the belt spray bars. The system will include level control pressure sensors, motorized ball valve, and basket strainer to re-use filtrate from the gravity section of the belt press as the wash water for all three belt showers. The system will automatically start up on plant-provided non-potable water. As soon as the gravity section filtrate level is established, the system will automatically close the non-potable water valve and run entirely on the filtrate from the system. From

that point on, the valve will be automatically opened and closed as needed to maintain proper water levels in the gravity drainage pan. With this system, the non-potable water demand can be reduced to 0 gpm with adequate inlet sludge feed flow.

7. The booster pump shall be a centrifugal type pump with replaceable stainless steel shaft sleeve and casing wear ring. The impeller shall be equipped with a high pressure O-ring seal. The motor shall be a standard NEMA frame, C Face mounting with JM shaft, 10 HP, 3500 RPM, 480 volt, 60 hertz, 3-phase power, with a TEFC enclosure. The belt press manufacture shall supply a 4-1/2 inch pressure gauge with isolation diaphragm with a scale of 0 to 200 PSI. The wash water booster pump shall be a Goulds model eSH or equal. The shower system shall include a dual basket Titian strainer.
8. All piping from the booster pump shall be Schedule 80 PVC pipe.

H. Belt Alignment System

1. The belt aligning devices shall be hydraulically operated to align each belt and locate it centrally on the rollers by means of a sensing arm. Pneumatic systems shall not be permitted. This arm shall operate a pilot valve, which shall modify the position of the hydraulic actuator. The actuator shall be connected to a pivot belt-aligning roller, causing this roller to skew from its traverse position.
2. The alignment system shall function as a continuous automatic belt guidance system and shall be an integral part of the press. The alignment system shall operate with smooth and slow motions resulting in a minimum of belt travel from side to side. The use of electric servos shall not be permitted.
3. Backup limit switches for the belt aligning system shall be provided with sufficient contacts to de-energize all drives and sound an alarm in case of a belt over travel.
4. A complete simplex hydraulic system shall be provided. This system shall include pump, 2 HP TEFC motor, valves, 20-gallon 304 stainless steel storage reservoir, all controls and piping as necessary to provide a complete and functional system. The pump shall be an adjustable flow and pressure vane pump. The unit shall include a low-pressure switch, system pressure gauge, temperature gauge, and tank level gauge. The system shall include a high-pressure line filter and low-pressure return filter. The hydraulic unit shall be floor mounted away from the press to eliminate wash down spray. A minimum of ½” 316L stainless steel tubing shall be provided from the hydraulic unit to the press.
5. The hydraulic unit shall be supplied with a 304L stainless steel support stand to allow for the tank oil to be easily drained. The tank shall also include a 304L stainless steel drain valve to allow for draining of the hydraulic oil.

6. All hydraulic lines and fittings shall be 316L stainless steel and rigidly supported on the structural frame and properly sized for the intended use with adequate factors of safety for the rated pressure.
7. All belt alignment control equipment shall be fabricated from aluminum or stainless steel. The hydraulic cylinders shall be composite material with stainless steel rods and hardware.

I. Belt Tensioning System

1. Each belt shall be provided with a belt tensioning system. The belt tensioning system shall be hydraulically actuated and shall be such that the dewatering pressure is directly proportional to belt tension and that adjustments in the tension shall result in immediate changes in dewatering pressure. Manual or electric servo tensioning systems are shall not be permitted.
2. Each belt tensioning system shall be furnished with an individual control station such that independent adjustment for each belt is possible. The control stations shall incorporate an on/off selector, calibrated pressure regulating valve and a pressure gauge to indicate actual operating pressure on each system.
3. The design of the belt tensioning system for the pressure section shall insure parallel movement of the cylinders on each end of the tensioning roller by use of a rack and pinion assembly. The gravity belt tensioning roller shall be mounted on a rugged yoke assembly, with hydraulic cylinders at each end. Plastic components will not be accepted. The belt tensioning system shall accommodate a minimum of 2.5% increase in belt length. The system must be capable of producing up to 50 PLI belt tension at a system pressure of 1,000 PSI or less.
4. Sensing devices shall be furnished to determine belt travel beyond normal operating limits. The sensing devices shall be electrically connected within the alarm system to cause "an alarm shut down". Manual reset of the system shall be required.
5. The hydraulic cylinders shall be composite cylinders with stainless steel hardware. The cylinder rods shall be constructed with 316 stainless steel.

