Vermillion WWTF Digester Improvements - 2018
Vermillion, SD

PREPARED FOR
The City of Vermillion

PREPARED BY
Banner Associates, Inc.
www.bannerassociates.com
BAI No. 22755.00.00
VERMILLION WWTF DIGESTER IMPROVEMENTS - 2018
VERMILLION, SOUTH DAKOTA

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PROFESSIONAL CONSULTANTS

GENERAL/PROCESS

Banner Associates, Inc.
409 22nd Avenue South
Brookings, South Dakota 57006
(605) 692-6342

PROCESS CONTROL AND INSTRUMENTATION

Banner Associates, Inc.
409 22nd Avenue South
Brookings, South Dakota 57006
(605) 692-6342
ELECTRICAL

PE Group
25 North Main Ave.
PO Box 567
Parker, South Dakota 57053-0567
(605) 297-3647

MECHANICAL

Brewer Engineering Consultants, PLC
905 Washington Avenue SE
Bondurant, IA 50035
(515) 957-8806

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Notice is hereby given that the City of Vermillion, South Dakota will receive sealed bids for construction of the Vermillion WWTF Digester Improvements – 2018 project. The base bid of the project scope will include the following:

- Demolition of existing boiler, heat exchanger and associated hot water and digester sludge piping
- New 40 HP, 1,139,000 Btu/hr output dual fuel (biogas/methane) boiler and associated insulated, stainless steel biogas and insulated hot water piping
- New 600,000 Btu/hr spiral heat exchanger and associated sludge and hot water piping
- Draining and clearing of primary and secondary anaerobic digesters
- Replacement of selected sludge piping penetrating the primary and secondary anaerobic digesters with Sch. 80 PVC piping and replacement of associated plug valves
- Mechanical and electrical improvements necessary to complete the work

Bid Alternative No. 1 of the project scope includes the following:

- Demolition of selected digester sludge pumps and piping
- Two screw-centrifugal, 5 HP sludge digester recirculation pumps and associated piping and valves
- Two rotary lobe, 7.5 HP sludge transfer pumps and associated piping and valves
- Replacement of existing stainless steel sludge piping with Sch. 80 PVC piping and replacement of associated plug valves

The Bids must be prepared on bid forms supplied in the Bidding Documents and filed with the City Engineer at the Vermillion City Hall, 25 Center Street, Vermillion, SD 57069 not later than 2:00 P.M. Local Time, July 17, 2018, at which time and place all Bids will be publicly opened and read aloud in the presence of Bidders and their representatives. No bids will be received after the specified hour and date, and bids which are not prepared and filed in accordance with the “Instructions to Bidders” may be rejected.

Each Bid must be submitted in a sealed envelope. Each sealed envelope containing a Bid must be plainly marked on the outside as Bid for Vermillion WWTF Digester Improvements – 2018, Vermillion, South Dakota. The envelope should also bear on the outside the name and address of the Bidder. If forwarded by mail or other delivery system, the sealed envelope containing the Bid must be sealed in another envelope, with the notation “Bid Enclosed” on the face thereof, and addressed to the City Engineer, Vermillion City Hall, 25 Center Street, Vermillion, SD 57069.

Bidding Documents may be examined at the offices of Banner Associates, Inc. in Sioux Falls or Brookings, SD. A complete set of Bidding Documents may be obtained at the office of Banner Associates, Inc., 409 22nd Avenue South, P.O. Box 298, Brookings, SD 57006, (605) 692-6342 or may be ordered from www.bannerassociates.com. Copies may be obtained upon a non-refundable payment in the sum of $60.00 including applicable taxes and fees for each set of Bidding Documents. Electronic copies are also available and can be ordered and downloaded from the above website for a $25.00 including applicable taxes non-refundable fee. Upon request, in accordance with South Dakota Codified Law 5-18B-1, one copy of electronic or paper Bidding Documents shall be furnished, without charge, to each prime contractor resident in South Dakota who intends, in good faith, to submit a bid to the Owner. Additionally, if a paper copy is provided under the conditions of SDCL 5-18B-1, in consideration of the documents being provided at no charge, unsuccessful bidders agree to return the documents to the office of Banner Associates, at the address listed above, within thirty (30) days after the bid opening.

The Bidder to whom the contract is awarded will be required to furnish a construction performance bond and a construction payment bond to the Owner in the amount of one hundred percent (100%) of the contract award for each bond, in conformance with the requirements of the Contract Documents. The construction performance bond and construction payment bond shall remain in full force until the completion of the Contract as specified in the General Conditions.
All bids must be accompanied by a Bid security. Bid security will take the form of a bid bond in an amount of ten percent (10%) of the Bidder's maximum Bid price or a cashier's or certified check made payable to Owner in an amount of five percent (5%) of the Bidder's maximum Bid price.

The Bid security will be retained by the Owner as liquidated damages if the successful bidder refuses or fails to enter into an Agreement within fifteen (15) days after Notice of Award or fails at time of executing the contract to furnish a construction performance bond and construction payment bond guaranteeing the faithful performance of the work.

A pre-bid conference will be held at 10:00 pm on July 10, 2018 at the Vermillion Wastewater Treatment Facility, 1530 South Dakota Street, Vermillion, SD 57069.

Bids may not be withdrawn after the time fixed for opening them. The Owner reserves the right to reject any and all bids, and to waive any irregularities therein.

BY ORDER of the City Council of Vermillion, South Dakota.

Date ________________________ By ____________________________

City of Vermillion

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INSTRUCTIONS TO BIDDERS

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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office – The office from which the Bidding Documents are to be issued.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder’s qualifications to perform the Work, after submitting its Bid and within 5 days of Owner’s request, Bidder shall submit (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:

A. Evidence of Bidder’s authority to do business in the state where the Project is located.
B. Bidder’s state or other contractor license number, if applicable.
C. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, “Subcontractors, Suppliers, and Others.”
D. Other required information regarding qualifications.

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

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder’s qualifications.

3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder’s representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER’S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 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.

4.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:
   a. Those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
   b. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
   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.

B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 Visit and Testing by Bidders

A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.

B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder 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.

D. Bidder shall 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.

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

4.04 Owner’s Safety Program

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

4.05 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 5 – BIDDER’S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;
E. consider 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 Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder’s safety precautions and programs;

F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 A pre-bid conference will be held at 1:00 pm on July 10, 2018 at the Vermillion City Office, 25 Center Street, Vermillion, SD 57069.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of Bidder’s maximum Bid price and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) in the amount of ten percent of Bidder’s
maximum Bid price issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

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 Documents, 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 Documents 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. Such forfeiture shall be Owner’s exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 31 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

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

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 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 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

11.01 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 at least 7 days prior to the date for receipt of Bids. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

11.02 All prices that Bidder sets forth in its Bid shall 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 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work for which such identification is required.

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

12.04 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, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

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

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

13.02 A Bid by a corporation shall 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 seal shall be affixed and attested by the corporate secretary or an assistant corporate secretary.” The corporate address and state of incorporation shall be shown.
13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

13.04 A Bid by a limited liability company shall 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 shall be shown.

13.05 A Bid by an individual shall show the Bidder’s name and official address.

13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

13.07 All names shall be printed in ink below the signatures.

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

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

13.10 The Bid shall contain evidence of Bidder’s authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder’s state contractor license number, if any, shall also be shown on the Bid Form.

13.11 The Bidder may attach a substitute Bid schedule printed by a computer in lieu of completing the bound Bid schedules in ink. All of the provisions of the bound Bid section must be fully complied with except, if a computer printed substitute Bid schedule is used the unit bid prices need not be written in words. If a substitute Bid schedule is used it shall be attached to the bound Bid schedule. Such computer printed substitute Bid schedule shall include the following at the top of each page:

A. Bid Date
B. Title of Project
C. Bid schedules
D. Name of Owner
E. Bidder's Name and Address

The substitute computer printed Bid schedule shall identify the Bid schedule and have column headings that include the Item Number, Spec. Ref. No., Item Description, Quantity, Unit Designation, Unit Bid Price, Amount Bid for each item, Total or Gross Sum Bid below the last bid item and bidder's name, signature in ink and title at the end of the Bid schedule. The Bidder shall complete the acknowledgement of addendum, and signature page(s). The signature on the substitute computer printed Bid schedule shall be the same as that on signature page(s) in the Bid Form. The total or gross sum bid shall also be written in ink in the designated space for the Bid schedule, that is Bid, in the Bid Form. In case of a discrepancy between the line number, bid item description, and/or quantity shown in the Bid Form and those shown on the substitute computer printed bid schedule, the bid item
description and the quantity shown in the Bid Form shall govern. The unit bid price shown on
the substitute computer printed Bid schedule shall govern whether or not the amount bid
shown is correct. The substitute Bid schedule page size and size of printed characters shall
be approximately the same as the bound Bid Form. Solid lines for separating columns and
line numbers need not be printed. At least one blank line or space shall separate each line
number. Columns may be arranged either vertically or horizontally on the substitute bid
schedule. Any irregularities which are not waived by the Owner as a technicality will result in
rejection of the bid.

ARTICLE 14 – BASIS OF BID

14.01 Lump Sum

A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price
for each alternate described in the Bidding Documents as provided for in the Bid Form. The
price for each alternate will be the amount [added to] [or] [deleted from] the base Bid if
Owner selects the alternate. The Owner reserves the right to award the construction
contracts, including Owner selected bid alternates.

ARTICLE 15 – SUBMITTAL OF BID

15.01 Bid shall be submitted on the Bid Form provided in the Project Manual. 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 7 of the Bid Form.

15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in
the advertisement or invitation to bid and shall be enclosed in a plainly marked package with
the Project title (and, if applicable, the designated portion of the Project for which the Bid is
submitted), the name and address of Bidder, and shall be accompanied by the Bid security and
other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope
containing the Bid shall be enclosed in a separate package plainly marked on the outside with
the notation "BID ENCLOSED." A mailed Bid shall be addressed to as indicated in the
advertisement or invitation to bid.

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

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A 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.

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in
the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the
opening of Bids.

16.03 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, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

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

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. 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, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

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

19.03 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. 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.

19.04 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.

19.05 The Owner reserves the right to delete Bid schedules to stay within budget funding amounts or to reject any or all Bids. Bidder must bid all Bid schedules and Bid alternates (if any) complete. If the Bid is to be awarded, it will be awarded to the low responsive, responsible Bidder whose evaluation by Owner indicates to Owner that the award is in the best interest of the Project. Remaining alternates (if any) will be awarded in the best interest of the Project.
19.06 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 20 – BONDS AND INSURANCE

20.01 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 and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall 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 shall 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 ten days thereafter, Owner shall 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.

END OF SECTION
Bid Form

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<th>ARTICLE</th>
<th>Description</th>
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<td>Bid Recipient</td>
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<td>2</td>
<td>Bidder’s Acknowledgements</td>
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<td>9</td>
<td>Bid Submittal</td>
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</table>
ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City Engineer
City of Vermillion City Hall
25 Center Street
Vermillion, SD 57069

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

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 30 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

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<th>Addendum No.</th>
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B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

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

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and
drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. 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 any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder’s safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

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

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

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

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER’S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at 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.

E. The prices bid herein include sales tax and all other applicable taxes and fees.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

A. Lump Sum Base Bid:
   1. Process Integration Fixed Priced Package:                        $25,000.00
   2. Total Lump Sum Base Bid Price (Includes Process Integration Fixed Priced Package)
      ___________________________________  ___________________
      (words) (numerals)

B. Lump Sum Bid Alternative No. 1:
   1. Process Integration Fixed Priced Package:                        $18,000.00
   2. Total Lump Sum Bid Alternative No. 1 Price (Includes Process Integration Fixed Priced Package)
      ___________________________________  ___________________
      (words) (numerals)

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

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:
   A. Required Bid security in accordance with Article 8 of the Instructions to Bidders;
   B. List of proposed Subcontractors and Suppliers;
7.02 The following forms must be submitted by the apparent low-bidder within ten calendar days of the bid opening:
   A. Bidder’s Statement of Qualifications (Qual-1 to Qual-4);

ARTICLE 8 – DEFINED TERMS

8.01 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 9 – BID SUBMITTAL

BIDDER: [Indicate correct name of bidding entity]

By:  

[Signature] 

[Printed name]  

(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:  

[Signature] 

[Printed name] 

Title:  

Submittal Date:  

Address for giving notices: 

Telephone Number:  

Fax Number:  

Contact Name and e-mail address:  

_____________________________  

_____________________________  

_____________________________  

_____________________________
Bidder’s License No.: ________________________________

(where applicable)
BID BOND

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

BIDDER (Name and Address):

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

OWNER (Name and Address):

BID
Bid Due Date:
Description (Project Name—Include Location):

BOND
Bond Number:
Date:
Penal sum $ (Words) (Figures)

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

BIDDER
(Signature)
Bidder’s Name and Corporate Seal
By: 
Signature (Attach Power of Attorney)
Print Name
Title
Attest: 
Signature
Title

SURETY
(Signature)
Surety’s Name and Corporate Seal
By: 
Signature (Attach Power of Attorney)
Print Name
Title
Attest:
Signature
Title

Note: Addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.
1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder’s and Surety’s liability. Recovery of such penal sum under the terms of this Bond shall be Owner’s sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:
   3.1 Owner accepts Bidder’s Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
   3.2 All Bids are rejected by Owner, or
   3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety’s written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

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

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

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

12. Surety companies executing BONDS must appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.
LIST OF SUBCONTRACTORS AND SUPPLIERS

PROJECT: 

BIDDER: 

List all Subcontractors and Suppliers to be employed on the above Project. This list shall be submitted as required in Article 12 of the Instructions to Bidders and Article 7 of the Bid Form with such additional information as is required therein.

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<th>Work</th>
<th>Firm</th>
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END OF SECTION
# QUALIFICATIONS STATEMENT

**THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS**

1. **SUBMITTED BY:**
   - Official Name of Firm: 
   - Address:  
     - Line 1  
     - Line 2  
     - Line 3  

2. **SUBMITTED TO:**

3. **SUBMITTED FOR:**
   - Owner:  
   - Project Name:  
     - Line 1  
     - Line 2  

   **TYPE OF WORK:**

4. **CONTRACTOR'S CONTACT INFORMATION**
   - Contact Person:  
   - Title:  
   - Phone:  
   - Email:  

---

EJCDC® C-451, Qualifications Statement.
Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.
5. **AFFILIATED COMPANIES:**

   Name: 
   
   Address: 

6. **TYPE OF ORGANIZATION:**

   - [ ] SOLE PROPRIETORSHIP
     
     Name of Owner: 
     
     Doing Business As: 
     
     Date of Organization: 

   - [ ] PARTNERSHIP
     
     Date of Organization: 
     
     Type of Partnership: 
     
     Name of General Partner(s): 

   - [ ] CORPORATION
     
     State of Organization: 
     
     Date of Organization: 
     
     Executive Officers:
     
     - President: 
     
     - Vice President(s): 
     
     - Treasurer: 


- Secretary: ____________________________

☐ LIMITED LIABILITY COMPANY

State of Organization: ____________________________

Date of Organization: ____________________________

Members: ____________________________

☐ JOINT VENTURE

State of Organization: ____________________________

Date of Organization: ____________________________

Form of Organization: ____________________________

Joint Venture Managing Partner

- Name: ____________________________

- Address: ____________________________

Joint Venture Managing Partner

- Name: ____________________________

- Address: ____________________________

Joint Venture Managing Partner

- Name: ____________________________
7. LICENSING

Jurisdiction:

Type of License:

License Number:

Jurisdiction:

Type of License:

License Number:

8. CERTIFICATIONS

CERTIFIED BY:

Disadvantage Business Enterprise:

Minority Business Enterprise:

Woman Owned Enterprise:

Small Business Enterprise:

Other (____________________): ___

9. BONDING INFORMATION

Bonding Company:

Address:

Bonding Agent:

Address:

Contact Name:
Phone: 

Aggregate Bonding Capacity: 

Available Bonding Capacity as of date of this submittal: 

10. **FINANCIAL INFORMATION**

Financial Institution: 

Address:  

Account Manager: 

Phone: 

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. **CONSTRUCTION EXPERIENCE:**

Current Experience:

List on Schedule A all uncompleted projects currently under contract (If Joint Venture list each participant’s projects separately).

Previous Experience:

List on Schedule B all projects completed within the last 5 Years (If Joint Venture list each participant’s projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner’s contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner’s contact information.
Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

[ ] YES  [ ] NO

If YES, attach as an Attachment details including Project Owner’s contact information.

12. **SAFETY PROGRAM:**

Name of Contractor’s Safety Officer:______________________________

Include the following as attachments:

Provide as an Attachment Contractor’s (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 500- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor’s (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - **IF NONE SO STATE.**

Provide as an Attachment Contractor’s (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - **IF NONE SO STATE.**

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

**Workers’ compensation Experience Modification Rate (EMR) for the last 5 years:**

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<th>YEAR</th>
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Total Recordable Frequency Rate (TRFR) for the last 5 years:

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Total number of man-hours worked for the last 5 years:

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<th>YEAR</th>
<th>TOTAL NUMBER OF MAN-HOURS</th>
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</table>

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

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<th>YEAR</th>
<th>DART</th>
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13. **EQUIPMENT:**

**MAJOR EQUIPMENT:**

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.
I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: ________________________________________

BY: ________________________________________

TITLE: ________________________________________

DATED: ________________________________________

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS __________ DAY OF __________, 20___

NOTARY PUBLIC - STATE OF ______________________

MY COMMISSION EXPIRES: ______________________

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.
### SCHEDULE A

#### CURRENT EXPERIENCE

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<th>Project Name</th>
<th>Owner's Contact Person</th>
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EJCDC' C-451, Qualifications Statement.  
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and American Society of Civil Engineers. All rights reserved.
## SCHEDULE B

**PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Owner’s Contact Person</th>
<th>Design Engineer</th>
<th>Contract Date</th>
<th>Type of Work</th>
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## SCHEDULE B

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### SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

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<th>ACQUIRED VALUE</th>
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NOTICE OF AWARD

Date of Issuance:

Owner: City of Vermillion

Owner's Contract No.: 

Engineer: Banner Associates, Inc.

Engineer's Project No.: #22755.00.00

Project: Vermillion WWTF Digester Improvements - 2018

Contract Name: 

Bidder: 

Bidder's Address: 

TO BIDDER:

You are notified that Owner has accepted your Bid dated [____________________________] 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: $________________ [note if subject to unit prices, or cost-plus]

[ ] 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. [revise if multiple copies accompany the Notice of Award]

[] a set of the 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 [____]counterparts of the Agreement, fully executed by Bidder.

2. Deliver with the executed Agreement(s) the Contract security [e.g., performance and payment bonds] and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.

3. Other conditions precedent (if any):

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

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

Owner: City of Vermillion

Authorized Signature

By:

Title:

Copy: Engineer
AGREEMENT

THIS AGREEMENT is by and between City of Vermillion ("Owner") and


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:

Vermillion WWTF Digester Improvements - 2018

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Vermillion WWTF Digester Improvements - 2018.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Banner Associates, Inc.

3.02 The Owner has retained Banner Associates, Inc. ("Engineer") to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 Time of the Essence

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

4.02 Contract Times: Dates

A. The Work will be substantially completed on or before April 30, 2019, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before May 31, 2019. The work required for substantial completion and final completion is defined in Specification Section 10 0000 General Requirements.

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 times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. 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 $675 for each calendar day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A 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 Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $350 for each calendar day that expires after such time until the Work is completed and ready for final payment.

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

ARTICLE 5 – CONTRACT PRICE

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

   A. For all Work other than Unit Price Work, a lump sum of: $__________

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

ARTICLE 6 – PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

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

6.02 Progress Payments; Retainage

   A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor’s Applications for Payment on or about the 10TH 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 Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character
and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 100 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 in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the maximum rate of allowed by law at the place of the Project.

ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS

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

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

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

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

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. 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 Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance
of the Work; (2) the means, methods, techniques, sequences, and procedures of
construction to be employed by Contractor; and (3) Contractor’s safety precautions and
programs.

F. 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.

G. 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.

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

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

J. 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.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 Contents

A. The Contract Documents consist of the following:
   1. This Agreement (pages 1 to _____, inclusive).
   2. Performance bond (pages _____ to _____, inclusive).
   3. Payment bond (pages _____ to _____, inclusive).
   4. Other bonds.
      a. _____ (pages ______ to ______, inclusive).
   5. General Conditions (pages _____ to _____, inclusive).
   7. Community Development Block Grant Special Provisions.
   9. Drawings (not attached but incorporated by reference) consisting of _______ sheets
      with each sheet bearing the following general title: ___________________.
   10. Addenda (numbers _____ to _____, inclusive).
   11. Exhibits to this Agreement (enumerated as follows):
      a. Contractor’s Bid (pages _____ to _____, inclusive).
   12. The following which may be delivered or issued on or after the Effective Date of the
      Contract and are not attached hereto:
ARTICLE 9 – CONTRACT DOCUMENTS

A. The documents listed in Paragraph 9.01.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 9.

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

ARTICLE 10 – MISCELLANEOUS

10.01 Terms

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

10.02 Assignment of Contract

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto 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 Documents.

10.03 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.

10.04 Severability

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

10.05 Contractor’s Certifications

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 Other Provisions

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

This Agreement will be effective on ________________ (which is the Effective Date of the Contract).

OWNER:  CONTRACTOR:

City of Vermillion, SD

By:  By:

Title:  Title:

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

Attest:  Attest:

Title:  Title:

Address for giving notices:

City Engineer

25 Center Street

Vermillion, SD 57069

License No.:  

(where applicable)

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)
NOTICE TO PROCEED

Owner: City of Vermillion

Contractor:

Engineer: Banner Associates, Inc.

Project: Vermillion WWTF Digester Improvements - 2018

Owner’s Contract No.:

Contractor’s Project No.:

Engineer’s Project No.: #22755.00.00

Contract Name:

Effective Date of Contract:

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on ________________, 2018. [see Paragraph 4.01 of the General Conditions]

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the date of Substantial Completion is ________________, and the date of readiness for final payment is ________________.