J. Press Drives

1. The three belt drives shall be 1.0 HP gravity drive and Single 2.0 HP press section drive. Each shall be variable speed with a variable frequency AC drive unit. The feedbox paddle wheel shall be driven by 1/3 HP AC/VFD drive. Speed indicator readout for each shall be installed in the main press control panel. All motors shall be TEFC.
2. The gravity belt drive shall be capable of varying output speed from 8 to 75 feet per minute and the press section drive, 3 to 15 feet per minute.

3. The nominal input horsepower rating of each gear or speed reducer shall be at least equal to the nameplate horsepower of the drive motor. Each drive unit shall be rated IP65 and designed for 24-hour continuous service.
4. Each gear reducer shall be totally enclosed, water spray proof, oil lubricated with anti-friction bearings throughout.
5. The drives shall operate on 480 volt, 60 hertz, 3-phase power supply.
6. The belt drive for the pressure section shall be driven by a single roller. The gearbox shall be shaft mounted. Spur gears or chain driven rollers shall not be permitted.

K. Safety Guards

1. All equipment having exposed moving parts such as fans, V-belts, gears, couplings, chains, and including the pressure roll section, shall be provided with safety guards as required by State, Local and OSHA standards. All safety guards shall be of a minimum Type 304 stainless steel construction or better.

L. Discharge Blades

1. Discharge blades shall be provided to scrape dewatered sludge from the belt at the final discharge rollers. The doctor blade shall be made of wear resistant UHMW plastic. The blades shall be readily removable. The blade holders shall be secured in place by means of counterweights. Spring tension type fasteners shall not be permitted.
2. The minimum discharge height shall be 6’6” high. If necessary, the belt presses and catwalks shall be supplied with additional support legs by the press manufacturer.

M. Bearings

1. The shafts of all rollers shall be equipped with heavy-duty grease-able type, roller bearings in sealed, split case bearing housings. All bearings in the press shall be spherical roller bearings. The housings shall allow the changing of the bearings without changes in the factory alignment of the roller. The housing shall be sealed to provide adequate sealing from moisture and grime with closed end housing. The outside of the housing on tracking roller bearings shall also incorporate a stainless-steel sealed end cap. The bearing housing seal shall incorporate a triple lip, nitrile seal mechanism to eliminate contamination.
2. All bearings shall have a minimum B 10 bearing life of 750,000 hours based on ANSI B13.6 1972. The B 10 bearing life of 750,000 hours shall be based on the maximum summation of all forces applied to the bearing. The forces shall include both belts at a belt tension of 50 PLI each, maximum belt speed of 15 ft/min and torque of the drive motor.

3. Bearings and housings shall be US manufactured and shall be manufactured by FMC Corporation, Link-Belt Division, Indianapolis, Indiana; Reliance Electric Company, Dodge Division, Greenville, South Carolina: or equal.
4. All bearings shall be manufactured and supplied with off the shelf bearings and housings from the above manufacturers with original part numbers. Any manufacturers that supply only their belt press manufacturer part number, provide custom bearing manufacturing, or manufacture the bearing housing will not be considered.

N. Rollers

1. All rollers shall be of solid steel or double-separated plate stub end shaft construction. The stub end shafts and roller heads shall be welded in place. Bolted and or through shaft roll construction shall not be permitted. All rollers shall be designed to have a maximum deflection of 0.05 inches at their center when under maximum loading.
2. All rollers except drive and tracking rolls shall be of carbon steel construction, coated with a minimum of 30 mils of thermoplastic nylon, selected by the press manufacturer. Drive and tracking shall incorporate 50 mils of thermoplastic nylon with a 65 Durometer surface or 3/8" vulcanized rubber for abrasion resistance and proper belt tracking and drive. Other types of roller coatings shall not be permitted.
3. All rollers must be US manufactured at the suppliers manufacturing facility. Out sourced roll suppliers will not be accepted.