Before starting any Work at the Site, Contractor must comply with the following:
[Note any access limitations, security procedures, or other restrictions]

Owner: City of Vermillion, SD

Authorized Signature

By: _____________________________

Title: _____________________________

Date Issued: ____________________

Copy: Engineer
PERFORMANCE BOND

CONTRACTOR (name and address):

SURETY (name and address of principal place of business):

OWNER (name and address):

CONSTRUCTION CONTRACT
   Effective Date of the Agreement:
   Amount:
   Description (name and location):

BOND
   Bond Number:
   Date (not earlier than the Effective Date of the Agreement of the Construction Contract):
   Amount:
   Modifications to this Bond Form:  None  See Paragraph 16

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

CONTRACTOR AS PRINCIPAL
   ________________________________  ________________________________
   Contractor’s Name and Corporate Seal  Surety’s Name and Corporate Seal

   By: ________________________________
   ________________________________
   Signature  Signature (attach power of attorney)

   Print Name
   ________________________________
   ________________________________
   Title  Title

   Attest: ________________________________
   ________________________________
   Signature  Signature

   Title
   ________________________________

   Attest: ________________________________
   ________________________________
   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 shall be considered plural where applicable.
1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

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

3. If there is no Owner Default under the Construction Contract, the Surety’s obligation under this Bond shall 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 shall 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 shall 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 shall 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 shall not constitute a failure to comply with a condition precedent to the Surety’s obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety’s expense take one of the following actions:
   
   5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

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

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

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
   
   5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

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

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

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall 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 shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than
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 may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after 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 shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall 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 shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall 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 shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:
PAYMENT BOND

CONTRACTOR (name and address):  

SURETY (name and address of principal place of business):

OWNER (name and address):

CONSTRUCTION CONTRACT

Effective Date of the Agreement:  
Amount:  
Description (name and location):

BOND

Bond Number:  
Date (not earlier than the Effective Date of the Agreement of the Construction Contract):  
Amount:  
Modifications to this Bond Form:  
None  
See Paragraph 18

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

CONTRACTOR AS PRINCIPAL

______________________________ (seal)  
Contractor’s Name and Corporate Seal  

By:  
Signature  

Print Name  
Title  
Attest:  
Signature  
Title  

SURETY

______________________________ (seal)  
Surety’s Name and Corporate Seal  

By:  
Signature (attach power of attorney)  

Print Name  
Title  
Attest:  
Signature  
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 shall be considered plural where applicable.
1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

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

3. If there is no Owner Default under the Construction Contract, the Surety’s obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor, the Surety, and 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 shall 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 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney’s fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety’s total obligation shall 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 shall 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 shall 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 satisfy 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 shall 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 shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall 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 shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall 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:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
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;
4. A brief description of the labor, materials, or equipment furnished;
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;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
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 shall be 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 shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:
CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: City of Vermillion
Contractor: 
Engineer: Banner Associates, Inc.
Project: Process Boiler Improvements – Phase 2

Owner's Contract No.:
Contractor’s Project No.:
Engineer's Project No.: #22755.00.00
Contract Name: 

☑ 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.

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 shall be as provided in the Contract, except as amended as follows: [Note: 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.]

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: [punch list; others]

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.

EXECUTED BY ENGINEER: RECEIVED: RECEIVED:

By: ___________________________ By: ___________________________ By: ___________________________
(Authorized signature) Owner (Authorized Signature) Contractor (Authorized Signature)

Title: ___________________________ Title: ___________________________ Title: ___________________________

Date: ___________________________ Date: ___________________________ Date: ___________________________
WAIVER AND RELEASE OF LIEN

TO: __________________________ (Owner)

and

____________________________________
Contractor

FROM: __________________________
name of manufacturer, material supplier, or subcontractor

PROJECT: __________________________

WHEREAS, the undersigned has furnished to Contractor the following (insert type of material and services furnished) for the above referenced Project:

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
NOW, THEREFORE, the undersigned, for and in consideration of $_____________ and other good and valuable consideration, the receipt whereof is hereby acknowledged, does hereby waive and release any and all liens, or right to claim of lien, on the above described project and premises, under any law, common or statutory, on account of labor or materials, or both, heretofore or hereafter furnished by the undersigned to or for the account said Contractor for said Project.

Dated this __________ day of __________, 20__. 

FIRM: ________________________________

Name of firm or person giving release

By: ________________________________

Title: ________________________________

STATE OF ____________________________

COUNTY OF ____________________________

The foregoing release was subscribed and sworn to before me this ___ of ____________, 20__, by ____________

_____________________________
(as ___________________________ of ________________________________)

My Commission expires:

_____________________________

Notary Public
# Contractor's Application for Payment No.

<table>
<thead>
<tr>
<th>Application No.</th>
<th>Application Date:</th>
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<tbody>
<tr>
<td>To (Owner):</td>
<td>From (Contractor):</td>
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<tr>
<td>Project:</td>
<td>Via (Engineer):</td>
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<table>
<thead>
<tr>
<th>Owner's Contract No.:</th>
<th>Contractor's Project No.:</th>
<th>Engineer's Project No.:</th>
</tr>
</thead>
</table>

## Application For Payment

### Change Order Summary

| Approved Change Orders | 1. ORIGINAL CONTRACT PRICE | 2. Net change by Change Orders | 3. Current Contract Price (Line 1 ± 2) | 4. TOTAL COMPLETED AND STORED TO DATE | 5. RETAINAGE:  
<table>
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## Application of Funds

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<tr>
<th>6. AMOUNT ELIGIBLE TO DATE</th>
<th>7. LESS PREVIOUS PAYMENTS (Line 8 from prior Application)</th>
<th>8. AMOUNT DUE THIS APPLICATION</th>
<th>9. BALANCE TO FINISH, PLUS RETAINAGE</th>
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<tr>
<td>(Line 6 or other - attach explanation of the other amount)</td>
<td></td>
<td>(Line 8 or other - attach explanation of the other amount)</td>
<td>(Column G total on Progress Estimates + Line 5.c above)</td>
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## 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.

Payment of: $ ________________

is recommended by: ____________________________ (Engineer) ____________________________ (Date)

Payment of: $ ________________

is approved by: ____________________________ (Owner) ____________________________ (Date)

Approved by: ____________________________ (Funding or Financing Entity) ____________________________ (Date)

---

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

<table>
<thead>
<tr>
<th>Specification Section No.</th>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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#### Contractor's Application

- **A** Work Completed
- **B** From Previous Application
- **C** Scheduled Value ($)
- **D** Stored (not in C or D)
- **E** Stored to Date
- **F** Total Completed
- **G** Balance to Finish

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**Totals**

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EJCDC® C-620 Contractor's Application for Payment
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## Stored Material Summary

### Contractor's Application

**For (Contract):**

Application Period:

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<td>Date Placed into Storage (Month/Year)</td>
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**Totals**

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**Application Number:**

Application Date:

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EJCDC® C-620 Contractor's Application for Payment

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Page 1 of 1
Change Order No. ________

Date of Issuance: __________________________ Effective Date: __________________________

Owner: City of Vermillion Owner’s Contract No.: __________________________

Contractor: Contractor’s Project No.: __________________________

Engineer: Banner Associates, Inc. Engineer’s Project No.: #22755.00.00

Project: Vermillion WWTF Digester Improvements – 2018 Contract Name: __________________________

The Contract is modified as follows upon execution of this Change Order:

Description: __________________________

Attachments: [List documents supporting change]

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RECOMMENDED: __________________________ ACCEPTED: __________________________
By: __________________________ By: __________________________ By: __________________________
Title: __________________________ Title: __________________________ Title: __________________________
Date: __________________________ Date: __________________________ Date: __________________________

Approved by Funding Agency (if applicable)
By: __________________________ Date: __________________________
Title: __________________________

EJCDC® C-941, Change Order.
Prepared and published 2013 by the Engineers Joint Contract Documents Committee.
#22755.00.00 Page 1 of 1
STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Issued and Published Jointly by

AMERICAN COUNCIL OF ENGINEERING COMPANIES

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To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC’s Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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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 form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. **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, or both; 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 in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer’s decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (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. 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), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree 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 the 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. **Engineer**—The individual or entity named as such in the Agreement.

21. **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.

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

23. **Laws and Regulations; Laws or Regulations**—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. **Liens**—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. **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.

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

27. **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.

28. **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.

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

30. **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.

31. **Project Manual**—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

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

33. **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.

34. **Schedule of Submittals**—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.

35. **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.

36. **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.
37. **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 furnished by Owner which are designated for the use of Contractor.

38. **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.

39. **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.

40. **Substantial Completion**—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.

41. **Successful Bidder**—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

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

43. **Supplier**—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. **Technical Data**—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. **Underground Facilities**—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

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

47. **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.
48. Work Change Directive—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. Intent of Certain Terms or Adjectives:

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. Day:

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

D. Defective:

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
   a. does not conform to the Contract Documents; or
   b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
   c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. Furnish, Install, Perform, Provide:

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. **Bonds:** When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. **Evidence of Contractor’s Insurance:** When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. **Evidence of Owner’s Insurance:** After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), 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 executed 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 specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04  *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05  *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor’s full responsibility therefor.

2. Contractor’s Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor’s Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06  *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items 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 items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

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

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, shall mean 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, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the 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 Documents 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 Documents 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 shall 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 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 thereunder.

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 give written notice to Owner and Contractor 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 editions, 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 shall preclude 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 thirtieth 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 sixtieth day after the day of Bid opening or the thirtieth 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 shall be done at the Site prior to such date.

4.03 **Reference Points**

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

4.04 **Progress Schedule**

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall 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 shall 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 the Contract Times and Contract Price. 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.

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. 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. Such an adjustment shall 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 utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. 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.

E. Paragraph 8.03 governs 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.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times 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.
G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

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; 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 7.12, 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 at law; 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 shall conform to applicable Laws and Regulations.

C. **Cleaning:** Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. **Loading of Structures:** Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 **Subsurface and Physical Conditions**

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

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); 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 upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. 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. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.
5.04 **Differing Subsurface or Physical Conditions**

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

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 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 5.04.A above; 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. **Possible Price and Times Adjustments:**

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
c. Contractor’s entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor’s ability to complete the Work within the Contract Times.

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; 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 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, or both, then any such adjustment shall 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, or both, 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

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

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
   a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
   b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
   c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
   d. 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 in the Contract Documents, or was not shown or indicated 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), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. **Engineer’s Review**: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor’s resumption of Work in connection with the Underground Facility in question; 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 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. **Possible Price and Times Adjustments**:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, 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. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
   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;
   c. 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; and
   d. 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, or both, then any such adjustment shall 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, or both, no later than 30 days after Owner’s issuance of the Owner’s written statement to Contractor regarding the Underground Facility in question.
5.06 Hazardous Environmental Conditions at Site

A. Reports and Drawings: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
2. 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 Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. 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. 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, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, 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.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner’s own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or 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.H shall oblige 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 shall oblige 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 all of Contractor’s obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, 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 shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

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

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. 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.

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

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. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is
maintaining the policies, coverages, and endorsements 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 and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements 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 and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. 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, shall not be construed as a waiver of the other party’s obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of 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.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner’s termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect 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 shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor’s interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 Contractor’s Insurance

A. Workers’ Compensation: Contractor shall purchase and maintain workers’ compensation and employer’s liability insurance for:

1. claims under workers’ compensation, disability benefits, and other similar employee benefit acts.
2. United States Longshoreman and Harbor Workers’ Compensation Act and Jones Act coverage (if applicable).
3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor’s employees (by stop-gap endorsement in monopolist worker’s compensation states).
4. Foreign voluntary worker compensation (if applicable).

B. 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:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor’s employees.
2. claims for damages insured by reasonably available personal injury liability coverage.
3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. Commercial General Liability—Form and Content: Contractor’s commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:
   a. Such insurance shall 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, to the extent permitted by law, including but not limited to coverage of Contractor’s contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 01 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. 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.

D. Automobile liability: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. 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. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. Contractor’s pollution liability insurance: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result
of pollution conditions arising from Contractor’s operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. **Additional insureds**: The Contractor’s commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. **Contractor’s professional liability insurance**: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. **General provisions**: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.
2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
4. remain in effect at least until final payment (and longer if expressly required in this Article) 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 Documents.
5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor’s performance of the Work and Contractor’s other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.
6.04 **Owner’s Liability Insurance**

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner’s option, may purchase and maintain at Owner’s expense Owner’s own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. 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.

6.05 **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 full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder’s risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as “insureds.”

2. be written on a builder’s risk “all risk” policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder’s risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.

8. allow for the waiver of the insurer’s subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. Notice of Cancellation or Change: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed 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.

C. Deductibles: The purchaser of any required builder’s risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

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 notice of such occupancy or use to the builder’s risk insurer. The builder’s risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder’s risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.

E. Additional Insurance: 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 6.05, it may do so at Contractor’s expense.

F. Insurance of Other Property: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.
6.06 **Waiver of Rights**

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder’s risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. 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 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 Subcontractors, all individuals or entities identified in the Supplementary Conditions as 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. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner’s property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial 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.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work 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 any of the perils or causes of loss covered by builder’s risk insurance and any other property insurance applicable to the Work.

6.07 **Receipt and Application of Property Insurance Proceeds**

A. Any insured loss under the builder’s risk and other policies of insurance required by Paragraph 6.05 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 6.05 shall 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, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

7.01 Supervision and Superintendence

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

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

7.02 Labor; Working Hours

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, 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.

7.03 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and
guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 “Or Equals”

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the 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 material or equipment, or items from other proposed suppliers under the circumstances described below.

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

   a. in the exercise of reasonable judgment Engineer determines that:
      1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
      3) it has a proven record of performance and availability of responsive service; and
      4) it is not objectionable to Owner.

   b. Contractor certifies that, if approved and incorporated into the Work:
      1) there will be no increase in cost to the Owner or increase in Contract Times; and
      2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

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 shall result in any change in Contract Price. The Engineer’s denial of an “or-equal” request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. **Treatment as a Substitution Request:** If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

### 7.05 Substitutes

A. Unless the specification or description of an item of material or equipment 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 material or equipment under the circumstances described below. To the extent possible such requests shall 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 material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

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

   a. shall 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 that specified, and

      3) be suited to the same use as that 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 that specified, and
2) available engineering, sales, maintenance, repair, and replacement services.

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

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

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

D. Reimbursement of Engineer’s Cost: Engineer will record Engineer’s costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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

F. Effect of Engineer’s Determination: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer’s denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 Concerning Subcontractors, Suppliers, and Others

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities 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, Supplier, or other individual or entity 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 five days.
E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. 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, Suppliers, or other individuals or entities 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, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, 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, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

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

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

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

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

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

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
O. Nothing in the Contract Documents:
   1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
   2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 Permits

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of 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.
7.09 **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.

7.10 **Laws and Regulations**

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor’s compliance with any Laws or Regulations.

B. If Contractor performs any Work 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 shall not be Contractor’s responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor’s obligations under Paragraph 3.03.

C. Owner or Contractor may give 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 notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 **Record Documents**

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

7.12 **Safety and Protection**

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when 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.

C. Contractor shall comply with the applicable requirements of Owner’s safety programs, if any. The Supplementary Conditions identify any Owner’s safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor’s safety program with which Owner’s and Engineer’s employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor 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).

F. Contractor’s duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor’s duties and responsibilities for safety and protection shall 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.

7.13 Safety Representative

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

7.14 Hazard Communication Programs

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

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 threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 Shop Drawings, Samples, and Other Submittals

A. Shop Drawing and Sample Submittal Requirements:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
   a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
   b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
   c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
   d. determined and verified all information relative to Contractor’s responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor’s obligations under the Contract Documents with respect to Contractor’s review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. Submittal Procedures for Shop Drawings and Samples: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. Shop Drawings:
   a. Contractor shall submit the number of copies required in the Specifications.
   b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to
provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

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.D.

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. **Other Submittals:** Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. **Engineer’s Review:**
   1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer’s review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
   2. Engineer’s review and approval will not extend to means, methods, techniques, sequences, or procedures of construction 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 shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
   5. Engineer’s review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 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, shall 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, Sample, or other submittal shall 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.D.4.

E. **Resubmittal Procedures**:

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

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer’s time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer’s charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

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

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 and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor’s warranty and guarantee.

B. Contractor’s warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor’s obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor’s obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

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

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.
D. 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 shall 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 and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer’s officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 Delegation of Professional Design Services

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

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop
Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer’s review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer’s review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

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

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 utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

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

D. If the proper execution or results of any part of Contractor’s Work depends upon work performed by others under this Article 8, 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.
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 at or adjacent to the Site for Owner, the Owner’s employees, any other contractor working for Owner, or any utility owner 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, or both. 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 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. When applicable, any such equitable adjustment in Contract Price shall 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 is conditioned on such adjustment being essential to Contractor’s ability to complete the Work within the Contract Times.

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. 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 to 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.

C. 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 to Contractor.
D. 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 shall be that of the former Engineer.

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

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

9.05 Lands and Easements; Reports, Tests, and Drawings
A. Owner’s duties with respect to providing lands and easements are set forth in Paragraph 5.01.
B. Owner’s duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
C. Article 5 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

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

9.07 Change Orders
A. Owner’s responsibilities with respect to Change Orders are set forth in Article 11.
9.08 **Inspections, Tests, and Approvals**
A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

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

9.10 **Undisclosed Hazardous Environmental Condition**
A. Owner’s responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 **Evidence of Financial Arrangements**
A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner’s obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 **Safety Programs**
A. While at the Site, Owner’s employees and representatives shall comply with the specific applicable requirements of Contractor’s safety programs of which Owner has been informed.

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

**ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION**

10.01 **Owner’s Representative**
A. Engineer will be Owner’s representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner’s representative during construction are set forth in the Contract.

10.02 **Visits to Site**
A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor’s executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer’s efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer’s visits and observations are subject to all the limitations on Engineer’s authority and responsibility set forth in Paragraph 10.08. 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 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 Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer’s consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 Rejecting Defective Work

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

10.05 Shop Drawings, Change Orders and Payments

A. Engineer’s authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer’s authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer’s authority as to Change Orders is set forth in Article 11.

D. Engineer’s authority as to Applications for Payment is set forth in Article 15.

10.06 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.

10.07 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.

10.08 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, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor’s failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer’s review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 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 10.08 shall also apply to the Resident Project Representative, if any.

10.09 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 (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 Amending and Supplementing Contract Documents

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

1. Change Orders:

   a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

   b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not 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, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. Work Change Directives: 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 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an
adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

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

11.02 **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. Such changes shall be supported by Engineer’s recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes 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 shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate 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.

11.03 **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.

11.04 **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 shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

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 11.04.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 11.04.C).

C.  **Contractor’s Fee**: When applicable, the Contractor’s fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor’s fee shall be 15 percent;

   b. for costs incurred under Paragraph 13.01.B.3, the Contractor’s fee shall be five percent;

   c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor’s fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.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 five 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 shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

   d. no fee shall 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 will be the amount of the actual net decrease in cost plus a deduction in Contractor’s fee by an amount equal to five percent of such net decrease; and

   f. when both additions and credits are involved in any one change, the adjustment in Contractor’s fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05  **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 shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor’s progress.

11.06  **Change Proposals**

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under
the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. **Procedures**: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. 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. The supporting data shall 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. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. **Engineer’s Action**: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor’s supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer’s inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. **Binding Decision**: Engineer’s decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. **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 that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

### 11.07 Execution of Change Orders

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

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

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 11.02, (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 in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 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 shall be submitted 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; and
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.

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 shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor’s knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. Review and Resolution: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

**ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

13.01 **Cost of the Work**

A. **Purposes for Determination of Cost of the Work**: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. 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 shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers’ compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable
thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers’ field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor’s Cost of the Work and fee shall be determined in the same manner as Contractor’s Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:
   a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor’s employees incurred in discharge of duties connected with the Work.
   b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
   c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
   d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
   e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
   f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes
other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor’s fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as 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 shall not include any of the following items:

1. Payroll costs and other compensation of Contractor’s officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, 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. Expenses of Contractor’s principal and branch offices other than Contractor’s office at the Site.

3. Any part of Contractor’s capital expenses, including interest on Contractor’s capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. Contractor’s Fee: When the Work as a whole is performed on the basis of cost-plus, Contractor’s fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor’s fee shall be determined as set forth in Paragraph 11.04.C.

E. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

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 on account of any of the foregoing will be valid.

C.  **Contingency Allowance**: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

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

13.03  **Unit Price Work**

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor’s overhead and profit for each separately identified item.

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

E. Within 30 days of Engineer’s written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.
ARTICLE 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 will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor’s safety procedures and programs so that they may comply therewith as applicable.

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 shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner’s and Engineer’s acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor’s purchase thereof for incorporation in the Work.

Such inspections and tests shall 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 shall be at Contractor’s expense unless Contractor had given Engineer timely notice of Contractor’s intention to
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 notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. **Correction, or Removal and Replacement**: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. **Preservation of Warranties**: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. **Costs and Damages**: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 **Acceptance of Defective Work**

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall 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 special 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, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 Owner May Stop the Work

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

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 rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 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 on account of 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. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner’s interest therein, all of which must be satisfactory to Owner.
   2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor’s legitimate obligations associated with prior Applications for Payment.
   3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications:
   1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer’s reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
   2. Engineer’s recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer’s observations of the executed Work as an experienced and qualified design professional, and on Engineer’s review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer’s knowledge, information and belief:
a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor’s being entitled to such payment appear to have been fulfilled in so far as it is Engineer’s responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

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

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor’s failure to comply with Laws and Regulations applicable to Contractor’s performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer’s opinion, it would be incorrect to make the representations to Owner stated in Paragraph 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 on account of Contractor’s conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor’s conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
   b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
   c. Contractor has failed to provide and maintain required bonds or insurance;
   d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
   e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
   f. the Work is defective, requiring correction or replacement;
   g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
   h. the Contract Price has been reduced by Change Orders;
   i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
   j. liquidated 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;
   l. there are other items entitling 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
removing 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 shall 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 shall be treated as an amount due as determined by Paragraph 15.01.C.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 seven days after the time of payment by Owner.

15.03 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor’s notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall 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 seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner’s objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner’s use or occupancy of the Work following Substantial Completion, review the builder’s risk insurance policy with respect to the end of the builder’s risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner’s use or occupancy of the Work.
E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 Partial Use or Occupancy

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor’s performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 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 6.05 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 7.11), and other
documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously
delivered) by:
   a. all documentation called for in the Contract Documents;
   b. consent of the surety, if any, to final payment;
   c. satisfactory evidence that all title issues have been resolved such that title to all
      Work, materials, and equipment has passed to Owner free and clear of any Liens
      or other title defects, or will so pass upon final payment.
   d. a list of all disputes that Contractor believes are unsettled; 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 Application and Acceptance:

1. If, on the basis of Engineer’s observation of the Work during construction and final
   inspection, and Engineer’s review of the final Application for Payment and
   accompanying documentation as required by the Contract Documents, Engineer is
   satisfied that the Work has been completed and Contractor’s other obligations under
   the Contract have been fulfilled, Engineer will, within ten days after receipt of the final
   Application for Payment, indicate in writing Engineer’s recommendation of final
   payment and present the Application for Payment to Owner for payment. Such
   recommendation shall 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. At the same time Engineer will also give written notice
   to Owner and Contractor that the Work is acceptable, subject to the provisions of
   Paragraph 15.07. 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. 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.