O. Drainage Pans

1. Drainage pans shall be supplied as necessary to contain all filtrate and wash water within the belt filter press and to reduce rewetting of downstream cake. Filtrate and wash water pans shall be constructed of minimum 14-gauge type 304L stainless steel. All drainage piping shall schedule 80 PVC, adequately sized for the intended service and rigidly attached to the press frame.

2.04 ELECTRICAL REQUIREMENTS

A. General Requirements

1. Provide belt press master control panel constructed of 304 stainless steel, NEMA 4X construction.
2. The Master Control Panel shall include an Allen Bradley 12" color Panel View Plus 7 touch screen for control of all system components including each press, the hydraulic units, wash water booster pumps, polymer make-down unit, polymer aging tanks level/mixers, polymer feed pumps, sludge feed pumps, feed box motor drive, gravity section drive, and pressure

section drive. The master control panel shall include the VFDs for the polymer feed pumps, feedbox, gravity section drive and pressure section drives. The sludge pump VFDs shall be NEMA 4X and externally mounted to the exterior of the master control panel. In addition, the master control panel shall include the starter for the polymer aging tank mixer. The control panel shall include motor starters for the hydraulic unit and wash water booster pump. The control panel shall include an Allen Bradley Compact Logix PLC with Ethernet communication and such ancillary drives as hereafter specified.

3. Three phase, 480 volt, 60-Hertz power shall be supplied to the control panels A control transformer will be provided for 120-volt, single phase power source for motor starter coils, lights, relays, timers, controllers, and other related items.
4. Each control panel shall be provided with terminal blocks for power wiring to and from the panel. The incoming terminal blocks shall be provided with a single magnetic circuit breaker disconnect switch. Circuit breaker protected motor starters with thermal overloads shall be supplied for each motor furnished with the unit.
5. All electrical equipment controls located on the belt press shall have NEMA 4X enclosures and wired, through PVC conduit, to a single common NEMA 4X terminal box.
6. All devices within the panel shall be permanently identified. Nameplates shall be provided on the face of the panel or on the individual device as required. Nameplates shall be made of laminated phenolic materials with a white face and a black core.
7. The panel shall be designed for manual starting and stopping of all drives. A master manual/ auto system switch shall be supplied to override the alarm system and allow operation of any drive through a momentary contact pushbutton. The control panel shall contain start/stop pushbuttons, run lights, and alarm indications for the sludge pumps, polymer systems, conveyors and the booster pumps.
8. The operator interface terminal (OIT) touchscreen shall be equipped with a start/stop switch and run light for each adjustable piece of equipment. The belt drives, feedbox drive, polymer system and sludge pump drives as hereafter specified, shall also incorporate speed control and speed indication. The control panel shall include start/ stop pushbutton, run lights, speed control and 4 to 20 mA signal generators for the polymer solution and sludge pumps controls.
9. Alarm lights, sensors, and related circuitry shall be provided for the following functions: zero speed, emergency stop push button on each side of the press, low water pressure, and low hydraulic pressure. In the event of any of the above malfunctions, the machine will shut down and an alarm sound. The alarm system shall include an audible horn rated at 90 DBA at IO'. The system shall include silencing provisions, but the function alarm indicating light shall remain lit until the alarm condition is satisfied. A separate set of alarm contacts shall be provided for remote alarm indication

10. Arrange control panel to allow either manual or automatic control of belt press equipment. When "MANUAL" operation is selected, all equipment associated with the belt press shall be controlled by "START/STOP" pushbuttons on the touchscreen. When "AUTOMATIC" operation is selected, control of equipment shall be "AUTOMATIC/START "and" AUTOMATIC/STOP" pushbuttons on the touchscreen, and programmable controller:
    a. Master control panel shall include OIT touchscreens with the following:
        1) One control mode selector switch marked "AUTOMATIC/ MANUAL." When "MANUAL" operation is selected, all equipment associated with belt press shall be controlled by" START/STOP" pushbuttons. Provide one "START" and one " STOP" pushbutton for each of the following:
            a) Feedbox Drive.
            b) GBT Drive.
            c) Press Drive.
            d) Hydraulic Unit.
            e) Wash Water Pump.
            f) Sludge Pump Drives
            g) Polymer System Drive.
        2) One speed potentiometer for manual adjustment of each drive speed.
        3) Digital indicators for sludge feed flow rate. Indicators shall accept 4 to 20 mADC field input and shall be calibrated in gpm.
        4) Green indicating lights for "RUNNING" status for each unit operated from panel, including wash water solenoid valve energized indication.
        5) Red indicating lights for "OFF" status for each unit operated from panel, including wash water solenoid valve de-energized indication.
        6) One each "AUTOMATIC/START" and one "AUTOMATIC/STOP" momentary pushbuttons, for automatically starting and stopping each belt press system. Sludge cake conveyor shall be manually controlled when belt press control mode selector switch is in either the "AUTOMATIC" or "MANUAL" position.
        7) One "EMERGENCY STOP" red mushroom pushbutton.
11. Automatic Controls and Sequencing:
    a. General:
        1) Program the PLC for automatic control of belt press, system sequencing, and interlock functions as specified.
        2) Configuration and programming of PLC system shall be responsibility of belt press manufacturer. System

documentation including memory loading, 1/0 configuration and progran1mingshall be provided.

3) Provide and install auxiliary relays and wiring for equipment and devices specified in this Section required for implementing functional requirements specified.

b. "AUTOMATIC START/AUTOMATIC STOP" Cycle:

1) Automatic start cycle request to PLC shall be initiated by "AUTOMATIC/START" pushbutton.

2) Control logic for an "AUTOMATIC/START" cycle shall start belt press in the following order after "AUTOMATIC/START" command has been initiated and interlocks are complete.

a) Wash water pump.
b) Belt Shower "Pre-Wash"
c) Belt press drive.
d) GBT drive.
e) Feedbox drive.
f) Polymer system drive.
g) Sludge feed pump.

3) Each drive shall not start until previous drive is running and necessary time delay has elapsed. The belt press manufacturer shall detem1ine where time delays are required and shall program settings to provide smooth start-up of equipment.

4) Once all drives are confirmed running by motor rw1 contacts from their respective starters, PLC shall cause the indicating light to illuminate. Loss of run status contact for a drive once cycle logic is complete shall shut down belt press and associated equipment.

5) Upon "AUTOMATIC/STOP" command, system shall shut down in order that is reverse of specified start-up order with necessary time delays.

c. Interlocks: The following interlocks shall be satisfied when control mode selector switch is in either "AUTOMATIC" or "MANUAL" position. Failure of any one signal during start cycle or after cycle is complete shall shut down all associated belt press equipment.

1) Wash water pump must be on, and sufficient wash water pressure must be sensed at a specified level.

2) Hydraulic pressure must be sensed at a specified level.

3) Control mode selector switch shall be in "AUTOMATIC" position.

4) "EMERGENCY STOP" pushbutton shall be in operating position.

12. Annunciation and Alarms:

a. Provide audible alarm and detailed alarm history in belt press control panel for alarming of the following:

1) GBT drive failure.

2) Press drive failure.
3) Feedbox drive failure.
4) Local emergency stop initiated at either belt press control panel or pull cord switch.
5) High discharge pressure at sludge feed pump.
6) Low wash-water pressure.
7) Low hydraulic pressure.
8) Polymer pump failure.
9) Sludge pump failure.
10) Sludge pump pressure

b. Wire all alarms to PLC system for relaying to remote location.

13. Additional stations shall be included as hereinafter specified for other ancillary drives or systems.

B. Electric Motors furnished with this equipment shall meet the following requirements:

1. Rated for continuous duty at 40°C ambient and insulated with a minimum of Class F insulation, with Class B temperature rise. All motors shall be totally enclosed, fan cooled or non-ventilated. All motors supplied shall be rated at 150% nameplate horsepower of the required horsepower maximum service condition.