D. Payment Becomes Due: Thirty days after the presentation to Owner of the final Application
   for Payment and accompanying documentation, the amount recommended by Engineer
   (less any further sum Owner is entitled to set off against Engineer’s recommendation,
including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 Waiver of Claims

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor’s failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor’s continuing obligations under the Contract Documents.

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 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 terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then 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 other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner’s written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.
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, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall 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) ten 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) 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 seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,
and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor’s services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 Owner May Terminate For Convenience

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; 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 on account of loss of anticipated overhead, profits, or revenue, 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 seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 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, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph 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; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising 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; or

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 Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 Computation of Times

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

18.03 Cumulative Remedies

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

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 **No Waiver**

A. A party’s non-enforcement of any provision shall not constitute a waiver of that provision, nor shall 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 or completion of the Contract or termination 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 **Headings**

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.
SECTION 00800
SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

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 thereto.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Subsurface and Physical Conditions

SC 5.03 – No subsurface reports are available for the site. Work in all within existing building.

ARTICLE 6 – BONDS AND INSURANCE

SC-6.03 Contractor’s Liability Insurance

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers’ Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

   State:________________________ Statutory

   Federal, if applicable (e.g., Longshoreman’s):________________________ Statutory

   Employer’s Liability:

   Bodily injury, each accident $1,000,000

   Bodily injury by disease, each employee $1,000,000

   Bodily injury/disease aggregate $2,000,000

   Foreign voluntary worker compensation __________________________ Statutory
2. Contractor’s Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

   General Aggregate $ 5,000,000
   Products - Completed Operations Aggregate $ 5,000,000
   Personal and Advertising Injury $ 2,000,000
   Each Occurrence (Bodily Injury and Property Damage) $ 2,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

   Bodily Injury:
   Each person $ 1,000,000
   Each accident $ 1,000,000

   Property Damage:
   Each accident $ 1,000,000
   [or]
   Combined Single Limit of $ 2,000,000

4. Excess or Umbrella Liability:

   Per Occurrence $ 5,000,000
   General Aggregate $ 5,000,000

5. Contractor’s Pollution Liability:

   Each Occurrence $ N/A
   General Aggregate $ N/A

   ✔️ If box is checked, Contractor is not required to provide Contractor’s Pollution Liability insurance under this Contract
ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION

SC-10.03 Project Representative

Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR’s dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.

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. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:
   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 proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. 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.

7. 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 Engineer.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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.

14. 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.

C. The RPR shall not:
   1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including “or-equal” items).
   2. Exceed limitations of Engineer’s authority as set forth in the Contract Documents.
   3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
   4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor’s work.
   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. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
   8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.03 Substantial Completion

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, shall 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 Article 15.
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PART 1 - SUMMARY OF THE WORK

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of Contract.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Vermillion WWTF Digester Improvements – 2018

1. Project Location: Vermillion, SD, Clay County, Section 30, T92N, R51W.

B. Owner: City of Vermillion

C. Engineer: Banner Associates, Inc.
   409 22nd Avenue South
   Brookings, SD 57006

D. The Work consists of the following:

1. The Work to be performed under this Contract consists of Anaerobic Digester System Improvements
2. Construction shall include the following improvements as detailed on the Drawing, specified herein, and described in the Advertisement to Bidders.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a lump sum bid schedule.

1.5 CHARACTER OF WORK

A. It is intended that the Contract Documents include all items requisite and necessary to finish the entire work properly, even though every item necessarily involved may not be particularly mentioned. All work when finished shall be turned over to the Owner in complete and undamaged state. The work shall be executed in the best and most workmanlike manner by qualified and efficient mechanics, in strict accordance with the Contract Documents.
B. It is intended that the Contractor perform all work in accordance with the applicable and current Federal, State and Local; Acts, Standards, Guidelines and Safety manuals including, but not limited to, the following:

1. Occupational Safety and Health Administration (OSHA).
2. Environmental Protection Agency (EPA).
3. South Dakota Department of Environment and Natural Resources (SD DENR).
4. Recommended Standards for Water Works – Great Lakes Upper Mississippi River board of State Public Health and Environmental Manager’s; also known as the Ten State Standards.
5. American Water Works Association (AWWA).

C. If there is any conflict between the Standards, Guidelines, and Safety manuals, the more stringent requirement shall govern.

1.6 ACCESS TO SITE

A. The Contractor shall confine operations to those areas indicated in the Contract Documents and permitted by law, ordinances and permits. The Contractor shall not unreasonably encumber the site with any materials or equipment, and shall not occupy sites without prior approval of the Owner. The Contractor shall not disturb portions of the site beyond areas in which the Work is indicated.

B. Driveways, Walkways and Entrances: Keep driveways, loading areas and entrances serving premises clear and available to Owner, Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

1.7 COORDINATION WITH OCCUPANTS

A. Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner’s day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Do not close or obstruct walkways, driveways, or entrances without written permission from Owner and approval of authorities having jurisdiction.
2. Notify the Owner not less than 72 hours in advance of activities that will affect Owner’s operations unless indicated otherwise in the Sequence of Construction.

1.8 USE OF COMPLETED PORTIONS - OWNER OCCUPANCY

A. The Owner shall have the right to take possession of and use any completed or partially completed portions of the work. Such taking possession and use shall not be deemed as acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost or delays to the work, the Contractor shall be entitled to such extra compensation, or extension of time, or both, as the Engineer may determine.

PART 2 - TEMPORARY FACILITIES AND TRAFFIC CONTROLS

2.1 CONSTRUCTION AREA

A. The Contractor shall limit his construction operations to the areas indicated on the Drawings as construction areas. This shall include the operation and storage of equipment and the storage of materials
for use on the project. The construction areas shall be maintained in a neat and orderly condition at all times.

2.2 SECURITY

A. The Contractor shall provide security as required at the site. It shall be the Contractor's responsibility to provide such additional security as may be required to protect the construction and any materials and/or equipment stored on the site.

2.3 ACCESS ROAD

A. Access roads within the project area shall be kept open and maintained in a passable condition at all times.

PART 3 - MATERIAL AND EQUIPMENT

3.1 STORAGE AND PROTECTION

A. The Contractor shall, at all times, carefully and properly protect all materials and equipment, both before and after being used on the job, and all work performed by him, and provide any special protection from weather deemed necessary without additional cost to the Owner. The Contractor shall coordinate with the Engineer for designating storage areas and for the requirements for storage and protection. Storage of materials and equipment shall be within the area designated on the Drawings as the Construction Area.

3.2 MATERIALS SOURCES

A. It shall be the responsibility of the Contractor to locate sources for all materials specified herein and for any other material or item required to produce or complete the materials and/or work specified. The Contractor shall bear all costs in connection with acquisition, transportation, preparation, fabrication and/or installation of the material or item in the final work.

PART 4 - CONSTRUCTION SEQUENCE

4.1 GENERAL

A. General: The Vermillion WWTF shall remain in operation and the Contractor shall make every effort to prevent treatment process disruptions during construction under this contract. The anaerobic digesters will need to be taken out of service to allow for cleaning and piping improvements; however, the Contractor shall work to minimize their downtime. The work identified with this project shall not affect WWTF operations outside the Digester Complex.
B. The Contractor is to coordinate construction schedule with Owner and Engineer with the following sequence anticipated to accommodate equipment arrival times and Owner operations:

<table>
<thead>
<tr>
<th>Work Description</th>
<th>Anticipated Construction Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Contractor to empty primary digester contents into sludge storage lagoon, clean primary digester, and replace piping identified for replacement that penetrates into the primary digester.</td>
<td>August 2018 - September 2018</td>
</tr>
<tr>
<td>2. Contractor to transfer 30,500 gallons of secondary digester sludge into cleaned primary digester for “seed” per Specification Section 13 6000. Contractor to fill remaining portion of primary digester to level indicated with primary clarifier effluent from primary clarifier effluent box.</td>
<td>September 2018</td>
</tr>
<tr>
<td>3. Contractor to empty secondary digester contents to sludge storage lagoon, clean secondary digester, and replace piping identified for replacement that penetrates into the secondary digester.</td>
<td>September - October 2018</td>
</tr>
<tr>
<td>4. Contractor to fill secondary digester to level indicated with primary clarifier effluent from primary clarifier effluent box.</td>
<td>October 2018</td>
</tr>
<tr>
<td>5. Contractor to install new biogas piping to new boiler while digesters are out of service.</td>
<td>August - October 2018 while digesters are down for cleaning.</td>
</tr>
<tr>
<td>6. Contractor to replace interior piping and pumps awarded as part of Base Bid/Bid Alternative No. 1.</td>
<td>November – December 2018</td>
</tr>
<tr>
<td>7. Contractor to install new dual-fuel firebox boiler and associated piping, but not make connections to hot water system.</td>
<td>December 2018 – January 2019</td>
</tr>
<tr>
<td>8. Contractor to take existing heat exchanger off-line for demolition of existing boiler/heat exchanger and associated equipment. Contractor to install new heat exchanger and connect to hot water heating system. Contractor to connect new dual-firebox boiler to hot water system.</td>
<td>Contractor allowed 2 weeks for demolition of existing boiler/heat exchanger and installation of new heat exchanger equipment to minimize downtime of providing heat to the anaerobic digesters. Work is anticipated to occur in February – March 2019.</td>
</tr>
</tbody>
</table>
SECTION 01 2100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Project Manual Sections, apply to this Section.

1.2 DESCRIPTION

A. Include as a portion of the Total Lump Sum Base Bid Price and Alternative No. 1 Bid Price, the following allowance(s):

1. Base Bid allowance for Control System Improvements as provided in the Bid Form.
2. Alternative No. 1 Bid allowance for Control System Improvements as provided in the Bid Form.

1.3 PRICE ALLOWANCE(S)

A. Allowance for Control System Improvements:

1. The Owner has selected to have the Contractor purchase control system improvements on a sole-source basis and the Owner has received a “not to exceed” price from an integrator.
   a. The “not to exceed” price includes labor, equipment, delivery to the job site, submittals, training, testing, Operation and Maintenance Manuals, start-up services and warranty.
   b. Control System Improvements shall meet all requirements of its respective Project Manual Sections.
   c. The Terms and Conditions of Sale is appended to its respective Project Manual Sections.
   d. The Contractor is responsible for reviewing the requirements of the Project Manual Sections with the Scope of Supply provided by the Integrator and providing all necessary costs not included by the Integrator, in their Bid.
   e. Either the General Contractor or Electrician acting as a Subcontractor to the General Contractor will be allowed to include the control system improvements allowance in their bid.

2. The amount provided on the Bid form shall be included for the Control System Improvements as specified in the following Sections:
   a. Refer to the following Project Manual Sections for terms and conditions:
      1) Section 40 9000 – Process Integration
      2) Section 40 0000 – Integrator Coordination
      3) Section 40 9100 – Instrumentation and Control for Process Systems

PART 2 - PRODUCTS (NOT APPLICABLE TO THIS SECTION)
PART 3 - EXECUTION (NOT APPLICABLE TO THIS SECTION)

END OF SECTION 01 2100
SECTION 01 2300 –ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS
A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES
A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

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

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

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

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION
3.1 SCHEDULE OF ALTERNATES

A. Bid Alternate No. 1: Sludge Transfer Pumps, Sludge Recirculation Pumps and Additional Sludge Piping Replacement – All equipment, materials and work required for construction and installation of the alternate as shown on the Contract Drawings and as Specified in the Project Manual. The work shall include but not be limited to construction, furnishing and installing new sludge transfer pumps, new sludge recirculation pumps, and replacing additional piping and valves outside of the primary and secondary digester and all other items, work and equipment as shown on the project plans but not herein mentioned.

END OF SECTION 01 2300
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:

1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the Owner or Engineer.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: The Engineer will consider requests for substitution if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Engineer.

1. Submit an electronic request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
3. Statement indicating why specified product or fabrication or installation cannot be provided.
4. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
   a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
   b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties and specific features and requirements indicated. Indicate deviations, if any, from the work specified.
   c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
   d. Samples, where applicable or requested.
   e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
   f. Cost information, including a proposal of the net change, if any in the Contract Sum.
   g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
   h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

5. Engineer's Action: If necessary, the Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Engineer will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
   a. Use the product specified if the Engineer cannot make a decision on the use of a proposed substitute within the time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

   A. Conditions: The Engineer will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Engineer. If the following conditions are not satisfied, the Engineer will return the request without action except to record noncompliance with these requirements.
1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The specified product or method of construction cannot be provided within the Contract Time. The Engineer will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
5. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and the Engineer's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

END OF SECTION 01 2500
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SECTION 01 2600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Submittal Procedures" for requirements for the Contractor's Construction Schedule.
   2. Division 1 Section "Payment Procedures" for administrative procedures governing Applications for Payment.
   3. Division 1 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK
A. The Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time.

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

1. Proposal requests issued by the Engineer are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.

2. Within 20 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.
   a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   c. Include costs of labor and supervision directly attributable to the change.
   d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times,
and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Engineer.

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

C. Proposal Request Form: Use the Change Order, of these Specifications or a form approved by the Engineer or Owner.

1. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.

D. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.

1.5 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Proposal Request, the Engineer will issue a Change Order for signatures of the Owner and the Contractor on an approved form.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Engineer may issue a Construction Change Directive. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

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

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

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 2600
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SECTION 01 2900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contact, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

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

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

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

2. Submit the schedule of values to Engineer at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values correlated with each element.
B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Name of Engineer.
   c. Engineer's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
      1) Labor.
      2) Materials.
      3) Equipment.


4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

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

7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.

9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 MEASUREMENT AND PAYMENT

A. General: With the exception of lump sum items, all work completed and in general conformance with the Contract Document, as determined by the Engineer, shall be measured by the Engineer according to the United States standard measures. The method of measurement and computation to be used in determination of quantities of materials furnished and of work performed under this contract shall be those methods generally recognized as conforming to good engineering practices.

B. Lump sum items shall not be measured for payment. However, measurements may be made to monitor work progress.

C. The unit price bid shall be considered full compensation for furnishing all materials, labor and testing for performance and acceptance of each unit price item.

1. Overruns and Underruns: Contractor and Owner shall find no additional monetary relief other than bid unit prices for overruns or underruns not exceeding fifteen percent (15%) of original unit price bid quantities. Quantity overruns or underruns exceeding fifteen percent (15%) of original unit price bid quantities shall be subject to the provisions of the General Conditions. The Owner shall be entitled to any cost savings incurred as a result of overruns or underruns exceeding fifteen percent (15%) of the original unit price bid quantities. The "15% rule" does not apply to lump sum items.

2. Weighing of Materials: Materials which are measured or proportioned by weight shall be weighed on accurate, approved scales furnished by the Contractor at locations designated by the Engineer. The use of commercial scales may be permitted provided they are satisfactory to the Engineer and all charges for such use are paid by the Contractor.

a. Except as provided elsewhere in the Specifications, scales shall be accurate within one-half (1/2) percent at any point throughout the range of use of the scale and sensitive to the weight indicated by twice the smallest graduation of the scale.

b. The Contractor shall provide, and be responsible for, the verification by the State Scale Inspector, or by other feasible means as the Engineer may order, of scales and measures which the Contractor is to operate or use in connection with the work.

c. Platform scales shall be of adequate length and capacity to permit weighing the entire hauling unit with one (1) placement. In the case of tractor-trailer combinations, this will mean placement in one (1) operation of the entire unit inclusive of the front axle of the tractor. It will be permissible to weigh the primary hauling unit and the auxiliary hauling ("pup") unit separately without uncoupling, provided the scale approach ramps are level for a sufficient distance and the auxiliary hauling unit coupling does not transfer significant weight to the primary hauling unit.

d. Trucks used to haul material being paid for by weight shall be weighed empty at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

e. Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Engineer, provided the body is of such shape that the volume may be readily and accurately determined.

f. When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard or gallon may be weighed and such weights will be converted to cubic yards or gallons for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall
be agreed to by the Contractor before such method of measurement of pay quantities is used.
g. The term "ton" will mean the short ton consisting of two thousand (2000) pounds avoirdupois.
h. When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

1.6 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Owner, Engineer, Contractor and funding agency, where applicable, and paid for by Owner.

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

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

C. Application for Payment Forms: Use forms provided by in the Contract Documents for Applications for Payment. Sample copies are included in the Project Manual.

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

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
5. Progress payments on equipment installed shall not exceed 90% of aggregate contract price until approved Shop Drawings are received

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
2. Provide summary documentation for stored materials indicating the following:
   a. Materials previously stored and included in previous Applications for Payment.
   b. Work completed for this Application utilizing previously stored materials.
   c. Additional materials stored with this Application.
   d. Total materials remaining stored, including materials with this Application.
F. Transmittal: Submit required number of signed original copies of each Application for Payment to Engineer.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
   5. Products list (preliminary if not final).
   6. Schedule of unit prices.
   7. Submittal schedule (preliminary if not final).
   8. List of Contractor's staff assignments.
  12. Initial progress report.
  14. Certificates of insurance and insurance policies.
  15. Performance and payment bonds.
  16. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. Completed “Waiver and Release of Lien” form for each supplier, subcontractor and charge account related to the project.
   5. Evidence that claims have been settled.
   6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   7. Final liquidated damages settlement statement.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900
SECTION 01 3100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Administrative and supervisory personnel.
4. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Construction Progress Documentation" for progress meetings, coordination meetings, and pre-installation conferences.
2. Division 1 Section "Submittal Procedures" for preparing and submitting the Contractor's Construction Schedule.
3. Division 1 Section "Closeout Procedures" for coordinating contract closeout.

1.3 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.4 SUBMITTALS

A. CONSTRUCTION SCHEDULES
1. Within ten days after receipt of the Notice to Proceed, the Contractor shall submit to the Engineer a schedule showing the proposed progress of the construction. The schedule shall show the proposed starting and completion dates for the various stages of the construction and shall be prepared such that it can be used to plot actual progress against proposed progress. No progress payments will be made until the construction schedule is received.
2. Construction Sequence: The schedule shall be organized by Plan Area (excavation, piping, control structures, etc). The Contractor shall at a minimum address the following items:
   a. Primary Clarifier Equipment Replacement
   b. Primary Clarifier Construction
   c. UV Disinfection Construction
   d. Site Piping Installation
   e. Instrumentation and Controls Replacement

B. SUBCONTRACTORS AND SUPPLIERS
1. Within ten days after receipt of the Notice to Proceed, the Contractor shall submit to the Engineer a list, including names and addresses, of the subcontractors he proposes to use on the project and the suppliers of major equipment or material items

C. STAFF NAMES:
1. Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
2. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable)
PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Water or ice.
5. Solvents.
6. Chemicals.
7. Puncture.
8. Abrasion.
9. Heavy traffic.
10. Bacteria.
11. Rodent and insect infestation.
12. Misalignment.
13. Excessive weathering.
15. Improper shipping or handling.
16. Theft.
17. Vandalism.

3.3 CONSTRUCTION SEQUENCE

A. The Contractor shall provide the Owner and the Engineer with a written sequence and schedule for construction prior to commencing any work. The sequence and schedule shall indicate key tasks and establish estimated completion dates for the individual items of the project. The schedule submitted will be subject to review and approval by both the Owner and the Engineer. The key tasks shall be identified by the Contractor. The submittal information on the work schedule shall include a description of methods
proposed for completing the work. In addition, the description shall be complete with an estimate of the man-power and equipment proposed to complete the key tasks.

END OF SECTION 01 3100
SECTION 01 3119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including but not limited to, the following:
   1. Preconstruction conferences.
   2. Progress meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Submittal Procedures" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Engineer, but no later than fifteen (15) days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Engineer, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:
   1. Tentative construction schedule.
   2. Critical work sequencing.
   3. Designation of responsible personnel.
   4. Procedures for processing field decisions and Change Orders.
   5. Procedures for processing Applications for Payment.
   7. Submittal of Shop Drawings, Product Data, and Samples.
   8. Preparation of record documents.
   9. Use of the premises.
   11. Office, work, and storage areas.
   12. Equipment deliveries and priorities.
   13. Safety procedures.
14. First aid.
17. Working hours.

1.4 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site as needed. Notify the Owner and the Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Engineer, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead, or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:
   a. Interface requirements.
   b. Time.
   c. Sequences.
   d. Status of submittals.
   e. Deliveries.
   f. Off-site fabrication problems.
   g. Access.
   h. Site utilization.
   i. Temporary facilities and services.
   j. Hours of work.
   k. Hazards and risks.
   l. Housekeeping.
   m. Quality and work standards.
   n. Change Orders.
   o. Documentation of information for payment requests.

D. Reporting: No later than three (3) days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Progress meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittal Procedures" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Funding Agencies, Owner and the Engineer, but no later than fifteen (15) days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Engineer, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
7. Submittal of Shop Drawings, Product Data, and Samples.
8. Preparation of record documents.
9. Use of the premises.
11. Office, work, and storage areas.
12. Equipment deliveries and priorities.
13. Safety procedures.
14. First aid.
17. Working hours.

1.4 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site at regular intervals. Notify the Owner and the Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Engineer, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead, or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:
   a. Interface requirements.
   b. Time.
   c. Sequences.
   d. Status of submittals.
   e. Deliveries.
   f. Off-site fabrication problems.
   g. Access.
   h. Site utilization.
   i. Temporary facilities and services.
   j. Hours of work.
   k. Hazards and risks.
   l. Housekeeping.
   m. Quality and work standards.
   n. Change Orders.
   o. Documentation of information for payment requests.

D. Reporting: No later than three (3) days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION 01 3200
SECTION 01 3300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including, General and Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and submittals.

   1. Product Substitutions
   2. Contractor's construction schedule.
   3. Submittal schedule.
   4. Shop Drawings.
   5. Product Data.
   6. Samples.
   7. Inspection and test reports are included in Section "Quality Control Services."

B. Related Sections include the following:

   1. Division 1 Section “General Requirements” and appendices in this section for specific submittal requirements.
   2. Division 1 Section “Project Meetings” for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Engineer’s responsive action.

B. Informational Submittals: Written information that does not require Engineer’s responsive action. Submittals may be rejected for not complying with requirements.

1.4 ELECTRONIC SUBMITTAL PROCEDURES

A. Summary

   1. Shop drawing and product data submittals shall be transmitted to the Engineer in electronic (PDF) format.
   2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow and decreasing turnaround time.
   3. The electronic submittal process is not intended for the following:

      a. Color samples, color charts, and physical material samples.
B. Procedures:

1. Submittal Preparation:
   a. Subcontractors and Suppliers provide electronic (PDF) submittals to General Contractor via email.

2. General Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer/product, dimensions, and coordination of information with other parts of the work.

3. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the General Contractor.

4. Submit electronic copies on a CD of reviewed submittals at project closeout for record purposes in accordance with Section 017700 “Closeout Procedures”.

C. Costs:

1. Internet Service and Equipment Requirements:
   a. Email address and internet access at General Contractor’s office.
   b. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

D. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Engineer for Contractor’s use in preparing submittals.

E. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

   a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

F. Submittals Schedule: Comply with requirements in Division 1 Section “Project Meetings” for list of submittals and time requirements for scheduled performance of related construction activities.

G. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Engineer receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

   1. Initial Review: Allow two (2) weeks for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Re-submittal Review: Allow two (2) weeks for review of each re-submittal.
   4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
H. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block. Provide a space approximately on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken by the Engineer.

2. Include the following information on label for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name and address of Contractor.
   e. Name and address of Subcontractor.
   f. Name and address of Supplier.
   g. Name of Manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Other necessary identification.

I. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

J. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

K. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Use Contractor’s Standard form. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variation and limitations. Include Contractor's certification that information complies with Contract Document requirements.

2. Transmittal Form: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To :).
   d. Source (From :).
   e. Names of Subcontractor, Manufacturer, and Supplier.
   f. Category and type of submittal.
   g. Submittal purpose and description.
   h. Specification Section number of title.
   i. Drawing number and detail references, as appropriate.
   j. Transmittal number.
   k. Submittal and transmittal distribution record.
   l. Remarks.
   m. Signature of transmitter.

L. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
M. Distribution: Furnish copies of final submittals to Manufacturers, Subcontractors, Suppliers, Fabricators, Installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

N. Use of Construction: Use only final submittals with transmittal indicating approval notation from Engineer.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. Whenever in the Drawings or Specifications any material or process is indicated or specified by patent or proprietary name and/or by name of manufacturer, such Specifications shall be deemed to be used for the purpose of facilitating description of the material and/or process desired and shall be deemed to be followed by the words "or Engineer approved equivalent", and the Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if the material, process, or article offered by the Contractor is not, in the opinion of the Engineer, equal in every respect, then the Contractor must furnish the material, process, or article specified or one that, in the opinion of the Engineer, is equal thereof in every respect.

B. Prior Approval: The items of materials and/or equipment listed herein must receive approval ten (10) days prior to bidding if it is intended to furnish products other than those specified. The requirements for obtaining such approval are specified in the Instructions to Bidders. Submittals for prior approval shall include shop drawings and/or samples as required by these Specifications. The shop drawings shall be complete, including drawings, diagrams, illustrations, performance charts, brochures, or other data necessary to demonstrate compliance of the item with the requirements of the Specifications. Samples shall represent the actual material or item to be furnished and shall include such necessary certification or documentation as to fully demonstrate compliance with the Specifications. Approval for equivalent products for items not listed herein will be given after the time of award of the Contract.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 30 days of the date established for "Commencement of the Work".

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
2. Within each time bar indicate estimated completion percentage in ten (10) percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion.
B. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

C. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

D. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

E. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

F. Comply with other requirements specified in Division 1 Section "Project Meetings" for Construction Manager's action.

2.3 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within ten (10) days of the date required for establishment of the Contractor's construction schedule.

1. Coordinate submittal schedule with the list of subcontracts, schedule of values, and the list of products as well as the Contractor's construction schedule.

2. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:

   a. Scheduled date for the first submittal.
   b. Related Section number.
   c. Submittal category.
   d. Name of subcontractor.
   e. Description of the part of the work covered.
   f. Scheduled date for resubmittal.
   g. Scheduled date the Engineer's final release or approval.

B. Distribution: Following response to initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

D. Comply with requirements specified in Division 1 Section "Project Meetings."
2.4 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Submit electronic submittals directly to Engineer.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Standard color charts.
   e. Manufacturer's catalog cuts.
   f. Wiring diagrams showing factory-installed wiring.
   g. Printed performance curves.
   h. Operational range diagrams.
   i. Mill reports.
   j. Standard product operation and maintenance manuals.
   k. Compliance with specified referenced standards.
   l. Testing by recognized testing agency.
   m. Application of testing agency labels and seals.
   n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Templates and patterns.
   h. Schedules.
   i. Design calculations.
   j. Compliance with specified standards.
   k. Notation of coordination requirements.
   l. Notation of dimensions established by field measurement.
   m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1050 mm).

3. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

   a. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

4. Items Requiring Shop Drawing Submittals is listed in the appendices of Division 1 Section “General Requirements.”

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed. Copies of the transmittal letters and Contractor’s review sheets shall be submitted electronically (through the shop drawing process) to assist in keeping records of what was submitted, the action taken, and when it was returned. The action taken and any review comments will be included on the Contractor’s review sheet and returned to the General Contractor electronically. One sample will be retained by the Engineer and any additional samples will be returned to the Contractor.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of appropriate Specification Section.
   e. Compliance with recognized standards.
   f. Availability and delivery time.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner’s property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical
with material or product proposed for use, and that show full range of color and texture variations expected.
a. Samples include, but are not limited to, the following:

1) partial sections of manufactured or fabricated components;
2) small cuts or containers of materials;
3) complete units of repetitively used materials;
4) swatches showing color, texture, and pattern;
5) color range sets; and
6) components used for independent testing and inspection.

b. Number of Samples: Submit two (2) sets of Samples. Engineer will retain one Sample set; remainder will be returned.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Application for Payment: Comply with requirements specified in Division 1 Section "General Requirements."

F. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design, Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Number of Copies: Submit one (1) electronic PDF copy of subcontractor list.

2.5 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer’s installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as “Shop Drawings.”

1. Mark each copy to show applicable choices and options. Where printed Product Data include information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

   a. Manufacturer’s printed recommendations.
   b. Compliance with recognized trade association standards.
   c. Compliance with recognized testing agency standards.
   d. Application of testing agency labels and seals.
   e. Notation of dimensions verified by field measurement.
   f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirement of the Contract Documents has been confirmed.
1. Submittals: Submit electronic submittals directly to Engineer.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may
      serve as the final submittal.

2. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers,
   manufacturers, fabricators, and other required for performance of construction activities. Show
   distribution on transmittal forms.
   a. Field Samples specified in individual Sections are special types of Samples. Field Samples
      are full-size examples erected on site to illustrate finishes, coatings, or finish materials and
      to establish the standard by which the work will be judged.

      1) Comply with submittal requirements to the fullest extent possible. Process
         transmittal forms to provide a record of activity.

2.6 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Certificates and Certifications: Provide a notarized statement that includes signature of entity
      responsible for preparing certification. Certificates and certifications shall be signed by an officer
      or other individual authorized to sign documents on behalf of that entity.
   2. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "General
      Requirements."

B. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Project
   Meetings."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or
   person. Include lists of completed projects with project names and addresses, names and addresses of
   Engineers and Owners, and other information specified.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with
   requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and
   Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer
   complies with requirements in the Contract Documents and, where required, is authorized by
   manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that
   manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing
   experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product
   complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that product
   complies with requirements in the Contract Documents.
I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "General Requirements."

L. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

2.7 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR’S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
3.2 ENGINEER’S ACTION

A. General: Engineer will not review submittals that do not bear Contractor’s approval stamp and will return them without action.

B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will return each submittal with a transmittal marked appropriately to indicate action taken, as follows:

1. A – Reviewed, No Exception Taken: Signifies equipment or material represented by the submittal conforms with the design concept and complies with the intent of the Contract Documents and can be incorporated into the Work. Contractor is to proceed with fabrication or procurement of the items and with related Work.

2. B – Reviewed, Make Corrections Noted: Signifies equipment or materials represented by the submittal conforms with the design concept and complies with the intent of the Contract Documents and can be incorporated into the Work in accordance with the Engineer's notations. Contractor is to proceed with the Work in accordance with the Engineer's notations and is to submit a revised submittal responsive to notations marked on the returned submittal or written in the letter of transmittal.

3. C – Reviewed, Exceptions Noted, Revise and Resubmit: Signifies equipment or material represented by the submittal does not conform with the design concept or comply with the intent of the Contract Documents and cannot be incorporated into the Work. Contractor is to submit compliance submittals responsive to the Contractor Documents.

4. D – “Submit Specified Item”: Signifies submittals of such preliminary nature that a determination of conformance with the design concept or compliance with the intent of the Contract Documents must be deferred until additional information is furnished. Contractor is to submit such additional information to permit layout and related activities to proceed.

5. E – Engineer’s Review Not Required, For Reference Only: Signifies submittals which are for supplementary information only; pamphlets, general information sheets, catalog cuts, standard sheets, bulletins, and similar data, all of which are useful to Engineer and Owner in design, operation, or maintenance, but which by their nature do not constitute a basis for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Documents. The Engineer reviews such submittals for general content, but not for substance.

6. F - Engineer’s Review Not Required, Distribution Copy: Signifies submittals which have been previously reviewed and are being distributed to Contractor, Owner, Resident Project Representative, and others for coordination and construction purposes.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 3300
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Engineer, requested by the Engineer, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of authorities having jurisdiction.

2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on CSI's 16-Division format and Master Format's numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

   a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer to the Engineer before proceeding for a decision on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.

   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.
D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in the Contact Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

AASHTO American Association of State Highway and Transportation Officials
444 North Capitol St., Suite 249
Washington, DC 20001 (202) 624-5800

ACI American Concrete Institute
P.O. Box 19150
Detroit, MI 48219 (313) 532-2600

AI Asphalt Institute
Research Park Dr.
P.O. Box 14052
Lexington, KY 40512-4052 (606) 288-4960

AIA The American Institute of Architects
1735 New York Ave., NW
Washington, DC 20006 (202) 626-7300

AISC American Institute of Steel Construction
One East Wacker Dr., Suite 3100
Chicago, IL 60601-2001 (312) 670-2400

ANSI American National Standards Institute
11 West 42nd St., 13th Floor
New York, NY 10036 (212) 642-4900

ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103-1187 (215) 299-5400

AWWA American Water Works Assoc.
6666 W. Quincy Ave.
Denver, CO 80235 (303) 794-7711

CRSI Concrete Reinforcing Steel Institute
933 N. Plum Grove Rd.
Schaumburg, IL 60173 (708) 517-1200
DIPRA  Ductile Iron Pipe Research Assoc.
        245 Riverchase Parkway East, Suite O
        Birmingham, AL 35244
        (205) 988-9870

NCSPA  National Corrugated Steel Pipe
        Association
        1255 23rd St., NW, Suite 850
        Washington, DC 20037
        (202) 452-1700

NEC    National Electrical Code (from NFPA)
        P.O. Box 9101
        Quincy, MA 02269-9101

NSF    National Sanitation Foundation
        3475 Plymouth Rd.
        P.O. Box 130140
        Ann Arbor, MI 48113-0140
        (313) 769-8010

PCA    Portland Cement Assoc.
        5420 Old Orchard Rd.
        Skokie, IL 60077
        (708) 966-6200

PCI    Precast/Prestressed Concrete Institute
        175 W. Jackson Blvd.
        Chicago, IL 60604
        (312) 786-0300

UL     Underwriters Laboratories
        333 Pfingsten Rd.
        Northbrook, IL 60062
        (708) 272-8800

UNI    Uni-Bel PVC Pipe Assoc.
        2655 Villa Creek Dr., Suite 155
        Dallas, TX 75234
        (214) 243-3902

F. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CE     Corps of Engineers
        (U.S. Department of the Army)
        Chief of Engineers - Referral
        Washington, DC 20314
        (202) 272-0660

CFR    Code of Federal Regulations
        (Available from the Government Printing Office)
        N. Capitol St. between G and H St., NW
        Washington, DC 20402
        (202) 783-3238
        (Material is usually first published in the "Federal Register")
<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
<th>Address</th>
<th>Phone Number</th>
</tr>
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<tr>
<td>CPSC</td>
<td>Consumer Product Safety Commission</td>
<td>5401 Westbard Ave. Bethesda, MD 20207</td>
<td>(800) 638-2772</td>
</tr>
<tr>
<td>CS</td>
<td>Commercial Standard</td>
<td>(U.S. Department of Commerce)</td>
<td>(202) 783-3238</td>
</tr>
<tr>
<td>DOC</td>
<td>Department of Commerce</td>
<td>14th St. and Constitution Ave., NW Washington, DC 20230</td>
<td>(202) 482-2000</td>
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<tr>
<td>DOT</td>
<td>Department of Transportation</td>
<td>400 Seventh St., SW Washington, DC 20590</td>
<td>(202) 366-4000</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
<td>401 M St., SW Washington, DC 20460</td>
<td>(202) 382-2090</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
<td>800 Independence Ave., SW Washington, DC 20590</td>
<td>(202) 366-4000</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission</td>
<td>1919 M St., NW Washington, DC 20554</td>
<td>(202) 632-7000</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
<td>5600 Fishers Lane Rockville, MD 20857</td>
<td>(301) 443-1544</td>
</tr>
<tr>
<td>FHA</td>
<td>Federal Housing Administration</td>
<td>451 Seventh St., SW Washington, DC 20201</td>
<td>(202) 708-1422</td>
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<tr>
<td>FS</td>
<td>Federal Specification (from GSA)</td>
<td>Specifications Unit (WFSIS) 7th and D St., SW Washington, DC 20407</td>
<td>(202) 708-9205</td>
</tr>
<tr>
<td>GSA</td>
<td>General Services Administration</td>
<td>F St. and 18th St., NW Washington, DC 20405</td>
<td>(202) 708-5082</td>
</tr>
</tbody>
</table>
1.5 SUBMITTALS

A. Permits, Licenses, and Certificates:  For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.
PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 4200
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 TEMPORARY FACILITIES AND TRAFFIC CONTROLS.

A. Construction Area: The Contractor shall limit his construction operations to the areas indicated on the Drawings as construction areas. This shall include the operation and storage of equipment and the storage of materials for use on the project. The construction areas shall be maintained in a neat and orderly condition at all times.

B. Security: The Contractor shall provide security as required at the site. It shall be the Contractor's responsibility to provide such additional security as may be required to protect the construction and any materials and/or equipment stored on the site.

C. Access Roads: Access roads within the project area shall be kept open and maintained in a passable condition at all times.

D. Barricades and Warning Signs: The Contractor shall provide, erect, and maintain necessary barricades, suitable and sufficient lights, danger signals, signs and traffic control devices. The Contractor shall take all necessary precautions for the protection of the work and safety of the public. Highways and streets closed to traffic shall be protected by barricades. Obstructions shall be illuminated during hours of darkness. Warning signs shall be provided to control and direct traffic.

1. The Contractor shall erect warning signs in advance of the project where operations may interfere with the use of the road by traffic, and at intermediate points where the new work crosses or coincides with an existing road.

2. All traffic control devices and methods shall conform with the Manual on Uniform Traffic Control Devices for Streets and Highways issued by the United States Department of Transportation and adopted by the South Dakota Department of Transportation.

3. The work specified in the foregoing shall be incidental to other items of the Contract. No separate measurement or payment will be made for traffic control.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead or underground, unless otherwise indicated.
2. Connect temporary service to Owner's existing power source, as directed by Owner.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

END OF SECTION 01 5000
SECTION 01 6000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Storage and Protection: The Contractor shall, at all times, carefully and properly protect all materials and equipment, both before and after being used on the job, and all work performed by him, and provide any special protection from weather deemed necessary without additional cost to the Owner. The Contractor shall coordinate with the Engineer for designating storage areas and for the requirements for storage and protection.

C. Material Sources: It shall be the responsibility of the Contractor to locate sources for all materials specified herein and for any other material or item required to produce or complete the materials and/or work specified. The Contractor shall bear all costs in connection with acquisition, transportation, preparation, fabrication and/or installation of the material or item in the final work.

D. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

E. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.
1.3 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

END OF SECTION 01 6000
SECTION 01 7113 – MOBILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This item shall consist of preparatory work and operations, including, but not limited to the necessary movement of personnel, equipment, and incidentals to the project site; for the establishment of offices, buildings and other facilities necessary for work on the project; and for work and operations which must be performed, and for cost incurred before starting work on the various contract items on the project site.

1.3 STANDARD SPECIFICATIONS REFERENCE

A. The work to be performed under this Contract shall be governed by the South Dakota Department of Transportation “Standard Specifications for Roads and Bridges”, current Edition, which specifications shall apply as though printed in full with these Contract Documents.

B. Any reference to State, State of South Dakota, or Department of Transportation with regard to work or services to be completed or furnished shall be taken to mean the City of Vermillion, SD herein referred to as Owner, for purposes of this project.

C. Any reference to the Engineer shall mean the firm of Banner Assoc. Inc., Consulting Engineers, Brookings, South Dakota, for the purpose of this project.

PART 2 - BASIS OF PAYMENT

2.1 Payment shall be made at the Contract Lump sum price for “Mobilization”, as stipulated in the Bid, which price and payment shall be considered full compensation for all mobilization and/or re-mobilization costs. Partial payments for mobilization shall be made in accordance with SDDOT Standard Specifications for Roads and Bridges, current Edition, Section 9.10 – Mobilization.

END OF SECTION 01 7113
SECTION 01 7300 –EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 QUALITY ASSURANCE

A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.


3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet (2.4m) in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements Specification.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.
C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 7300
SECTION 01 7329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Divisions 02 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: When cutting and patching structural elements, notify Engineer of locations and details of cutting and await directions from the Engineer before proceeding. Shore, brace, and support structural element during cutting and patching. Do no cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
   1. Primary operational systems and equipment.
   2. Existing utilities.
   3. Communication systems.
   4. Existing piping systems.
   5. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Engineer for the functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.


2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "General Requirements."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Surfaces: Restore exposed surfaces of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 7329
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SECTION 01 7700 –CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 1 through 33.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. The dual-fuel boiler and heat exchanger shall be fully operational and be able to be used by the Owner. This shall include installation of the associated biogas and hot water piping, valves and appurtenances, as well as mechanical, electrical, and controls equipment.
2. Drain and clean the primary and secondary anaerobic digesters. Replace the sludge piping and valve identified for replacement, penetrating the digester walls.
3. If Bid Alternative No. 1 was awarded:
   a. The sludge recirculation pumps and sludge transfer pumps shall be fully operational and be able to be used by the Owner. This shall include installation of the associated piping, valves and appurtenances, as well as electrical and controls equipment.
   b. Replace the sludge piping and valves identified for replacement with Bid Alternative No. 1.
4. The Contractor shall list the work necessary for final completion

B. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in utilities.
12. Complete final cleaning requirements, including touchup painting.
13. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

C. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 FINAL ACCEPTANCE

A. At such time as all items of the work, including clean-up of the work, are acceptable to the Engineer and the Owner, the Contractor shall be so notified in writing and the period of posting and publication prior to final payment shall begin.

B. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.
4. Submit consent of surety to final payment.
5. Submit a final liquidated damages settlement statement.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

C. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfulfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
D. Reinspection Procedure: The Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.

1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Local manufacturer’s representative address and phone number.
3. Spare parts list.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
5. Safety procedures.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. Upon completion of the work, the Contractor shall clean up the construction site and all of the facilities constructed thereon in such a manner that the site and facilities will be acceptable to the Owner for placing the work in service. The clean-up shall include the removal of all debris and matter not intended to be left on the site or in or around the site facilities. All areas and facilities shall be thoroughly cleaned and all work specified shall be completed prior to final acceptance of the project.


1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, control structures, and similar spaces.

h. Remove labels that are not permanent.

i. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

j. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

k. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

l. Leave Project clean and ready for occupancy.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

E. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01 7700
SECTION 01 7750 – WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittal Procedures" specifies procedures for submitting warranties.
2. Division 1 Section "Closeout Procedures" specifies contract closeout procedures.
3. Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

A. All work under this Contract will have a normal one year warranty after the date of final acceptance by the Owner.

B. During the warranty period, the Contractor shall be responsible for all repairs arising out of defective workmanship or materials, or both, which in the judgment of the Owner, shall become necessary during such period. If, within ten days after the mailing of a notice in writing to the Contractor or his agent, the said Contractor shall neglect to make, or undertake with due diligence, to make the aforesaid repairs, the Owner is hereby authorized to make such repairs at the Contractor's expense; providing however, that in case of an emergency where, in the judgment of the Owner, delay would cause serious loss or damage, repairs may be made without notice being sent to the Contractor and the Contractor shall pay the cost thereof. The terms of the Contract shall not be deemed to be completed until such time that the warranty period has ended and any remedial action required by the warranty has been performed by the Contractor. The Contractor's performance and payment bond shall remain in full force until such completion of the Contract.

C. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
D. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

E. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work during the first year regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

F. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

   1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

G. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

A. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.

   1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Engineer, for approval prior to final execution.

   1. Refer to Divisions 2 through 44 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.

   1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.

3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 7750
SECTION 01 7823 –OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in Specification Section 01 3300 “Submittal Procedures” and this section to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
B. Format: Submit operations and maintenance manuals in the following format:
   1. Initial Manual Submittal: Submit draft copy of each manual at least 60 days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 days before commencing demonstration and training. Engineer will return copy with comments.
   1. Correct or revise each manual to comply with Engineer’s comments. Submit copies of each corrected manual within 15 days of receipt of Engineer’s comments and prior to commencing demonstration and training.

1.6 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR OPERATION AND MAINTENANCE AND EMERGENCY MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Initial Manual Submittal:
1. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type.
   b. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in Table of Contents. Group documents for each system and subsystem into individual composite files, then create composite manual so that resulting bookmarks reflect the system, subsystem and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
   c. Submit draft copies of each manual at least 60 days before requesting inspection of Substantial Completion.

F. Final Manual Submittal:
1. The Contractor shall provide Final manuals in the form of Electronic Files and Two (2) Paper Copies as described below.
   b. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in Table of Contents. Group documents for each system and subsystem into individual composite files, then create composite manual so that resulting bookmarks reflect the system, subsystem and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
   a. Binders: Heavy Duty, three ring, vinyl covered, loose leaf binders, in thickness necessary to accommodate contents, sized to hold 8 ½ by 11 inch paper, with clear plastic sleeve on
spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets
1) If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross reference other binders if necessary to provide essential information for proper operation and maintenance of equipment of system.
2) Identify each binder on front and spine, with printed titles “OPERATION AND MAINTENANCE MANUAL,” Project title or name and subject matter of contents and indicated Specification Section number on bottom of spine. Indicate volume number for multiple volume sets.

b. Dividers: Heavy paper dividers with plastic covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross reference to Specification section number and title of Project Manual.

c. Subparagraph below provides protection for troubleshooting software diskettes used in some operation systems. Delete requirements if unnecessary.

d. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

e. Requirements in two subparagraphs and associated subparagraphs below are normal. Insert unique requirements, such as special paper or plastic lamination of important items for permanent preservation, if needed.

f. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.

g. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
1) If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
2) Avoid placing loose, oversize drawings in binder pockets. Use reduced drawings or place folded drawings in labeled envelopes bound in manual.

h. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
5. Power failure.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 7823
SECTION 01 7839 –PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order.
   k. Changes made following Engineer’s written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.

2. Consult Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

3. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Engineer.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer’s reference during normal working hours.

END OF SECTION 01 7839
SECTION 07 5323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Adhered EPDM membrane roofing system.
   2. Vapor retarder.
   3. Roof insulation.