2.05 FLOW METER

A. The belt press manufacturer shall supply one (1) totalizing flow meter as supplied by Siemens or approved equal. The flow meter shall include a 4" ANSI flange connection for the sludge feed line and shall have a digital display, and 30 feet of display cord.

B. The electromagnetic induction flow meter shall generate a voltage linearly proportional to flow for full-scale velocity setting from 2 to 33 feet per second. Standard accuracy of plus output shall be +/- 0.5% of rate for all meters.

C. The meter shall incorporate a high impedance amplifier of 1012 ohms or greater, eliminating the need for electrode cleaning systems the meter shall utilize bipolar pulsed DC coil excitation with auto-integrated zeroing each half-cycle. Manual zero adjustments shall not be required - even at start-up. Power consumption shall be no more than 15 VA, independent of meter size. Input power required will be from 85 to 120 VAC, 46-65 Hz, with DC input option available.

D. The power to each flow meter is 120 volt, single phase with a 2 amp breaker fed from the belt press control panel.

E. The magnetic flow meter shall be microprocessor based with integral electronics. The electronics shall be interchangeable for all sizes from 1/12" to 78". The housing is to be powder coated cast aluminum with a NEMA 4X rating.

F. The meter' s analog and pulse outputs shall be independently selected by push buttons. The analog output shall be an isolated 4-20mA DC into 700 ohms load. The pulse output shall be an open collector output \With a maximum frequency of 1,000 Hz with configurable pulse width (0.5 to 2 sec). An open collector status output shall indicate either system or process error or flow direction. An auxiliary input shall be available to positive zero return. A low flow cutoff will be standard which can be turned on or off by pushbuttons.

G. A 2-line, 16-digit LCD backlit display shall indicate flow rate and/or total flow. The totalizer value is protected by EEPROM during power outages and utilizes an overflow counter. The display shall also be capable of indicating error messages such as empty pipe condition, error condition and low flow cutoff.

2.06 POLYMER SYSTEM

A. General Requirements

1. The press manufacturer shall provide as a part of the total dewatering equipment package, one (1) polymer feed system capable of automatically metering, diluting, activating and feeding a liquid polymer with water. Unit shall be a BDP or approved equal.

B. Polymer Make-Down Unit

1. Polymer and water shall be mixed in a chamber designed to create sufficient mixing energy. This design shall include a progressive cavity metering pump, solenoid valve and pressure regulator.
2. The pumps shall have an adjustable speed with a variable frequency drive. The pumps shall be supplied with a 1/2 hp, 120 volt AC motor.
3. A motor driven impeller mixer shall be provided that will mix the polymer and water into solution.

C. Polymer Feed Pump

1. The polymer system shall be equipped with progressive cavity pump each capable of pumping up to 5 GPH.
2. The pump shall be designed with a high viscosity wet end pump capable of pumping neat polymer solution to the mixing chamber.
3. The pump shall be a Seepex, Rotopump or approved equal.
4. The drive motor shall be an inverter duty, 1/2 horsepower, complete with a VFD control unit. The VFD shall have local speed adjustment, ON-OFF switch and running indication. The VFD shall provide adjustments of feed rate over a range of 20 to 1.

D. Dilution Capability

1. The primary dilution shall feed into the motorized mixing chamber and shall be capable of 1200 GPH.
2. The dilution capability shall be adjustable through a stainless steel globe valve with a clear rotameter with a stainless steel float.
3. Furnish a solenoid valve or ON-OFF control of dilution water supply
4. Loss of dilution water flow; thermal flow sensor installed on incoming dilution water line.

E. Emulsion Unit Control Panel

1. The polymer system shall be supplied with a NEMA 4X control panel that provides an automated mixing system. The controls for the polymer make-down system shall be capable of local control and remote control supplied in the belt press control panel.
2. The control panel shall include all timers and relay for a complete manual and auto system. The polymer mixer chamber and metering pump shall turn on, and the water solenoid valve shall open.
3. The polymer system will have an ON-OFF disconnect switch, a System On-Off-Remote switch, a Loss of Water alarm light, a System Running light, and a VFD keypad for local neat polymer pump speed control.
4. When the system switch is placed to ON, the system will start. The dilution water valve will first begin to open, once water flow is established then the neat polymer pump and polymer mixing chamber will start. Polymer neat pump speed is adjustable from the panel mounted VFD keypad.
5. When the system switch is placed to REMOTE, the system can be started remotely from the belt press control panel. Neat polymer pump speed will also be controlled remotely.
6. Single phase, 120 volt, 60 Hertz power shall be supplied to the main control panel.
7. All devices within the panels shall be permanently identified. Nameplates shall be made of laminated phenolic materials with a black face and white core.
8. Required system inputs/outputs:
    a. Remote start input (dry contact from remote panel)
    b. Neat polymer pump speed command (4-20mA input from remote panel)
    c. System Running (dry output contact for remote panel)
    d. System in Remote (dry output contact for remote panel)
    e. Loss of Water Alarm (dry output contact for remote panel)

2.07 EQUIPMENT SKID

A. The manufacturer shall supply a complete skid-mounted dewatering system. The skid-mounted unit shall be designed to operate as a complete dewatering package.

Affixed to the skid shall be the belt press unit, electrical control panel, wash water booster pump, polymer system, and filtrate recycle system. The following items will be mounted remotely with interconnections to be completed by the CONTRACTOR: Flow meter, venturi mixer, polymer injection and discharge conveyance. The frame of the skid shall be channel and I-beam steel construction, Hot Dipped Galvanized (HDG). The skid shall include a 304L stainless steel sump pan with 6" drain connections. All wiring shall be contained in PVC conduit.

B. General - The belt press supplier shall mount the belt press unit, electrical control panel, wash water booster pump, polymer system, and filtrate recycle system on a HDG steel equipment skid.

C. Plumbing - The skid shall be pre-plumbed with SCH 80 PVC on the sludge feed line and 1 ½" wash water line. All drain pipes will be schedule 40 PVC.

D. Equipment Skid Frame - The skid side rails shall be constructed of a minimum 10" channel, HDG steel. Internal cross supports will be HDG steel members. The collection pan of the skid will be a 14 gauge, 304 stainless steel filtrate sump. The sump will allow filtrate to exit the side of the skid through 6"drain connections.

E. Skid Design – The equipment skid shall have an operator walkway on both sides of the screw press unit. The walkways shall be minimum 22" wide and shall have aluminum grating over the skid collection sump pan.

F. Testing - The equipment affixed to the skid will be factory pre-wired to the control panel and all equipment will be pre-plumbed. The system will be tested prior to shipment. Electrical conduit will be pre-wired with PVC conduit to make a complete equipment skid.

2.08 DISCHARGE CONVEYOR SYSTEM

A. The Discharge Conveyor is outlined in Section 41 12 13.36. It is the responsibility of the Belt Filter Press Manufacturer to coordinate with the Contractor and Conveyor Manufacturer to ensure a professional installation is achieved.

B. The Belt Filter Press and Discharge Conveyor shall operate in tandem as outlined in Section 16950.

2.09 SLUDGE PUMPS

A. The Sludge Pumps are provided by others, see Section 43 23 58. The Belt Filter Press Manufacturer is required to power and operate the Sludge Pumps from the BFP control panel as outlined in Part 2.04. The Belt Filter Press Manufacturer shall accommodate the Sludge Pump Pressure Switch Assembly.

2.010 TOOLS AND SPARE PARTS

A. The following minimum spare parts shall be furnished with the system:

1. Ten (10) spare spray nozzles.
2. Two (2) relays of each type and size.
3. One (1) spare level pressure sensor of each type.
4. One (1) complete set of replacement belts.
5. One (1) complete set of replacement seals.