B. Related Sections:
   1. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counter flashings.
   2. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

1. Corner Uplift Pressure: Uplift pressures resulting from a wind speed of 90 mph.
2. Perimeter Uplift Pressure: Uplift pressures resulting from a wind speed of 90 mph.
1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For adhesives and sealants, including printed statement of VOC content.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   1. Base flashings and membrane terminations.
   2. Preformed saddles, crickets and tapers, including slopes.
   3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Qualification Data: For qualified Installer and manufacturer.

D. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of complying with performance requirements.

E. Maintenance Data: For membrane roofing system to include in maintenance manuals.

F. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

B. Source Limitations: Obtain all components for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, and other components of membrane roofing system.
2. Warranty shall include wind speeds up to 90 mph.
3. Warranty Period: 20 years from date of Substantial Completion.

B. Roofing Installer’s Warranty

1. Complete warranty in Paragraph 3.10 upon completion of installing roof system.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EPDM MEMBRANE ROOFING

A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.

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. Carlisle SynTec Incorporated.
   b. Firestone Building Products.
   c. GenFlex Roofing Systems.
   d. Versico Incorporated.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Black.
2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Plastic Foam Adhesives: 50 g/L.
   b. Multipurpose Construction Adhesives: 70 g/L.
   c. Contact Adhesive: 80 g/L.
   d. Single-Ply Roof Membrane Sealants: 450 g/L.
   e. Nonmembrane Roof Sealants: 300 g/L.
   f. Sealant Primers for Nonporous Substrates: 250 g/L.
   g. Sealant Primers for Porous Substrates: 775 g/L.
   h. Other Adhesives and Sealants: 250 g/L.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Seaming Material: Single-component, butyl splicing adhesive and splice cleaner Manufacturer's standard, synthetic-rubber polymer primer and 3-inch- (75-mm-) wide minimum, butyl splice tape with release film.

E. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

J. Deck Primer: Manufacturer’s recommended primer for substrates to gain better adhesion for vapor retarder.
   1. Firestone Building Products, SA Primer.
   2. Or approved equal.

2.3 VAPOR RETARDER

A. Reinforced Vapor Retarder over concrete deck: Complying with ASTM D 5147 and ASTM 1970. Include manufacturer’s recommended adhesive or pressure sensitive tape.
1. Vapor retarder consists of a Styrene-Butadiene-styrene (SBS) self-adhesive rubber modified asphalt reinforced with a strong glass fiber mat and coated with a fine mineral release film on bottom surface.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Firestone Building Products Company, MB Base Sa
   b. Or approved equal.

2.4 SUBSTRATE BOARDS
   A. Substrate Board: ASTM C1177/C1177M, glass mat, water resistant gypsum substrate, ½ inch thick.
   B. Substrate Board is only necessary if, it is required by the manufacturer to provide the specified warranty.

2.5 ROOF INSULATION
   A. General: Preformed roof insulation boards manufactured or approved by EPDM membrane roofing manufacturer, of thicknesses indicated. Provide products that have been tested and approved by ICC International Building Code for use on metal decks without thermal barrier.
   B. Insulation: Provide the following:
      1. Polysiocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3 (25 psi), felt or glass-fiber mat facer on both major surfaces.
      2. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope ¼-inch per 12-inches.
      3. Provide pre-formed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slope ½-inch per 12-inches.

2.6 INSULATION ACCESSORIES
   A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
   B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
   C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
   D. Cover Board: Refer to Paragraph 2.4 for Substrate Board.
2.7 WALKWAYS

A. Flexible Walkways: Factory formed, non porous, heavy duty, solid rubber, slip-resisting, surface textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 VAPOR-RETARDER INSTALLATION

A. Reinforced Vapor Retarder:

1. Install over primed concrete decking as applicable using self-adhering SBS modified Bitumen.
2. Cut around roof penetrations and seal vapor tight.
3. Extend vapor retarder up face of parapet wall over top of wood blocking securely adhering to wood blocking.
4. Lap side joints minimum 4 IN, lap end joints minimum of 6 IN and seal all laps with adhesive then tape raw edge of lap.
5. Repair all damage, tears, holes, and nicks in accordance with vapor retarder manufacturer’s recommendations.
   a. Verify compatibility of adhesive with vapor retarder patching method and materials.
6. Do not piece vapor retarder together using scraps.

3.4 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Trim surface of insulation where necessary at roof drains/scuppers so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
   2. Insulations shall resist uplift pressures at corners, perimeter and field of Roof.

3.5 ADHERED MEMBRANE ROOFING INSTALLATION

A. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

D. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure
a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

F. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

G. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer’s written instructions.

3.8 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner.>
2. Address: <Insert address.>
3. Building Name/Type: <Insert information.>
4. Address: <Insert address.>
5. Area of Work: <Insert information.>
6. Acceptance Date: <Insert date.>
7. Warranty Period: <Insert time.>
8. Expiration Date: <Insert date.>

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. Lightning;
   b. Peak gust wind speed exceeding 90 mph (m/sec);
   c. Fire;
   d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. Vapor condensation on bottom of roofing; and
   g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not
become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

END OF SECTION 07 5323
SECTION 07 9200 – JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   b. Joints between plant-precast structural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints between different materials listed above.
   e. Perimeter joints between materials listed above and frames of doors and wall penetrations.
   f. Other joints as indicated.

2. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior and interior openings where indicated.
   c. Vertical joints on exposed surfaces of interior unit masonry concrete and walls.
   d. Joints on underside of plant-precast structural concrete beams and planks.
   e. Other joints as indicated.

3. Interior joints in the following horizontal traffic surfaces:
   b. Other joints as indicated.

B. Related Sections include the following:

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
1.4 SUBMITTALS
   A. Product Data: For each joint-sealant product indicated.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
   B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PROJECT CONDITIONS
   A. Do not proceed with installation of joint sealants under the following conditions:
      1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
      2. When joint substrates are wet.
      3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
      4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL
   A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
   B. Colors of Exposed Joint Sealants: As selected from manufacturer's full line of colors.

2.3 ELASTOMERIC JOINT SEALANTS
   A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   B. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to
ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
   1. Products:
      a. Pecora Corporation; 898.
      b. Tremco; Tremsil 600 White.
   2. Type and Grade: S (single component) and NS (nonsag).
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Joints where plumbing fixtures abut ceramic tile or plastic laminate.

D. Multicomponent Nonsag Immersible Urethane Sealant:
   1. Products:
      a. Pacific Polymers, Inc.; Elasto-Thane 227 R Type II (Gun Grade).
      b. Pecora Corporation; Dynatred.
      c. Tremco; Vulkem 227.
      d. Tremco; Vulkem 322 DS.
   2. Type and Grade: M (multicomponent) and NS (nonsag).
   4. Uses Related to Exposure: T (traffic) and NT (nontraffic) and I (immersible), Class 1.
   5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Concrete, precast, unit masonry, color anodic aluminum, aluminum coated with a high performance coating, galvanized steel.

E. Single-Component Nonsag Urethane Sealant:
   1. Products:
      b. Sika Corporation, Inc.; Sikaflex - 15LM.
      c. Sonneborn, Division of ChemRex Inc.; Ultra.
      d. Sonneborn, Division of ChemRex Inc.; NP 1.
      e. Tremco; Vulkem 116.
   2. Type and Grade: S (single component) and NS (nonsag).
   4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Precast, masonry, steel, and window and door frame perimeters.

Type S, Grade P, Class 50, Use T,M,A,O and I (class 2).

1. Products: Subject to compliance with requirements, provide the following or an approved equal:
   a. Tremco Incorporated; Vulkem 45SSL.

2. This product is to applied in control joint around caisson, refer to drawings for location.

2.4 SOLVENT-RELEASE JOINT SEALANTS

A. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.

1. Products:
   a. Bostik Findley; Bostik 300.
   b. Fuller, H. B. Company; SC-0296.
   c. Fuller, H. B. Company; SC-0288.
   d. Pecora Corporation; BC-158.
   e. Polymeric Systems Inc.; PSI-301
   f. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
   g. Tremco; Tremco Butyl Sealant.

2.5 NSF APPROVED SEALANT

A. Provide NSF certified sealants where required to be in contact or immersed in potable water.

2.6 HIGH TEMPERATURE SEALANT

A. Provide high temp sealant where required to be in contact with substrates that exceed standard ambient temperatures.

1. Products:
   a. Sika: Sikasil – GP / HT Red
   b. Or approved equal.

2.7 PREFORMED JOINT SEALANTS

A. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in precompressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer; and complies with the following:

1. Products:
   a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
   b. Illbruck Sealant Systems, Inc.; Wilseal 600.
   c. Polytite Manufacturing Corporation; Polytite B.
2. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.

   a. Density: Manufacturer's standard.

2.8 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field application of high-performance coating systems to items and surfaces scheduled.

B. Related Sections include the following

1. Division 5: Pipe and Tube Railings
2. Division 7: Joint Sealants
3. Division 44: Process Equipment

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D 16 apply to this Section.

B. Coating Inspector: Owner’s coating observer on site. Coating Inspector may or may not be the same as the Resident Project Representative. Coating Inspector has no formal inspection responsibilities (i.e. approving or rejecting surface preparation). Coating Inspector’s role is to observe and document observations. Coating Inspector will inform Applicator of areas that, in the Coating Inspector’s professional opinion, do not meet the intent of the specification.

C. Immersed Surface: Any surface that will be submerged in a tank. Submerging level shall be considered 1 foot above the overflow elevation of the tank.

1. Any surface that will see condensation on the surface over the majority of its life shall be considered an immersed surface. All piping (excluding air piping) shall be considered immersed.

D. Atmospheric Surface: Any surface that is not considered immersed.

1.4 SUBMITTALS

A. Applicator experience qualifications.

1. No product information will be reviewed until Engineer has received and approved applicator qualifications.

2. Include all information required in Paragraph 1.4A “Quality Assurance” of this Section.


4. Applicator Training and Product Certification Records

B. Product Data: For each coating system indicated.
1. An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   a. Acknowledgement that products submitted meet requirements of standards referenced.
   b. Manufacturer's surface preparation instructions.
   c. Manufacturer's application instructions.
   d. If products being used are manufactured by Company other than listed, provide complete individual data sheet comparison of proposed products with specified products including application procedure, coverage rates and verification that product is designed for intended use.
   e. Contractor's written plan of action for containing airborne particles created by blasting operation and location of disposal of spent contaminated blasting media.
   f. Coating manufacturer's recommendation on abrasive blasting.
   g. Manufacturer's recommendation for universal barrier coat.

2. Manufacturer's statement regarding applicator instruction on product use.

3. Certification that coating systems proposed as Substitutions have been reviewed and approved by Senior Corrosion Specification Specialist employed by the coating manufacturer.

C. Coating Schedule:

1. Provide a schedule including all surfaces to be coated. Schedule shall include the following:
   a. Surface identification.
   b. Specified coating system number.
   c. Surface preparation.
   d. For each coat:
      1) Product name.
      2) Color.
      3) Coating thickness.
   e. Note any deviations from the specification.

D. Miscellaneous Submittals:

1. Applicator's daily records:
   a. Submit daily records at end of each week in which coating work is performed unless requested otherwise by Engineer's on-site representative.
   b. All records shall be submitted through a computer-generated form.

2. Product Coating Submittal Information Form
   a. Form is included at the end of the Section.
   b. Form shall be submitted with all products that have shop applied coatings.

E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. After color selection, Architect will furnish color chips for surfaces to be coated.
1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.

1. Applicator shall furnish, to the Engineer, a letter from all selected coating manufacturer(s), stating that they have been trained in the proper preparation mixing, thinning, and application of the high-performance coating system(s) with the Submittals.
2. Application of the high-performance coating system(s) by anyone other than the applicator trained by the Manufacturer(s) will not be allowed.
3. Coating Superintendent shall have minimum of 10 years experience in application of similar products on similar projects. Applicators shall have a minimum of 3 years experience in application of similar products on similar projects.
   a. Provide references for minimum of three (3) different projects completed in last five (5) years with similar scope of work. References shall be from projects w/ same proposed Coating Superintendent for Project.
   b. Include name and address of project, size of project in value (coating) and contact person.
4. Except in extreme circumstances, Coating Superintendent shall not be replaced without written notice provided to the Engineer at least seven (7) days prior to change. If replacement is necessary, an additional pre-job conference may be held at the Engineer’s discretion prior to continuing coating application.

B. Miscellaneous:

1. Furnish paint through one (1) manufacturer unless noted otherwise.

C. Deviation from specified mil thickness or product type is not allowed unless approved, in writing, by manufacturer’s authorized representative and Engineer.

D. Material shall not be thinned unless approved, in writing, by coating manufacturer's authorized representative and Engineer.

E. Accelerators shall not be used unless approved, in writing, by coating manufacturer's authorized representative and Engineer.

F. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1. All top coats shall be provided from the same manufacturer, regardless of whether it was shop or field coated. Contractor shall coordinate this between suppliers and Field Applicators.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:

1. Name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. Handling instructions and precautions.

B. Store materials not in use in tightly covered containers in a well-ventilated area and environmentally controlled atmosphere in accordance with Manufacturer’s recommendations. Temperature of storage shall be monitored for minimum and maximum ambient air temperature in accordance with product data sheets. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect materials from freezing and heat above manufacturer’s published recommendations. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.7 REFERENCES

A. ASTM International:
1. D 4285 – “Standard Test Method for Indicating Oil or Water in Compressed Air”.

B. ISO (International Organization for Standardization):
1. 8502-3 – “Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)”.

C. NACE International:
1. SP0188 – “Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates”.
2. RP0287 – Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape”.

D. SSPC (Society for Protective Coatings):
1. PA2 – “Procedure for Determining Conformance to Dry Coating Thickness Requirements”.
2. SP1 – “Solvent Cleaning”.
3. SP16 – “Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals”.

E. SSPC/NACE Combined Standards
1. NACE No. 1/SSPC-SP 5 “White Metal Blast Cleaning”
2. NACE No. 2/SSPC-SP 10 “Near-White Metal Blast Cleaning”

F. NAPF (National Association of Pipe Fabricators, Inc.)
1. NAPF 500-03 – “Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coating and/or Special Internal Linings”.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products indicated in the coating system descriptions.

B. Manufacturers' Names: The following manufacturers are referred to in the coating system descriptions by shortened versions of their names shown in parenthesis:

1. Sherwin-Williams Company (S-W).
2. Tnemec Company, Inc. (Tnemec).
3. Or approved equal.

2.2 COATINGS MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

2.3 COLORS

A. Piping Color Schedule: Piping schedule shown below is provide for purposes of pipe labeling.

<table>
<thead>
<tr>
<th>Pipe Description</th>
<th>Color</th>
<th>Tnemec Color Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pipe</td>
<td>Band</td>
</tr>
<tr>
<td>Process Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sludge Gas</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Heating Hot Water Ret</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Heating Hot Water Sup</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Supernate</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Equalization Pipe</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Recirculated Sludge</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Primary Sludge</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Digested Sludge</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
Common Piping
Nonpotable Water NA NA NA NA NA

1. Other approved manufacturers shall be the equivalent of listed colors.
2. Pipe labels shall be the same as the pipe description listed above.

2.4 PIPE IDENTIFICATION

A. Identification labels on piping shall be one of the following:
   1. Self-Adhesive Labels
      a. Interior/Exterior Grade Vinyl with a minimum thickness of 5 mils.
      b. Permanent adhesive.
      c. Resistant to weathering and UV light.
      d. Label color shall be same as specified pipe color

B. Color and band piping in accordance with Article 2.3 of this Section.
   1. Band piping using maximum of three (3) different colors at 8 FT maximum centers.
   2. Place bands:
      a. Along continuous lines.
      b. At changes in direction.
         1) This requirement is in addition to the typical 8 FT maximum spacing requirement for banding piping.
      c. At changes of elevation.
         1) This requirement is in addition to the typical 8 FT maximum spacing requirement for banding piping.
      d. On both sides of an obstruction (e.g., wall, ceiling) that painted item passes through.
         1) This requirement is in addition to the typical 8 FT maximum spacing requirement for banding piping.
   3. Band width for individual colors (pipe diameter measured to outside of insulation, if applicable):
      a. Piping up to 8 IN DIA:  2 IN minimum.
      b. Piping greater than 8 IN up to 24 IN DIA:  4 IN minimum.
      c. Piping greater than 24 IN up to 48 IN DIA:  6 IN minimum.
      d. Piping greater than 48 IN DIA:  8 IN minimum.

2.5 HIGH-PERFORMANCE COATING SYSTEMS

A. Any coating applied to surfaces in contact with potable water shall be NSF certified.

B. PIPING AND MISCELLANEOUS FERROUS METALS
1. Prime Coat:
   a. Product: Zinc-Rich Primer
      1) S-W: Corothane I Galvapac 2K Zinc Primer
      2) Tnemec: Series 90-97 Tnemec-Zinc
   b. Dry Film Thickness: 2.5 – 3.5 mils

2. Intermediate Coat:
   a. Product: Epoxy
      1) S-W: Macropoxy 646 Fast Cure Epoxy
      2) Tnemec: Series 69 Hi-Build Epoxoline II
   b. Dry Film Thickness: 4.0 – 6.0 mils

3. Top Coat:
   a. Product: Polyurethane
      1) S-W: Acrolon Ultra
      2) Tnemec: Series 1074U Endura-Shield
   b. Dry Film Thickness: 2.0 – 3.0 mils
   c. Color: As indicated in piping schedule.

C. IMMERSED PIPING

1. Prime Coat:
   a. Product: Epoxy
      1) S-W: Dura-Plate 5800
      2) Tnemec: Series 435 Perma-Glaze
   b. Dry Film Thickness: 15.0 – 20.0 mils

2. Top Coat
   a. Product: Epoxy
      1) S-W: Dura-Plate 5800
      2) Tnemec: Series 435 Perma-Glaze
   b. Dry Film Thickness: 15.0 – 20.0 mils
   c. Color: Gray

D. NON-FERROUS METALS

1. Prime Coat:
a. Product Epoxy
   1) S-W: Macropoxy 646 Fact Cure Epoxy
   2) Tnemec: Series 69 Hi-Build Epoxoline II
b. Dry Film Thickness: 4.0-6.0 mils

2. Top Coat:
   a. Product Epoxy
      1) S-W: Macropoxy 646 Fact Cure Epoxy
      2) Tnemec: Series 69 Hi-Build Epoxoline II
   b. Dry Film Thickness: 4.0-6.0 mils
   c. Color: Gray

2.6 SHOP COATED SURFACES

A. Items shall only be shop coated when previously approved (either through the RFI process or shop drawings).

B. Coating system shall be the same as specified in this Section.

C. Surface preparation shall be the same as specified in this Section.

D. Quality control requirements shall be the same as specified in this Section for “Field Quality Control”.
   1. Documentation shall be provided at the same interval as specified.
   2. Documentation shall be provided prior to the equipment arriving on site.

E. Manufacturer supplying shop coated surfaces shall provide touch-up paint for all coats of entire system applied.
   1. All touch-up painting shall be performed by Applicator.
   2. Touch-up paint shall be the same products as provided on the surface.

PART 3 - EXECUTION

3.1 ITEMS TO BE PAINTED

A. Items to be painted shall be prepared and have coating applied in the manner specified.

B. Items to be painted include the following:
   1. All piping (not including stainless steel, aluminum or PVC), including valves and fittings, except immersed in water.
      a. System to be as specified in Part 2.
   2. Aluminum surfaces, where in direct contact with either concrete or dissimilar metals.
   3. Miscellaneous ferrous metal surfaces.
   4. Equipment with ferrous metal surfaces.
3.2 ITEMS NOT TO BE PAINTED

A. All items indicated not to be painted shall be protected from surface preparation and application of coatings.

B. Items not to be painted include the following:

1. Stainless steel surfaces, unless specifically indicated to be painted.
2. Aluminum surfaces, unless specifically indicated on the Drawings or required in “Items to be Painted”.
3. PVC surfaces.
4. Pipe insulation jacketing, unless specifically indicated to be painted.
5. Any moving parts where the coating would hinder the operation of the equipment.
6. Concrete surfaces, unless indicated to be coated in room finish schedule.
7. Any item indicated to be entirely shop coated shall not be field coated.

3.3 EXAMINATION

A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.

1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.

B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.

1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
   a. Confirmation of primer's suitability for expected service conditions.
   b. Confirmation of primer's ability to be top coated with materials specified.
2. Notify Engineer about anticipated problems before using the coatings specified over substrates primed by others.

3.4 GENERAL PREPARATION

A. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

B. Environmental Conditions

1. Prior to the start of any coating work (surface preparation or coating application) verify conditions are within acceptable limits as specified.
a. Ambient air temperature shall be in the same areas as the work being performed.
b. Minimum and maximum surface temperatures and air temperatures shall be as indicated in writing from coating manufacturer. Minimum surface and air temperatures shall not be less than 45 degrees F and maximum surface and air temperatures shall not more than 95 degrees F, unless approved, in writing, by coating manufacturer’s authorized representative and Engineer. Temperatures shall be followed for standard coating; shall not be adjusted for accelerator.
c. Ambient air temperature and surface temperature of substrate shall be at least 5 degrees F above dew point. If the difference is less than 10 degrees F; on following measurements, the difference shall be increasing.
d. Relative humidity shall be less than 85 percent.
e. Coating application and surface preparation shall not be performed in rain, snow, fog or mist.
f. Allow any wet or damp surfaces to dry thoroughly, and attain temperature prior to beginning coating application or surface preparation.
g. Avoid painting surfaces exposed to hot sun.

1) Provide artificial shade if required.

h. Any additional environmental requirements stated on manufacturer’s data sheets shall also be followed.
i. Entire area where work is being performed shall be adequately ventilated. Use artificial methods if work space doesn’t vent naturally.

1) Provide adequate ventilation of confined spaces to prevent dust/blast media from accumulating or coming in contact with wet paint.

C. Artificial Environmental Control

1. Provide temporary heating as required (in-direct fired type only).

a. Provide clean heat with heat exchanger type equipment sufficient in size to maintain temperature.
b. No exhaust gases shall be allowed to vent into the space being painted.

2. Provide temporary dehumidification equipment as required to maintain humidity levels within specified limits, if necessary to complete Work.

3. Provide temporary ventilation equipment as required to complete Work.

D. Prepare surfaces to be coated in accordance with coating manufacturer's instructions and this Section unless noted otherwise in the Specification.

E. Remove all dust, grease, oil, compounds, dirt and other foreign matter which would prevent bonding of coating to surface.

1. Adhere to manufacturer's recoat time surface preparation requirements.

a. Reccoat time surface preparation requirement will not be waived.
b. Schedule cleaning and coating application so dust and other contaminates from cleaning process will not fall on wet, newly coated surfaces.

3.5 SURFACE PREPARATION
A. Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.

B. Prior to any further surface preparation, remove all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants in accordance with SSPC-SP1 for steel surfaces or NAPF 500-03-01 for ductile iron surfaces.

C. All corners and edges shall be rounded to a minimum of 1/16”.

D. Dry Abrasive Blasting

1. Do not begin surface preparation if environmental conditions are not within acceptable limits.
2. Provide compressed air for blasting that is free of water and oil.
   a. Provide accessible separators and traps.
   b. Perform blotter test at start of work and after extended breaks. Test in accordance with ASTM D 4285.
   c. If oil is found on surface during or after blasting, blotter test shall be performed immediately. Blasting shall not continue until problem is found, solved and blotter test is passed.
3. Surface Profile
   a. Provide a minimum 2 mil surface profile on all blast cleaned surfaces, unless coating manufacturer indicates otherwise, in writing. Maximum surface profile shall be as indicated by coating manufacturer, in writing, prior to start of coating work.
   b. Profile shall have an angular shape.
4. Perform additional blasting and cleaning as required to achieve surface preparation required.
   a. Prior to painting, reblast surfaces allowed to set overnight and surfaces that show rust bloom.
5. Confine blast abrasives to area being blasted.
   a. Provide shields of polyethylene sheeting or other such barriers to confine blast material.
   b. Plug pipes, holes, or openings before blasting and keep plugged until blast operation is complete and residue is removed.
6. Protect any surfaces that may be damaged from blasting.
7. Abrasive blasting media may be recovered, cleaned and reused providing Contractor submits, for Engineer’s review, a comprehensive recovery plan outlining all procedures and equipment proposed in reclamation process.
8. Properly dispose of blasting material contaminated with debris from blasting operation not scheduled to be reused.

E. Carbon Steel Surfaces

1. Atmospheric Exposure (Interior or Exterior)
   a. Dry-abrasive blast clean all carbon steel surfaces exposed to atmospheric conditions to a near-white metal blast in accordance with NACE No. 2/SSPC-SP10.
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a. Dry-abrasive blast clean all carbon steel surfaces exposed to immersed conditions to a white metal blast in accordance with NACE No. 1/SSPC-SP5.

F. Ductile Iron Surfaces

1. Atmospheric Exposure (Interior or Exterior)
   a. Dry-abrasive blast clean all ductile iron pipe surfaces exposed to atmospheric conditions in accordance with NAPF 500-03-04.
   b. Dry-abrasive blast clean all ductile iron fitting surfaces exposed to atmospheric conditions in accordance with NAPF 500-03-05 “Ductile Iron Fitting Blast Clean #2”. If previously coated with asphaltic (bituminous) paint, blast clean to “Ductile Iron Fitting Blast Clean #1”.

2. Immersed Exposure
   a. Dry-abrasive blast clean all ductile iron pipe surfaces exposed to immersed conditions in accordance with NAPF 500-03-04.
   b. Dry-abrasive blast clean all ductile iron fitting surfaces exposed to immersed conditions in accordance with NAPF 500-03-05 “Ductile Iron Fitting Blast Clean #1”.

G. Non-Ferrous Metal Surfaces (Aluminum, Stainless Steel, Copper)

1. Dry-abrasive brush blast clean any non-ferrous metal surfaces indicated to be coated in accordance with SSPC-SP16.

H. PVC Surfaces

1. Scarify all PVC surfaces, which are to be coated, with a minimum of 80 grit sandpaper.

I. Shop Primed Surfaces

1. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
2. Shop primed surfaces shall be lightly brush blasted prior to application of next coat, unless approved, in writing, by manufacturer’s authorized representative and Engineer.

J. Pipe and Fitting Preparation:

1. Painter shall install a 360 degree bead of caulk, prior to or after topcoat, in the void between mating flange faces and in the void between any pipe and the dismantling joint or thread-on-flange, for ductile iron pipe. The bead of caulk shall prevent water from penetrating into the described void and leaving rust streaks. Caulking shall not be performed until after passing pressure or leak testing of the pipe.

3.6 APPLICATION

A. General: Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques best suited for the material being applied.
2. Thin, mix and apply coatings by brush, roller, or spray in accordance with manufacturer's installation instructions.
3. Surface Cleanliness

   a. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
   b. Avoid degradation and contamination of blasted surfaces and avoid intercoat contamination.

      1) Clean contaminated surfaces before applying next coat.

   c. Prior to the application of any single coat, surface must be free of all visible contaminants.

      1) Maximum allowable dust content is “Level 2” as defined in Figure 1 of ISO Standard 8502-3.

         a) Any overall discoloration of the tape shall be deemed dust content “Level 5” and is not acceptable.

      2) Maximum size of dust particles is “Class 2” as defined in Table 1 of ISO Standard 8502-3.

      3) Above indicated requirements are the maximum allowed; if coating manufacturer’s authorized representative specifies a more restrictive requirement, then follow manufacturer’s recommendation.

4. Provide complete coverage to dry film thickness specified.

   a. No individual gage readings shall be lower than specified.

5. If so directed by Engineer, do not apply consecutive coats until Engineer has had an opportunity to observe previous coats.

6. Apply materials under adequate illumination.

7. Evenly spread to provide full, smooth coverage.

8. Smooth out runs or sags immediately, or remove prior to next coat; if on top coat remove and reapply entire top coat.

9. Allow preceding coats to dry before recoating.

   a. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.

   b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

   c. Recoat within time limits specified by coating manufacturer.

   d. If recoat time limits have expired reprepare surface in accordance with coating manufacturer's printed recommendations.

   e. If epoxy coating is exterior exposed for more than 30 days, coating shall be lightly brush blasted prior to application of next coat.

10. Allow coated surfaces to cure prior to allowing traffic or other work to proceed.

11. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.

12. Provide finish coats compatible with primers used.

13. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
a. Coat surfaces behind movable equipment the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment with prime coat only.
b. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
c. Pipe surfaces covered by pipe supports shall be coated with entire specified system prior to the installation of the pipe support.

14. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

15. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

16. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

17. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.

B. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue. If a bucket must be kept open, keep in an area protected from wind and wind-blown debris. Strain any coating that gets contaminated.

2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.

3. For multiple component coatings, stir components individually prior to mixing.

4. Do not mix previously catalyzed material with newly mixed material.

5. Use only the type of thinners approved by manufacturer (if thinning is approved by Engineer) and only within recommended limits.

a. Exact quantity of thinner shall be measured and recorded prior to mixing with coating material.

C. Prime Coat:

1. Apply prime coat within 8 hours of start of surface preparation. Surface shall not be allowed to flash rust prior to application of coatings.

2. Prime coat can be shop applied if the following conditions are met:

   a. Shop applied prime coats shall be same as prime coat indicated for specified system to be applied.

   b. Submit form, included at end of this Section, for all products that have shop primed. Form shall be included in submittal documents.

   c. Written notice is provided to Engineer at least two (2) weeks in advance.

   d. Coordinate schedule of shop priming with Engineer to allow for observation.

   e. Engineer or Coating Inspector is allowed access to shop to observe surface preparation and/or coating application.

   f. Quality control requirements shall be the same as specified in this Section for “Field Quality Control”.

   1) Documentation shall be provided at the same interval as specified.

   2) Documentation shall be provided prior to the equipment arriving on site.
3. Prime coat on ferrous metals cast in concrete shall extend from atmospheric or immersed exposure to at least 1 IN past face of concrete.

D. Stripe Coat:

1. Apply stripe coat to all welds, corners, edges, gouges, any other change in surface profile and any surface narrower than 6 inches wide.
2. Apply between the prime coat and intermediate coat.
3. Stripe coat shall be of the same product as the prime coat, unless indicated otherwise in the coating system.
4. Apply with brush only; work coating material into all crevices.
5. Stripe coat shall also be applied to areas that are difficult to spray or reach with roller.
6. Stripe coat is to be an individual coat; cannot be applied concurrently with intermediate coat.
7. Color of stripe coat shall also be of a different tint. If necessary due to limited color selection, the stripe coat shall be the same as the intermediate coat and different than the prime coat, but only when just 2 colors are available.

E. Intermediate/Top Coats:

1. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

F. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
   a. Brush out and work brush coats into surfaces in an even film.
   b. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.

3. Spray Application: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
   a. Conventional Air Spray:
      1) Use spray equipment with orifice size recommended by manufacturer for material and texture required.
      2) Provide compressed air for conventional air spray that is free of water and oil.
         a) Provide accessible separators and traps.
         b) Perform blower test at start of work and after extended breaks. Test in accordance with ASTM D 4285.
   b. Airless Spray:
      1) Use equipment (pump, orifice, etc.) sized appropriately for the application as recommended by manufacturer.
G. Minimum/Maximum Coating Thickness: Apply each coat no thinner or thicker than manufacturer's recommended thickness. Provide total dry film thickness of each system as specified.

   1. The number of coats and film thickness required is the same regardless of application method.

H. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.7 CURING

A. Environmental conditions shall be monitored and maintained until coating has sufficient time to cure. If required by ambient conditions, artificial environmental control shall be used during the cure of the coating.

B. Ventilation (natural or artificial) shall also be continued until coating has achieved complete cure.

3.8 CLEANING

A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

   1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.9 PROTECTION

A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

   1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
   2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

3.10 FIELD QUALITY CONTROL

A. Maintain Daily Records:

   1. Applicator shall provide daily records.
   2. Daily records shall be submitted weekly.
   3. Daily records shall include the following:

      a. Date, starting time, end time, and all breaks taken by painters.
      b. Area worked and work performed in area.
      c. Start and end time of any coating application.
      d. Batch numbers, dates, and quantity of coating used each day.
      e. All quality control information below.
B. Applicator is required to provide all equipment necessary to perform quality control work. All equipment shall be specifically designed for intended use.

C. Quality control shall be performed by only qualified personnel.

D. Environmental Conditions

1. The information required shall be measured and recorded during surface preparation, coating application and during the time required to achieve the necessary curing time.
2. Readings shall be taken in the morning prior to starting work, after lunch and at the end of the day prior to leaving the site. Readings may be required more frequently if the environmental conditions are continually changing. Frequency may be considered a judgement call. Applicator is responsible for any work affected by changing environmental conditions.
3. The information required shall include but not be limited to the following:
   a. For exterior painting:
      1) Sky condition.
      2) Wind speed and direction.
   b. Air temperature
   c. Relative humidity
   d. Dew point
   e. Surface temperature of substrate to which paint is being applied.
   f. Date and start time of cure period.
   g. Written documentation of all occurrences when air temperature, humidity, dew point or surface temperature reached or violated manufacturer's recommended minimum or maximum limits.

E. Surface Preparation

1. Visually inspect entire surface for any visible contaminants (oil, dust, dirt, rust, mill scale, etc.). Document and correct any contaminants found.
2. Surface Cleanliness
   a. Abrasive blast cleaned surfaces shall be visually compared to written standard at minimum every 100 sq. ft. of blasting performed.
3. Surface profile measurements
   a. Surface profile measurements of all abrasive blast cleaned surfaces shall be taken at minimum every 100 sq. ft. of blasting performed.
   b. Surface profile measurements shall be conducted in accordance with the latest version of NACE RP0287

4. Dust
   a. Dust measurements shall be taken every 100 sq. ft. of surface to be coated (both blasted surfaces and previously coated surfaces).
   b. Dust measurements shall be conducted in accordance with the latest version of ISO 8502-3.

F. Application

1. Verify mixing and induction (sweat-in) times are met. Document shortest times.
2. Verify pot life is not exceeded. Document longest times.
3. Verify mixing is being performed in accordance with manufacturer’s written recommendations.
4. Verify and document amount of thinner used.
6. Wet mil thickness verification frequency is not required. Applicator to perform as necessary to ensure consistent thickness. Document any wet mil thickness measurements performed.
7. After each coat has sufficiently cured, perform dry mil thickness verification. Perform measurements in accordance with ASTM D 7091. Frequency of measurements shall be in accordance with SSPC-PA2, with the following modifications.
   a. Average readings per the standard with restrictions as noted in “Level 2”, except individual gage readings shall also be restricted to as specified. All individual gage readings shall be above specified mil thickness.
   b. Coating Inspector shall be present during measurements taken of the completed coating system.

G. Curing
   1. Provide environmental data at minimum every 12 hours during the curing period.
   2. Perform solvent rub test in accordance with ASTM D 5402, if environmental data provided is inadequate to determine cure.

H. Holiday Test
   1. Owner reserves the right to have the Applicator conduct holiday test on 100 percent of coated surfaces.
   2. Perform holiday testing in accordance with NACE SP0188.
   3. Holiday testing shall be performed under the observation of the Engineer or Coating Inspector during normal business hours.
   4. Providing equipment for holiday testing is the responsibility of the Applicator.

I. Adhesion Test
   1. Owner reserves the right to have the Applicator conduct coating adhesion tests, if cleanliness or surface preparation are questioned.
   2. Applicator is responsible for the cost and repair of the adhesion test.
   3. Adhesion test shall be performed in accordance with ASTM D 4541.
   4. Adhesion tests will not be performed more than once every 1000 sq. ft. of coated surface.
      a. If adhesion test fails, additional tests may be performed at the Applicator’s expense to determine extent of non-adherent coating.

J. Summary Report
   1. At completion of Work, prepare and submit a summary report.
   2. Summary report shall include the following:
      a. Dry film thickness reports.
      b. Holiday test reports, if performed.
      c. Adhesion test reports, if performed.
      d. All coating batch numbers used.
      e. All repairs performed.
3.11 REPAIR OF COATING DEFECTS

A. Coating defects include all spots found during the holiday test, gouges or wear from other trades or assembly, issues found during manufacturer’s walk through at completion of coating work, and anything that doesn’t resemble a uniform, undisturbed coating.

B. All repairs shall be performed in accordance with coating manufacturer’s written recommendations. Written recommendations shall be provided prior to any repairs being made. For typical repairs, provide written recommendations prior to the start of any coating work.

C. Coating manufacturer shall supply written recommendations for typical coating defects (such as runs/sags, gouges, misses, excessive film thickness, chalking, overspray) prior to the start of coating work.

D. Repair coatings shall consist of the same number of coats and thicknesses as the coating system that is being repaired.

3.12 TRAINING

A. Coating Manufacturer and Applicator shall conduct training for the Owner on procedures for coating repair and maintenance. Coating Manufacturer’s authorized representative and Applicator shall be present for training.

1. Time allotted for training shall be 4 hours.
2. This training may be provided around the same time as the Coating Completion Conference.

END OF SECTION 09 9600
SECTION 13 6000 – ANAEROBIC DIGESTER CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 through Division 44 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes furnishing the equipment, labor, supplies, electrical power, temporary lighting, and backflow prevention devices necessary to empty the contents of an anaerobic digestion system, pump or haul the contents to the Owner’s sludge drying lagoons and clean the anaerobic digestion system.

B. The Contractor is to removal all liquid, sludge, scum, rags, grease, hair, grit, debris and related materials from the primary and secondary anaerobic digesters.

C. The Contractor assumes all risks and responsibilities associated with the removal and dewatering of the digester contents, regardless of material type, nature, density, coarseness, and percent solids.

D. All work within the digester shall be classified as confined space work. The digester contents may be in a stage of active decomposition and producing hazardous gases such as carbon dioxide, carbon monoxide, hydrogen sulfide and other deleterious and/or harmful gases. Flammable materials shall not be stored or located in or near the digesters. All hazardous digester gases shall be safely removed prior to ventilation. A site visit is highly recommended prior to bidding to determine the extent of the work required.

E. After the digester contents are removed, the Contractor shall "power wash" all surfaces of the tank interior, including the digester walls, floors, and internal piping taking care not to damage existing digester coatings and pipe coatings. High pressure cleaning equipment shall be capable of producing flows from a fine spray to a solid stream.

F. In starting the primary digester back up, the Contractor shall transfer 30,500 gallons of secondary digester sludge (4 feet of sidewater depth) into the cleaned primary digester for “seed”. The Contractor shall fill the remaining portion of primary digester with primary clarifier effluent to an elevation of 1156.47, or 1 foot above the top of the cover skirt to provide a positive water seal prior to putting it back into operation. Contractor to provide pump, hose and all equipment to transfer liquid from primary clarifier effluent box into primary digester.

G. In starting the secondary digester back up, the Contractor shall fill the secondary digester with primary clarifier effluent to an elevation of 1147.63, or 1 foot above the top of the corbels to create a positive water seal. Contractor to provide pump, hose and all equipment to transfer liquid from primary clarifier effluent box into primary digester.

1.3 PROJECT CONDITIONS

A. The Digester Complex consists of two (2) Digesters with the following characteristics:
1. Primary Digester
   a. 190,000-gallon total volume
   b. 35-foot diameter
   c. 24.64-foot side water depth (excluding cone)

2. Secondary Digester
   a. 188,000-gallon total volume
   b. 35-foot diameter
   c. 24.41-foot side water depth (excluding cone)

B. The Primary and Secondary Digesters were last cleaned in 2009.

C. Digester Complex Sludge Characteristics: The contents of the digesters will be somewhat uniform where adequate mixing is taking place. Where mixing is less effective, the contents tend to settle and compact in the bottom cone of the digester and sludge concentrations can be come quite high. The expected sludge concentration for each area is shown below:

1. Upper contents percent solids = 2.0% to 2.8% solids
2. Lower contents percent solids = 2.0 to 7.0 % solids

D. Sludge Removal and Digester Cleaning Mobilization: The General Contractor is responsible for leaving one (1) digester in service at all times while performing digester cleaning and pipe gallery pipe improvements. Therefore, sludge removal and digester cleaning will require at least two (2) mobilizations. The date, length and volume of each mobilization will be dictated and coordinated by the General Contractor. If additional mobilizations are required, they shall come at no additional expense to the Owner.

1.4 MEASUREMENT AND PAYMENT

A. Sludge Removal and Digester Cleaning: Payment for Sludge Removal and Digester Cleaning will be a Lump Sum Bid Item. The work included in this Bid Item will consist of project mobilizations, sludge removal, and digester cleaning for the entire contents of the Primary and Secondary Digesters including the volume of wash water used. The volume of the Primary Digester has been set at 190,000 gallons and the volume of the Secondary Digester has been set at 188,000 gallons.

PART 2 - PRODUCTS

2.1 DIGESTER CLEANING

A. Pumps: The Contractor shall be responsible for furnishing, operating and maintaining all pumps and pumping equipment necessary to withdraw each digester's contents and convey them to the sludge storage lagoons. This shall include but not be limited to; fuel, electricity, lubricants, pumps, and other equipment needed for removal of the digester contents but not mentioned herein. The equipment required for the removal and processing of the digester contents shall be attended at all times while in operation.

B. Pipe: The Contractor shall be responsible for furnishing, operating and maintaining all piping, hoses, and equipment necessary for removal of the digester contents. This shall include but not be limited to; pipe,
fittings, pipe restraints and other equipment needed for removal of the digester contents but not mentioned herein.

C. Wash Water: The Owner will provide a local fire hydrant and water meter for the Contractor’s use. The location of the hydrant is shown on the project plans. All water used for digester cleaning operations will be metered but the Owner will not charge for the water used. The Contractor shall be responsible for furnishing, operating and maintaining all piping and equipment necessary for washing the digester for complete removal of its contents. This shall include but not be limited to; pipe, fittings, pipe restraints and other equipment needed for washing the digester but not mentioned herein.

D. Labor: The Contractor shall be responsible for furnishing all labor necessary for removal of the digester contents and cleaning of the digester tanks. This shall include but not be limited labor required for pumping, washing, cleaning and other labor needed for removal of the digester contents but not mentioned herein.

PART 3 - EXECUTION

A. The General Contractor is responsible for providing all coordination of the removal of the digester contents to coincide with the replacement of the digester gallery piping that penetrates the digesters and is located within the digesters.

B. The Contractor will be allowed to coordinate with the Owner to use the existing sludge transfer pumps to convey a portion of the sludge in the primary and secondary digesters to the sludge storage lagoons. However, at some unknown point, the sludge will be come to thick and the pumps will no longer be able to convey the sludge. At this point, the Contractor will be required to provide the pumps, piping and equipment needed to withdraw the remaining digester contents and transfer it to the sludge storage lagoons.

C. The Contractor is responsible, at all times, for protecting the health and safety of his workers. Neither the Engineer nor the Owner will be responsible for any injury occurring to the Contractor's workers. Neither the Engineer nor the Owner will be responsible for enforcing the Contractor's construction ways and means nor will they be responsible for enforcing OSHA standards. While conducting cleaning operations, the Contractor shall always have a superintendent in responsible charge at the site. This person shall have the authority to make management decisions pertaining to the project.

D. The Contractor shall provide electrical power to operate all equipment for the completion of the work.

E. During all work, the Contractor shall take all necessary precautions to prevent any damage to the digesters, other structures and piping associated with the digesters. Any damage as a result of the Contractors operations shall be repaired at no additional cost to the Owner. The Contractor shall grade, seed and fertilize any grassed areas damaged during the cleaning operations at no additional cost to the Owner.

F. The Contractor shall use the existing manways and access points in the roof to provide access to each digester.

G. Spills of any nature caused by the Contractor during the sludge removal and cleaning are the responsibility of the Contractor and shall be addressed immediately. Contractor shall not allow any residuals, free liquids from the digesters, or filtrate from the dewatering operations to enter storm drains, roadways, waterways, or any other land, either public or private. In the event that a spill occurs, the Contractor shall immediately take any necessary steps to control and clean the spill. The Contractor shall be responsible for satisfying state reporting requirements.
END OF SECTION 13 6000

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SECTION 22 0553 - MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Pipe markers.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 PRODUCTS

2.01 MANUFACTURERS

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with reverse engraved letters.
2. Letter Height: 1/4 inch.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
B. Metal Tags: Aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
C. Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.
B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify thermostats relating to terminal boxes or valves with nameplates.

I. Identify air terminal units and radiator valves with numbered tags.

J. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION
SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.
B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Painting insulation jacket.
B. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

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.
B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum ________ years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer’s identification, product density, and thickness.

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 (CODE C-1 AND C-2)

A. Manufacturers:
  4. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C975; rigid molded, noncombustible.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C975; semi-rigid, noncombustible, end grain adhered to jacket.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 650 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

D. 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-inches.

2.03 CELLULAR GLASS (CODE C-4)

A. Manufacturers:
  2. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C552, Type II.
   1. Apparent Thermal Conductivity, 'K' Value: Grade 6, 0.35 at 100 degrees F.
   2. Service Temperature: Up to 800 degrees F.
   3. Water Vapor Permeability: 0.005 perm inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches.

2.04 JACKETS

A. PVC Plastic.
   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.
e. Connections: Brush on welding adhesive.

B. Field or Pre-Applied Jacket and Vapor Barrier
1. Thickness: 5-Layer, 6 mils.
2. Flame/Smoke Index: 10/20 per U.L. 723
3. Service Temperature: -30(F) to 300(F).
4. Finish: White embossed or Aluminum Embossed
5. Joining: Self adhesive backing.
6. Application Temperature: 0 degrees (F) or above.
7. Overlap: 3 inches.
9. VentureClad 1574CW-WE or 1574CW-E.