B. Manufacturer shall furnish a list of additional recommended spare parts for an operating period of one year. The list shall describe each part, the quantity recommended, and the unit price of the part.

C. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the Owner at the conclusion of the Project.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Pump manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete system and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

A. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. Fasteners at all pipe connections must be tight. Install and secure all service lines (hydraulic lines, water lines, etc.) as required.

C. Check motor and control data plates for compatibility to site voltage. Install and test the pumps grounds prior to connecting line voltage to station control panel.

D. Prior to applying electrical power to any motors, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

E. Pumps and motors shall be installed in accordance with manufacturer's installation instructions, and in accordance with all OSHA, local, state, and federal codes and regulations.

F. The manufacturer shall provide the services of a qualified factory representative to advise the installing manufacturers on proper installation, setting, piping, and wiring procedures. This time shall be above and beyond the start-up services described below.

3.03 INSPECTION

A. A factory qualified service representative shall be present at initial startup of the system to ensure correct installation and rotation of the unit, supervise a review of the operation and testing of the equipment, and to provide training on operation and maintenance requirements of the equipment. Any deficiencies shall be noted and corrected prior to the commissioning of the system.

B. Manufacturer's inspection shall include, but not be limited to, the following parameters as applicable:

1. Soundness
2. Completeness in all details, as specified,
3. Correctness of setting, alignment and relative arrangement of various parts; and
4. Adequacy and correctness of sealing and lubricants.

3.04 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
2. After construction, in the presence of the Engineer and Operator, the contractor shall operate the system through several pumping cycles and shall observe and record operation of components; check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

B. Manufacturer's Start-up Services

1. Before the equipment is started, the manufacturer shall make a thorough inspection of the installation to make sure the press has been installed

properly and that all equipment relating to it has been installed according to the needs of the press.

2. The manufacturer shall provide nine (9) days of on-site services spread over three (3) trips of a qualified factory representative to place the units in operation. The owner shall assist the manufacturer by starting up and operating all support systems such as water, sludge pumping, polymer mixing and feed, electrical power and instrumentation, and other ancillary equipment as needed. This trip will be separate from training and performance. The services provided by the manufacturer shall be as detailed in the O&M manuals and shall include at a minimum the following:
    a. Check equipment alignment and assure that there are no unusual internal stresses.
    b. Calibrate all instrumentation such as hydraulic systems.
    c. Check hydraulic systems to insure proper operation.
    d. Check lubrication in all drives.
    e. Adjust all edge seals, discharge scraper blades, drive chains, etc.
    f. Adjust spray wash, cloth tension, and belt aligning system.
    g. Start the drives and assure they are operating properly with no binding and with correct rotation.
    h. Ensure that all ancillary systems have been properly adjusted, including polymer and sludge feed.
3. Start-up services shall be considered completed when the contractor and manufacturer have demonstrated to the owner that the units are operating without mechanical problems.

C. Training Supervision

1. During the start-up procedures, the equipment manufacturer shall provide two separate trips, five days of on-site training to the owner's employees for proper operation and maintenance of the sludge dewatering equipment.
2. Two (2) emergency service trips with one day of on-site service for each trip.

3.05 TESTING

A. In the presence of the Engineer and the Operator, field testing of all equipment shall be performed to determine that operation is satisfactory and in compliance with the specifications. Testing shall be completed after the installation is complete, the equipment has been operated, and all necessary adjustments have been made. Testing shall be completed using aerobically digested sludge produced from the aerobic digesters after the installation of the aerobic digesters and belt press system is complete.

B. During the field tests, as a minimum, the following items shall be recorded:

1. Sludge flow rate (gpm)
2. Polymer dosage (act. lb/dry ton)

3. Discharge cake solids (%wt)
4. Minimum solids capture (%)

C. Testing shall meet performance criteria listed in Section 1.3 of this specification before final acceptance by engineer and owner.

D. A written report shall be supplied to the engineer upon completion. Repeat tests if necessary, to obtain results acceptable to engineer.

E. The Contractor shall take corrective action to ensure full compliance to meet performance criteria.

END OF SECTION

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