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.
B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
H. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Div 7.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A. See Contract Drawings.

END OF SECTION
SECTION 22 1005 - PLUMBING PIPING

PART 1  GENERAL

1.01  SCOPE

A. Section Includes: Pipe, pipe fittings, valves, and connections for piping systems including:
   1. Storm water.
   2. Flanges, unions, and couplings.
   3. Pipe hangers and supports.
   4. Valves.
   5. Non-potable water.

B. The section does not include wastewater process piping and valves or any other piping indicated on the "P" sheets.

1.02  RELATED REQUIREMENTS

A. Section 31 2316 - Excavation.

B. Section 09 9123 - Interior Painting.

C. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

D. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

E. Section 22 0719 - Plumbing Piping Insulation.

F. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

1.03  REFERENCE STANDARDS

A. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.

B. ASME B31.9 - Building Services Piping; 2014.

C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of South Dakota, standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.

D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with applicable plumbing code. Installation shall conform, at a minimum, to the State of South Dakota plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.
1.07  DELIVERY, STORAGE, AND HANDLING
   A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
   B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08  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  NON-POTABLE WATER PIPING, ABOVE GRADE
   A. CPVC Pipe: Schedule 80 ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.

2.03  STORM WATER PIPING, ABOVE GRADE
   A. PVC Pipe: ASTM D2665 or ASTM D3034.
      1. Fittings: PVC.

2.04  FLANGES, UNIONS, AND COUPLINGS
   A. Unions for Pipe Sizes 3 Inches and Under:
      1. Ferrous pipe: Class 150 malleable iron threaded unions.
   B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.05  PIPE HANGERS AND SUPPORTS
   A. Provide stainless steel hangers and supports that comply with MSS SP-58.
      1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
      2. Overhead Supports: Individual stainless steel rod hangers attached to structure or to trapeze hangers.
      3. Trapeze Hangers: Welded stainless steel channel frames attached to structure.

2.06  BALL VALVES
   A. Manufacturers:
      4. Substitutions: See Section 01 6000 - Product Requirements.
B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CW, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.07 PLUG VALVES

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide non-conducting dielectric connections wherever jointing dissimilar metals and equipment connections.
C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.
G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08305.
I. Provide support for utility meters in accordance with requirements of utility companies.
J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
K. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 0523.
L. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
M. Install water piping to ASME B31.9.
N. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
O. Pipe Hangers and Supports:
   1. All materials and hardware shall be stainless steel.
   2. Install in accordance with ASME B31.9.
3. Support horizontal piping as required by governing codes.

3.03 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide gas rated valves in natural gas systems for shut-off service.

G. Provide flow controls in water recirculating systems where indicated.

3.04 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.05 SCHEDULES

A. See Contract Drawings.
SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

   A. Drains.

1.02 RELATED REQUIREMENTS

   A. Section 22 1005 - Plumbing Piping.
   B. Section 22 4000 - Plumbing Fixtures.
   C. Section 22 3000 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

   A. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).
   B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2003.
   C. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.

1.04 SUBMITTALS

   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
   D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
   E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

   A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

   A. Manufacturers:
      4. Substitutions: See section 15010 - Basic Mechanical Requirements.

   B. Roof Drains:
      1. Assembly: ASME A112.6.4.
      2. Body: Lacquered cast iron with sump.
4. Accessories: Coordinate with roofing type, refer to Section ______:

C. Floor Drain (FD-1):
   1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, sediment bucket, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Cleanouts at Interior Finished Floor Areas:
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and square gasketed depressed cover to accept floor finish in finished floor areas.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install floor cleanouts at elevation to accommodate finished floor.

END OF SECTION
SECTION 23 0519 - METERS AND GAGES FOR HVAC PIPING

PART 1  GENERAL

1.01  SECTION INCLUDES

A.  Pressure gages and pressure gage taps.
B.  Thermometers and thermometer wells.

1.02  RELATED REQUIREMENTS

A.  Section 23 2113 - Hydronic Piping.

1.03  REFERENCE STANDARDS

A.  ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
D.  UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.04  SUBMITTALS

A.  See Section 01 3000 - Administrative Requirements, for submittal procedures.
B.  Product Data:  Provide list that indicates use, operating range, total range and location for manufactured components.

1.05  FIELD CONDITIONS

A.  Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2  PRODUCTS

2.01  PRESSURE GAGES

A.  Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   2.  Size:  4-1/2 inch diameter.
   3.  Mid-Scale Accuracy:  1/2 percent.
   4.  Scale:  Psi.

2.02  PRESSURE GAGE TAPPINGS

A.  Gage Cock:  Tee or lever handle, brass for maximum 150 psi.

2.03  STEM TYPE THERMOMETERS

A.  Thermometers - Adjustable Angle:  Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1.  Size:  12 inch scale.
   2.  Window:  Clear Lexan.
4. Accuracy: 2 percent, per ASTM E77.
5. Calibration: Degrees F.

2.04 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.05 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.
C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
D. Provide instruments with scale ranges selected according to service with largest appropriate scale.
E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
G. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION
SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tags.
B. Pipe markers.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 TAGS

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Tags: Aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.02 PIPE MARKERS

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Color code as follows:
   1. Confirm schemes with Owner/Engineer
PART 3  EXECUTION

3.01  PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02  INSTALLATION

A. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

B. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION
SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1  GENERAL

1.01  SECTION INCLUDES

A.  Testing, adjustment, and balancing of hydronic systems.
B.  Measurement of final operating condition of HVAC systems.

1.02  REFERENCE STANDARDS


1.03  SUBMITTALS

A.  See Section 01 3000 - Administrative Requirements, for submittal procedures.
B.  Installer Qualifications:  Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
C.  TAB Plan:  Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1.  Include at least the following in the plan:
      a.  List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b.  Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c.  Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d.  Final test report forms to be used.
      e.  Procedures for formal deficiency reports, including scope, frequency and distribution.
D.  Final Report:  Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1.  Revise TAB plan to reflect actual procedures and submit as part of final report.
   2.  Submit draft copies of report for review prior to final acceptance of Project.  Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
   3.  Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side.  Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   4.  Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   5.  Form of Test Reports:  Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   6.  Units of Measure:  Report data in both I-P (inch-pound) and SI (metric) units.
   7.  Test Reports:  Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.  Submit data in SI (metric) units.
   8.  Include the following on the title page of each report:
VERMILLION WWTF DIGESTER IMPROVEMENTS - 2018
VERMILLION, SOUTH DAKOTA
SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

------------------------------------------------------------------------------------------
#22755.00.00 23 0593
6/22/2018

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 Engineer.
h. Report date.

E. Project Record Documents: Record actual locations of balancing valves and rough setting.

1.04 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. TAB Agency Qualifications: Independent Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.

C. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor experienced in performance of this Work and licensed at the Council Bluffs, Iowa.

1.05 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

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.

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. Certified by one of the following:

D. TAB Supervisor 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. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

3.03 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus 5 percent or minus 0 percent of design for supply systems and plus 5 percent or minus 0 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 5 percent of design.

3.05 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.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Main Hot Water Loop Pumps
   2. Boiler Pumps
   3. Packaged Steel Fire Tube Boilers.
   4. Air Coils.
   5. Terminal Heat Transfer Units.
SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.
B. Flexible removable and reusable blanket insulation.
C. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. 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.
B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum __________ years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
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

A. Manufacturers:
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. Maximum Service Temperature: 650 degrees F.
   2. 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-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.03 JACKETS

A. PVC Plastic.
   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.
      e. Connections: Brush on welding adhesive.
   2. Covering Adhesive Mastic: Compatible with insulation.
      a. Compatible with insulation.

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.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

D. Glass fiber insulated pipes conveying fluids above ambient temperature.
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

E. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Stainless steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

END OF SECTION
SECTION 23 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control Valves:
B. Room Thermostats.
   1. Line voltage thermostats.

1.02 RELATED REQUIREMENTS

A. Section 22 0519 - Meters and Gages for Plumbing Piping: Thermometer sockets, gage taps.
B. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gage taps.

1.03 REFERENCE STANDARDS


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. 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.
C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum ______ years experience approved by manufacturer.
C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
1.07 SYSTEM DESCRIPTIONS

A. Provide control systems consisting of certain thermostats, control valves, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. See specific section for acceptable manufacturers.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 CONTROL VALVES

A. Modulating Three Way Mixing Valves
   1. Manufacturer: Belimo, Siemens, Johnson Controls, Honeywell
   2. General: Electronic glove valve with NM non-spring return proportional 24v. actuator.
   4. Packings: Spring loaded TFE.
   5. ANSI Class: 250 psi.
   6. Temperature Range: 20 degrees to 280 degrees F.
   9. Power: 24 VAC.
   10. Control Signal: 4-20 mA with load resistor.
   11. Accepts control signal from building automation system.

2.04 DAMPERS

A. Performance: Test in accordance with AMCA 500-D.
   1. Manufacturer: Ruskin, Greenheck
   2. General: Low leakage insulated thermally broken control damper.
   3. Frame: 5" X 1" X 6063T5 extruded aluminum hat channel with .125" minimum wall thickness. Mounting flanges on both sides of frame.
   5. Blades: 6" wide, 6063T5 heavy gage extruded aluminum, airfoil shape.
   7. Axles: 1/2" plated steel hex.
   9. Blade Edge Seals: Extruded vinyl for -50 degrees F to +250 degrees F.
   10. Control Shaft: Removable, 1/2" diameter shaft extends 6' beyond frame.
   11. Finish: Mill

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch.

C. Jamb Seals: Spring stainless steel.

D. Product:
   1. Substitutions: See Section 01 6000 - Product Requirements.
2.05 DAMPER OPERATORS

A. General: Provide 2-position control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Actuators shall be spring return and direct coupled.

B. Manufacturer: Belimo, Siemens, Johnson Controls, Honeywell

C. Power: 120 VAC

D. Torque: 133 in-lb minimum.

E. End Switches: Provide two built-in SPDT auxiliary switches.

F. Accessories: Provide necessary brackets and linkages required to connect to dampers.

G. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

H. Product:
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.06 THERMOSTATS

A. Electric Room Thermostats:
   2. Range: 42 - 88 degrees F
   3. Product:
      a. Substitutions: See Section 01 6000 - Product Requirements.

B. Line Voltage Thermostats:
   2. Product:
      a. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

C. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

D. Ensure installation of components is complementary to installation of similar components.

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 60 inches above floor. Align with lighting switches.

C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

D. Provide separable sockets for liquids and flanges for air bulb elements.
E. Provide guards on thermostats in entrances.

F. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

3.03 SCHEDULES

A. See Contract Drawings for schedules.

END OF SECTION
SECTION 23 2113 - HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.
B. Heating water and glycol piping, above grade.
C. Pipe and pipe fittings for:
   1. Equipment drains and overflows.
   2. Pipe hangers and supports.
   3. Unions, flanges, mechanical couplings, and dielectric connections.

1.02 RELATED REQUIREMENTS

A. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.
B. Section 22 0719 - Plumbing Piping Insulation.
C. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

1.03 REFERENCE STANDARDS

B. ASME B31.9 - Building Services Piping; 2014.
C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).
L. AWWA C606 - Grooved and Shouldered Joints; 2011.
1.04 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use grooved mechanical couplings and fasteners only in accessible locations.

C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

D. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems and at equipment connections.

E. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

F. Use gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

G. Use globe valves for throttling, bypass, or manual flow control services.

H. Use 3/4 inch gate or ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

D. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturers catalogue information.
   3. Indicate valve data and ratings.
   4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

E. Project Record Documents: Record actual locations of valves and piping.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum five years of experience.

C. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

D. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1.07 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.
B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

1.08 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.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer to provide two year manufacturer's warranty on all pipe, fittings, and valves.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Engineer.
      b. Use rigid joints unless otherwise indicated.
   4. Provide stainless steel pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
D. Valves: Provide valves where indicated:
   1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.
   2. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves.
E. Welding Materials and Procedures: Conform to ASME BPVC-IX.

2.02 HEATING WATER AND GLYCOL PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
   5. Joints: Threaded, AWS D1.1 welded, or grooved mechanical couplings.
2.03 EQUIPMENT DRAINS AND OVERFLOWS

A. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide stainless steel hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. Hangers for Hot Pipe Sizes 2 to 4 Inches: Stainless steel, adjustable, clevis with stainless steel hardware.

C. Multiple or Trapeze Hangers: Stainless steel channels with welded spacers and stainless steel hanger rods.

D. All hardware and fasteners shall be stainless steel.

E. Hanger Rods: Stainless steel threaded both ends, threaded one end, or continuous threaded.

F. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:
   1. Ferrous Piping: 150 psig malleable iron, threaded.

B. Flanges for Pipe 2 Inches and Greater:
   1. Ferrous Piping: 150 psig forged steel, slip-on.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Mechanical Couplings: Comply with ASTM F1476.
   3. Housing Material: Ductile or malleable iron complying with ASTM A536.
   4. Housing Clamps: Malleable iron galvanized to engage and lock, designed to permit some angular deflection, contraction, and expansion.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
   7. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections: Union or waterway fitting with water impervious isolation barrier and one galvanized or plated steel end and one copper tube end, end types to match pipe joint types used.

2.06 GATE VALVES

A. Manufacturers:
   1. Hammond Valve
   2. Crane Valve Company
   5. Substitutions: See Section 01 6000 - Product Requirements.
B. Up To and Including 2 Inches:
   1. Iron or cast steel body, bronze trim, screwed bonnet, non-rising stem, handwheel, inside screw with backseating stem, solid wedge disc, threaded ends.

C. Over 2 Inches:
   1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends.

### 2.07 GLOBE OR ANGLE VALVES

A. Manufacturers:
   1. Hammond Valve
   2. Crane Valve Company
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 2 Inches:
   1. Iron or cast steel body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat, threaded ends.

C. Over 2 Inches:
   1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

### 2.08 BALL VALVES

A. Manufacturers:
   2. Hammond Valve
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 2 Inches:
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

C. Over 2 Inches:
   1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

### 2.09 BUTTERFLY VALVES

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Body: Cast or ductile iron with resilient replaceable EPDM seat, lug or grooved ends, extended neck.

C. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, Buna-N encapsulation, or ________________.

D. Stem: Stainless steel with stem offset from the centerline to provide full 360 degree circumferential setting.
2.10 SWING CHECK VALVES

A. Manufacturers:
   1. Crane Valve
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 2 Inches:
   1. Iron or cast steel body, bronze trim, bronze rotating swing disc, with composition disc, threaded ends.

C. Over 2 Inches:
   1. Iron body, bronze trim, stainless steel, bronze, or bronze faced rotating swing disc, renewable disc and seat, flanged or grooved ends.
   2. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Slope piping and arrange to drain at low points.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.

G. Grooved Joints:
   1. Install in accordance with the manufacturer's latest published installation instructions.
   2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

H. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

K. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. See Drawings.

B. Hanger Spacing for Steel Piping.
   1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
   6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
   7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion tanks.
B. Air vents.
C. Air separators.
D. Combination pump discharge valves.
E. Pressure-temperature test plugs.
F. Balancing valves.
G. Pressure reducing valves.
H. Glycol system.

1.02 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.
B. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.
C. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.
D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
E. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

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.

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 MAINTENANCE SERVICE

A. Furnish service and maintenance of glycol system for one year from date of substantial completion.
B. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

A. Manufacturers:
   2. ITT Bell & Gossett; ______: www.bellgossett.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psi.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.02 AIR VENTS

A. Manufacturers:
   2. ITT Bell & Gossett; ______: www.bellgossett.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

D. Washer Type:
   1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.03 AIR SEPARATORS

A. Centrifugal Air Separators/Strainers:
   1. Manufacturers:
      a. ITT Bell & Gossett; ______: www.bellgossett.com.
      b. Spirotherm, Incorporated.
      c. Substitutions: See Section 01 6000 - Product Requirements.
   2. Steel, tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.04 COMBINATION PUMP DISCHARGE VALVES

A. Manufacturers:
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psi operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

2.05 PRESSURE-TEMPERATURE TEST PLUGS

A. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

B. Application: Use extended length plugs to clear insulated piping.

2.06 BALANCING VALVES

A. Manufacturers:
   2. ITT Bell & Gossett; ______: www.bellgossett.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Size 2 inch and Smaller:
   1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded connections.
   2. Metal construction materials consist of bronze, brass, or stainless steel.
   3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.

C. Size 2.5 inch and Larger:
   1. Provide ball, globe, or butterfly style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged or grooved connections.
   2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
   3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.

2.07 PRESSURE REDUCING VALVES

A. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 23 2113.

B. Materials of Construction:
   1. Valve Body: Constructed of bronze, cast iron, brass, iron, or ________.
   2. Internal Components: Construct of stainless steel, brass, or ________ and engineered plastics, composition material, or ________.

C. Connections:
   1. NPT threaded: 0.50 inch, 0.75 inch, or ___ inch.

D. Provide integral check valve and strainer.

E. Maximum Inlet Pressure: 100 psi.

F. Maximum Fluid Temperature: 180 degrees F.

G. Operating Pressure Range: Between 10 psi and 25 psi.
2.08 GLYCOL-WATER SOLUTION
   A. Glycol-water Solution:
      1. Inhibited ethylene glycol and water solution mixed 50 percent glycol - 50 percent water, suitable for operating temperatures from minus 40 degrees F to 250 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install specialties in accordance with manufacturer's instructions.
   B. Provide manual air vents at system high points and as indicated.
   C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
   D. Provide air separator on suction side of system circulation pump and connect to expansion tank.
   E. Support pump fittings with floor mounted pipe and flange supports.
   F. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
   G. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
   H. Clean and flush glycol system before adding glycol solution. Refer to Section 23 2500.
   I. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.
   J. Perform tests determining strength of glycol and water solution and submit written test results.

3.02 MAINTENANCE
   A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.
   B. Provide service and maintenance of glycol system for one year from date of Substantial Completion at no extra charge to Owner.
   C. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Report findings in detail in writing, including analysis and amounts of glycol or water added.
   D. Explain corrective actions to Owner's maintenance personnel in person.

3.03 SCHEDULES:
   A. See Contract Drawings.

END OF SECTION
SECTION 23 2123 - HYDRONIC PUMPS

PART 1  GENERAL

1.01  SECTION INCLUDES

A. In-line circulators.

B. Vertical in-line pumps.

1.02  RELATED REQUIREMENTS

A. Section 22 0513 - Common Motor Requirements for Plumbing Equipment.

B. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

C. Section 23 2113 - Hydronic Piping.

D. Section 23 2114 - Hydronic Specialties.

1.03  REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2014.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.


1.04  PERFORMANCE REQUIREMENTS

A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.05  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and/or support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

E. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.06  QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright.
1.07 REGULATORY REQUIREMENTS

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Fluid Technology, Inc; ______ : www.armstrongfluidtechnology.com/#sle.
B. Bell & Gossett, a Xylem Inc. brand; ______ : www.bellgossett.com.
D. Grundfos.
E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 HVAC PUMPS - GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
B. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to Authority Having Jurisdiction as suitable for the purpose specified and indicated.

2.03 IN-LINE CIRCULATORS

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psi maximum working pressure.
B. Casing: Cast iron, with flanged pump connections.
C. Impeller: Non-ferrous keyed to shaft.
D. Bearings: Oil-lubricated bronze sleeve.
E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.
F. Seal: Mechanical seal, 225 degrees F maximum continuous operating temperature.

2.04 VERTICAL IN-LINE PUMPS

A. Type: Vertical, single stage, close coupled, radially or horizontally split casing, for in-line mounting, for 175 psi working pressure.
B. Casing: Cast iron, with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.
C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.
D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.
E. Seal: Mechanical seal, 225 degrees F maximum continuous operating temperature.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.
3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

D. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Lubricate pumps before start-up.

3.03 SCHEDULES

A. See Contract Drawings.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials.
   1. System cleaner.
   2. Closed system treatment (water).

B. Cleaning of piping systems.

C. Chemical treatment (30% propylene glycol solution).

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: Owner furnished treatment equipment.

B. Section 23 2113 - Hydronic Piping.

C. Section 23 2114 - Hydronic Specialties.

D. Section 23 0913 - Instrumentation and Control Devices for HVAC.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Sufficient chemicals for treatment and testing during required maintenance period.

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. Company shall have local representatives with water analysis laboratories and full time service personnel.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS


D. Substitutions: See Section 01 6000 - Product Requirements.
2.02 MATERIALS

A. System Cleaner:
   1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodium tripoly phosphate and sodium molybdate.
   2. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite or microbiocides such as quarternary ammonia compounds, tributyltin oxide, methylene bis (thiocyanate).

B. Glycol Treatment (Water):
   1. Manufacturers:
      a. Dow; Model Dowfrost propylene-glycol (96%).
      b. Interstate Chemical Company.
      c. Substitutions: See Section 01600 - Product Requirements.

C. Closed System Treatment (Water):
   1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
   2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium tolyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
   3. Conductivity enhancers; phosphates or phosphonates.

2.03 BY-PASS FEEDER

A. Manufacturers:
   2. Calgon
   3. Mogul
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. 2 quart quick opening cap for working pressure of 175 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Concentration:
   1. System cleaner shall be alkaline, containing sequestrants and dispersants, and be applied to provide at least one pound of trisodium phosphate, or equivalent, per 100 system gallons.

B. Hot Water Heating Systems:
   1. Apply heat while circulating, slowly raising the system temperature to 160 degrees F and maintain for eight hours minimum. Then, remove heat and circulate down to 75 degrees F or less. Drain system as quickly as possible and refill with clean water. Repeat until system water TDS (total dissolved solids) equals the city (makeup) water TDS.
   2. Alternately circulate at room temperature for 24 continuous hours. Drain, flush, refill, until system water TDS equals the city water TDS.
   3. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
4. Circulate for 6 hours at design temperatures, then drain.
5. Refill with clean water and repeat until system cleaner is removed.

C. Use neutralizer agents on recommendation of system cleaner supplier and approval of Engineer.

D. Remove, clean, and replace strainer screens.

E. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide bypass feeder across pump for all systems.

3.04 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Install 30% ethylene glycol treatment for the hot water heating system. Circulate to exclude all air.

3.05 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
   1. Provide minimum of one hour of instruction for two people.
   2. Have operation and maintenance data prepared and available for review during training.
   3. Conduct training using actual equipment after treated system has been put into full operation.

3.06 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

C. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

D. Provide laboratory and technical assistance services during this maintenance period.

E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION
SECTION 23 5100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1  GENERAL

1.01  SECTION INCLUDES

   A.  Double wall metal stacks.

1.02  REFERENCE STANDARDS


   B.  ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

   C.  ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

   D.  NEMA MG 1 - Motors and Generators; 2014.


   G.  NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.


   J.  SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

   K.  UL 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances; Current Edition, Including All Revisions.


   M.  UL 441 - Standard for Gas Vents; Current Edition, Including All Revisions.

   N.  UL 641 - Type I Low Temperature Venting Systems; Current Edition, Including All Revisions.


1.03  DEFINITIONS

   A.  Breeching:  Vent Connector.

   B.  Chimney:  Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

   C.  Vent:  That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

   D.  Vent Connector:  That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.
1.04 DESIGN REQUIREMENTS

A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

C. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory built units are used.

D. Manufacturer's Instructions: Include installation instructions, and indicate assembly, support details, and connection requirements.

E. Manufacturer's Certificate: Certify that refractory lined metal stacks meet or exceed specified requirements.

1.06 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. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum ______ years documented experience, and approved by manufacturer.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for installation of natural gas burning appliances and equipment.

B. Conform to applicable code for installation of oil burning appliances and equipment.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal-Fab, Inc; IPIC-2: www.mtlfab.com.


C. Van-Packer Co; DW+2: www.vpstack.com

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BREECHINGS, CHIMNEYS, AND STACKS - GENERAL REQUIREMENTS

2.03 DOUBLE WALL METAL STACKS

A. Provide double wall metal stacks, tested to UL 103 and UL listed with positive pressure rating, for use with building heating equipment, in compliance with NFPA 211.
B. Fabricate with 2” minimum air space between walls. Construct inner jacket of 20 gage ASTM A666, Type 316 stainless steel. Construct outer jacket of Type 316 stainless steel 24 gage for sizes 10 inches to 24 inches and 20 gage for sizes 28 inches to 48 inches.

C. Accessories, UL labeled:
   1. Hardware: All hardware and accessories shall be 304 or 316 stainless steel.
   2. Stack Cap: Consists of conical rainshield with inverted cone for partial rain protection with low flow resistance.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 54.

C. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

D. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA (DCS) for equivalent duct support configuration and size.

E. Install concrete inserts for support of breechings, chimneys, and stacks in coordination with formwork.

F. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

H. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement. Connect base section to foundation using anchor lugs.

I. Level and plumb chimney and stacks.

J. Clean breechings, chimneys, and stacks during installation, removing dust and debris.

K. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings, breeching insulation, chimneys, or stacks.

END OF SECTION
PART I GENERAL

1.01 SECTION INCLUDES

A. Boilers.
B. Controls and boiler trim.
C. Hot water connections.
D. Chimney connection.

1.02 RELATED REQUIREMENTS

A. Section 23 2114 - Hydronic Specialties.
B. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

B. ASME (BPV I) - Boiler and Pressure Vessel Code, Section I - Rules for Construction of Power Boilers; The American Society of Mechanical Engineers; 2010.
C. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2010.
D. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2010.
G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 PERFORMANCE REQUIREMENTS

A. Performance rating shall be in accordance with Hydronics Institute BTS-2000.
B. Minimum Efficiency: Minimum 80 percent from 30 to 100 percent of full load firing rate, certified by factory tests.
C. Capacity:
   1. Fluid: Hot water.
   2. Input: 1,679,000 Btu/hr.
   3. Output: 1,139,000 Btu/hr.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
B. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.
C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

D. Manufacturer's Inspection Report: Submit authorized boiler inspection prior to shipment.

E. Manufacturer's Field Reports: Indicate that specified performance and efficiency has been met or exceeded; at minimum provide report of the following combustion tests: boiler firing rate, over fire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for internal wiring of factory wired equipment.

B. Conform to ASME (BPV IV) for construction of boilers.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Construct boiler and accessories to meet FM Global requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide a one year warranty from start-up or eighteen (18) months from ship date on entire boiler package.

PART 2 PRODUCTS

2.01 MANUFACTURERS


D. Substitutions: See Section 01 6000 - Product Requirements.
2.02 MANUFACTURED UNITS

A. The boiler shall be a three-pass wetback horizontal firebox type boiler with five (5) square feet of fireside heating surface per rated boiler horsepower. Furnace volume shall not be less than 27.4 cubic feet. It shall be mounted on a heavy steel frame with integral forced draft burner and burner controls. The complete packaged boiler is approved as a unit by Underwriters Laboratories and shall bear the UL label.

B. Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

C. The boiler shall be built to comply with the requirements of ASME CSD-1 and Factory Mutual.

2.03 PRESSURE VESSEL

A. Minimum boiler construction shall provide for 11 gauge tubes, flared and rolled to ½” thick tube sheets. The pressure vessel is built in strict accordance with ASME code section IV, to latest year of issue and addendas. Manufacturer’s quality control department in conjunction performs all tests of materials and fabrication with a licensed authorized inspector in accordance with the N.B.I.C. code. Completed pressure vessel is post weld heat-treated where required and shop hydrostatically tested to ASME code requirements, and issued a national board number and an ASME H-2 data report which is furnished to the purchaser at time of shipment.

B. The boiler shall be furnished with one (1) 3” x 4” handhole in the boiler shell and six (6) 2”, 3,000 Psi extra heavy couplings located as follows: One (1) at each corner at bottom, one (1) at right rear in turn-around chamber, one (1) at left side of shell above furnace. Lifting lugs must be located on top of the boilers, front and back.

C. Doors are to be sealed with heat resistant gaskets and fastened using lugs and brass nuts. Design doors so front tube sheets and all flues are fully accessible for inspection and cleaning when doors are open.

D. Provide a baffle in the boiler shell below the main (steam/water) outlet. Provide a baffle at the (feedwater/hot water return) inlet to temper the water.

E. The exhaust gas vent shall be located at the rear of the boiler and be capable of supporting 1,000 lbs.

F. Boilers up to and including 60 hp shall have detachable (bolt on) front and rear smoke box assemblies for ease of removal. All bolted attachments on smoke boxes and doors must use brass nuts. Provide for a full width bolted rear smoke box access plate for inspection and cleaning of the rear smoke box assembly. Smoke box, cover, and stack connection shall be 316 stainless steel.

G. Provide 316 stainless steel ¾” rear smoke box drain connection.

2.04 BOILER SHELL

A. Construct applicable ASME Boiler and Pressure Vessels Code for allowable working pressure of 30 psi water.

B. Provide two lifting eyes on top of boiler.

C. Provide adequate tappings, observation ports, removable panels and access doors for entry, cleaning, and inspection.

D. Insulate casing with readily removable glass fiber blanket insulation covered by sectional performed sheet metal jacket. Unit(s) shall be provided with minimum 2” thick mineral wool insulation. The boiler shall be lagged with 22-gauge thick carbon steel jacket. The boiler jacket shall feature a bottom side primer of polyurethane resin base coat of .2 mil. dry finish thickness and a final coat of .4 mil. dry thickness of valspar. The top side (exterior) of the jacket shall feature a primer of .3 mil. Dry
finish thickness and a final coat of .8 mil. dry finish thickness of valspar polyurethane resin base paint. The application of the paint is to be automated roller type and is to be oven dried. The exterior finish of the boiler jacket shall have a limited warranty by the manufacturer for five (5) years from the date of manufacture for chalking, fade, peeling, or blistering.

E. Factory paint boiler, base, and other components with hard finish silicone enamel.

2.05 HOT WATER BOILER TRIM

A. Low Water Cut-off: With drain valve and manual reset to automatically prevent burner operation whenever boiler water falls below safe level. McDonnell- Miller #63M with #TC-4 test-n-check valves.

B. Temperature Controls:
   1. Auto reset type shall control burner on-off to maintain temperature.
   2. Auto reset type shall control burner firing rate to maintain temperature.
   3. Manual reset type shall control burner to prevent boiler water temperature from exceeding safe system water temperature.

C. Pressure Control: Fixed setting type shall control burner to ensure minimum operating pressure.

D. ASME rated pressure relief valves.

E. Combination pressure and thermometer gage.

F. Trim as required by ASME CSD-1 codes.

2.06 FUEL BURNING SYSTEM

A. Manufacturers:
   1. Webster Model JB1-GG fully modulating, dual fuel burner (NO SUBSTITUTION) designed to burner Methane gas as a main fuel and have natural gas as a back-up fuel with automatic changeover.

B. General: Forced draft automatic burner integral with front head of boiler designed to burn natural gas and methane/digester gas and maintain fuel-air ratios automatically.
   1. Blower: Statically and dynamically balanced to supply combustion air; direct connected to motor.

C. Combination Methane/Digester Gas--Natural Gas: Burner for methane gas, and natural gas built as single unit, without need of interchanging.
   1. Natural Gas Burner Piping: Include on unit complete gas train including high and low gas pressure switches, plug valve, and gas pressure regulator.
   2. Methane/Digester Gas Burner Piping: Include on unit complete gas train including high and low gas pressure switches, plug valve, and gas pressure regulator.
   3. All digester gas train piping shall be 304L stainless steel.

2.07 CONTROL PANEL

A. Mount NEMA 250, Type 1 hinged metal panel on boiler, containing electronic combustion control-Honeywell RM7800L, blower motor starter, automatic-manual firing selection switch, methane/digester gas selector switch, and control switches. Include indicating lights for major operations, numbered terminal strips, numbered wiring, engraved nameplates and control circuit transformer. Provide auto fuel changeover with necessary timers to automatically switch from methane gas to natural gas when methane gas is not available.
B. Electronic combustion control to control ignition, starting and stopping of burner, and provide both
pre-combustion purge and post combustion purge. Burner to shut down in event of ignition, pilot, or
main flame failure. Interlock to shut down burner upon combustion air pressure drop.

C. Electronic detector to prevent primary fuel valves from opening until pilot flame is established.

2.08 SOURCE QUALITY CONTROL

A. Provide factory tests to check construction, controls, and operation of unit.

B. Provide authorized boiler inspection prior to shipment; submit copy of inspection report to Engineer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA
54 and applicable codes.

C. Install boiler on concrete housekeeping base, sized minimum 4 inches larger than boiler base. Refer
to structural notes on Drawing Sheet 4.1 for concrete requirements.

D. Provide piping connections and accessories as indicated; refer to Section 23 2114.

E. Pipe relief valves to within 6 inches of floor in safe location.

F. Pipe relief valves to nearest floor drain.

G. Provide for connection to electrical service. Refer to Section 26 2717.

3.02 SCHEDULES

A. See Boiler Schedule on Project Drawings.

END OF SECTION
SECTION 260000 – SUMMARY OF WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

The following specification sections are included as part of this specification package.

1. Section 260000, Summary of Work
2. Section 260100, Basic Procedural Methods
3. Section 260500, Basic Electrical Materials and Methods
4. Section 260600, Grounding and Bonding
5. Section 260750, Electrical Identification
6. Section 261200, Conductors and Cables
7. Section 261300, Raceways and Boxes
8. Section 261400, Wiring Devices
9. Section 262913.03, Magnetic Motor Controllers
10. Section 264100, Enclosed Switches and Circuit Breakers
11. Section 264910, Fuses

A. The Project consists of; providing all necessary electric materials, concrete and other items as required for the successful installation of a new Boiler system in the existing Vermillion wastewater treatment plant as shown on the construction documents.

1. Project Location: Vermillion, SD
2. Owner: City of Vermillion

B. Contract Documents, were prepared for the project by pe Group, Inc., 225 North Main Ave., PO Box 567, Parker, SD 57053-0567.

C. The Work will be constructed under a single prime contract.

D. Use of the Site: Limit use of premises to areas indicated. Do not disturb portions of the site beyond the areas indicated.

1. Allow for Owner occupancy and use.
2. Keep driveways and entrances clear. Do not use these areas for parking or material storage. Schedule deliveries to minimize on-site storage of materials and equipment.

PART 2 - PRODUCTS (Not Applicable)
PART 3 - EXECUTION

3.1 SCOPE OF WORK

1. Provide all electrical material and labor necessary for the installation of a new boiler system at the WWTF in Vermillion, SD. This shall include, but not be limited to, the following:

   a. New motor connections, new motor disconnects, branch circuit wiring, raceway, breakers, etc.

PART 4 - SPECIAL INFORMATION/REQUIREMENT

4.1 RESOLUTION OF DISCREPANCIES

1. If discrepancies are found to exist between the project drawings and project specifications, the more restrictive and obligatory document shall prevail as the project requirement.

2. If discrepancies are found to exist between the requirements of the; Electrical Specifications (Division 26), the Mechanical Specifications (Division 22 and 23), the Architectural Specifications (Division 1 through Division 14 inclusive), and/or the Specification Front End Documents (Bidding Requirements-Agreement, Bonds, and Closeout Documents-Project Forms-Conditions of the Contract), the more restrictive and obligatory document/section(s) shall prevail as the project requirement.

END OF SECTION 260000
SECTION 260100 – BASIC PROCEDURAL METHODS

This Section of Specification contains several subsections. These subsections are listed below:

I. REQUEST FOR PRIOR APPROVAL
II. SHOP DRAWINGS AND PRODUCT DATA
III. REFERENCE STANDARDS AND DEFINITIONS
IV. PROJECT RECORD DOCUMENTS
V. OPERATION AND MAINTENANCE DATA
VI. WARRANTIES

I. REQUEST FOR PRIOR APPROVAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The only products and manufacturers allowed to be used under this contract are those that are specified, those listed as approved equals in the contract documents or those given “prior approval” during the bidding stage of this project.

B. This Section includes administrative and procedural requirements pertaining to requests for prior approval to bid and utilize products that are not specifically specified or listed as an equal in the original construction documents.

1.3 SUBMITTAL PROCEDURES

A. Manufacturers whose product is not specified or specifically listed on the plans or in the specifications are allowed to submit information on a product that they would like to be considered as an equal to those specified or listed. By submitting this information for consideration, the product representative is indicating that the product being presented for consideration equals or exceeds the specified product in quality, performance and operating parameters. The procedure for this submittal is listed below.

1. Submit literature on product that is to be considered for prior approval. This literature shall include catalog cuts with all pertinent technical specifications, dimensions and pictures for the product.

2. Literature shall be submitted so that engineer receives it no later that 8 days prior to bid date.

3. All approvals will be in the form of an addendum issued to all plan holders.
4. If product is not listed as approved in an addendum prior to opening of the bid, the contractor shall provide the product(s) specified or listed as equals in the original contract drawings or specifications.

II. SHOP DRAWINGS, AND PRODUCT DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the submittal of shop drawings.

B. Shop Drawings include, but are not limited to, the following:

1. Fabrication drawings.
2. Installation drawings.
5. Templates and patterns.
7. Wiring Diagrams

C. Standard generic information prepared without specific reference to the project is not shop drawings.

D. Product Data include, but are not limited to, the following:

1. Manufacturer's product specifications.
2. Manufacturer's installation instructions.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
7. Printed performance curves.
8. Operational range diagrams.
10. Standard product operating and maintenance manuals.
11. Field samples.
1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal to the Engineer sufficiently in advance of scheduled performance of related construction activities to avoid delay.

1. Coordinate each submittal with other submittals and related activities that require sequential activity including:
   a. Testing.
   b. Purchasing.
   c. Fabrication.
   d. Delivery.

2. Coordinate transmittal of different types of submittals for the same element of the Work and different elements of related parts of the Work to avoid delay in processing because of the Architect's need to review submittals concurrently for coordination.
   a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
   a. Allow 2 weeks for the Engineer's initial review of each submittal. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals. The Engineer will advise the Contractor when a submittal being processed must be delayed for coordination.
   b. Where necessary to provide an intermediate submittal, process the intermediate submittal in the same manner as the initial submittal.
   c. Allow 2 weeks for reprocessing each submittal.
   d. The Engineer will not authorize an extension of time because of the Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification.

1. Indicate name of the firm or entity that prepared each submittal on the label or title block.
2. Provide a space approximately 4 by 5 inches (100 by 125 mm) on the label or beside the title block to record the Contractor's review and approval markings and the action taken by the Engineer.

3. Include the following information on the label for processing and recording action taken.
   a. Project name.
   b. Date.
   c. Name and address of the Engineer.
   d. Name and address of the Contractor.
   e. Name and address of the subcontractor.
   f. Name and address of the supplier.
   g. Name of the manufacturer.
   h. Number and title of appropriate Specification Section.
   i. Drawing number and detail references, as appropriate.
   j. Similar definitive information as necessary.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal by use of a transmittal form. The Engineer will return submittals received from sources other than the Electrical Contractor.

   1. Record relevant information and requests for data on the transmittal form. On the form, or an attached separate sheet, record deviations from requirements of the Contract Documents, including minor variations and limitations.

   2. Include the Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

1.4 SHOP DRAWINGS

   A. Submit newly prepared information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.

   1. Include the following information on Shop Drawings:
      a. Dimensions.
      b. Identification of products and materials included.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.

   2. Submit Coordination Drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.

   3. Do not allow Shop Drawing copies that do not contain an appropriate final stamp or other marking indicating the action taken by the Engineer to be used in construction.
4. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).

5. Submittal: Submit 10 black-line prints for the Engineer's review.
   a. The Contractor shall mark up and retain one of the prints returned as a "Record Document."

1.5 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.

1. Where Product Data includes information on several similar products, some of which are not required for use on the Project, mark copies clearly to indicate which products are applicable.

2. Where Product Data must be specially prepared for required products, materials, or systems because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.

3. Include the following information in Product Data:
   a. Manufacturer's printed recommendations.
   b. Compliance with recognized trade association standards.
   c. Compliance with recognized testing agency standards.
   d. Application of testing agency labels and seals.
   e. Notation of dimensions verified by field measurement.
   f. Notation of coordination requirements.

4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 ENGINEER'S ACTION

A. Except for submittals for the record or for information, where action and return of submittals is required, the Engineer will review each submittal, mark to indicate the action taken, and return.

1. Compliance with specified characteristics is the Contractor's responsibility and not considered part of the Engineer's review and indication of action taken.

B. Action Stamp: The Engineer will stamp each submittal with a uniform, action stamp. The Engineer will mark the stamp appropriately to indicate the action taken, as follows:
1. Final Unrestricted Release: Where submittals are marked "No Exceptions Noted," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final acceptance will depend on that compliance.

2. Final-but-Restricted Release: When submittals are marked "See Attached Comments," the Work covered by the submittal may proceed provided it complies with both the Engineer's notations or corrections on the submittal and requirements of the Contract Documents. Final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked "Rejected," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the Engineer's notations. Resubmit without delay. Repeat if necessary to obtain a different action mark.
   a. Do not permit submittals marked "Rejected" to be used at the Project Site or elsewhere where construction is in progress.

III. REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Engineer, requested by the Engineer, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the 26-division format and CSI/CSC's "MasterFormat" numbering system.

B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe
responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different but apparently equal to the Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated names. Names and addresses are subject to change.
and are believed, but are not assured, to be accurate and up-to-date as of the date of the
Contract Documents.

AIA The American Institute of Architects
1735 New York Ave., NW
Washington, DC 20006-5292 (202) 626-7300

ANSI American National Standards Institute
11 West 42nd St., 13th Floor
New York, NY 10036-8002 (212) 642-4900

ETL ETL Testing Laboratories, Inc.
c/o ITS/Warnock Hersey
P.O. Box 2040
3933 U.S. Route 11, Industrial Park
Cortland, NY 13045 (800) 345-3851
(607) 753-6711

ICEA Insulated Cable Engineers Association, Inc.
P.O. Box 440
South Yarmouth, MA 02664 (508) 394-4424

IEC International Electrotechnical Commission
(Available from ANSI)
11 West 42nd St., 13th Floor
New York, NY 10036-8002 (212) 642-4900

IEEE Institute of Electrical and Electronic Engineers
345 E. 47th St.
New York, NY 10017-2394 (212) 705-7900

IESNA Illuminating Engineering Society of North America
120 Wall St., 17th Floor
New York, NY 10005-4001 (212) 248-5000

NECA National Electrical Contractors Association
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814-5372 (301) 657-3110

NEI National Elevator Industry
185 Bridge Plaza North, Suite 310
Fort Lee, NJ 07024 (201) 944-3211
<table>
<thead>
<tr>
<th>Agency</th>
<th>Address</th>
<th>Phone Numbers</th>
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<tbody>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
<td>(202) 457-8400</td>
</tr>
<tr>
<td></td>
<td>2101 L St., NW, Suite 300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20037</td>
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<tr>
<td>NETA</td>
<td>InterNational Electrical Testing Association</td>
<td>(303) 697-8441</td>
</tr>
<tr>
<td></td>
<td>P.O. Box 687</td>
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<tr>
<td></td>
<td>Morrison, CO 80465-1526</td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
<td>(800) 344-3555</td>
</tr>
<tr>
<td></td>
<td>One Batterymarch Park</td>
<td>(617) 770-3000</td>
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<tr>
<td></td>
<td>P.O. Box 9101</td>
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<td></td>
<td>Quincy, MA 02269-9101</td>
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<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
<td>(202) 366-4000</td>
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<td></td>
<td>(U.S. Department of Transportation)</td>
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<td></td>
<td>800 Independence Ave., SW</td>
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<td></td>
<td>Washington, DC 20591</td>
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<tr>
<td>FCC</td>
<td>Federal Communications Commission</td>
<td>(202) 418-0126</td>
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<td>1919 M St., NW</td>
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<td></td>
<td>Washington, DC 20554</td>
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<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
<td>(301) 443-1544</td>
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<tr>
<td></td>
<td>5600 Fishers Lane</td>
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<td></td>
<td>Rockville, MD 20857</td>
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<tr>
<td>GSA</td>
<td>General Services Administration</td>
<td>(202) 708-5082</td>
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<td>F St. and 18th St., NW</td>
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<tr>
<td></td>
<td>Washington, DC 20405</td>
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<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
<td>(301) 975-2000</td>
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<td>(U.S. Department of Commerce)</td>
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<tr>
<td></td>
<td>Building 101, #A1134</td>
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<td></td>
<td>Rte. I-270 and Quince Orchard Rd.</td>
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<td></td>
<td>Gaithersburg, MD 20899</td>
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<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
<td>(202) 219-8148</td>
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<td></td>
<td>(U.S. Department of Labor)</td>
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<tr>
<td></td>
<td>200 Constitution Ave., NW</td>
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<td></td>
<td>Washington, DC 20210</td>
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1.5 GOVERNING REGULATIONS AND AUTHORITIES

A. Copies of Regulations: Obtain copies of the following regulations and retain at the Project site to be available for reference by parties who have a reasonable need:

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

IV. PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents.

B. Project Record Documents required include the following:

1. Marked-up copies of Contract Drawings.
2. Marked-up copies of Shop Drawings.
3. Newly prepared drawings.
5. Marked-up Product Data submittals.
6. Field records for variable and concealed conditions.
7. Record information on Work that is recorded only schematically.

1.3 RECORD DRAWINGS

A. Markup Procedure: During construction, maintain a set of blue- or black-line white prints of Contract Drawings and Shop Drawings for Project Record Document purposes.

1. Mark these Drawings to show the actual installation where the installation varies from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to, the following:
a. Revisions to details shown on the Drawings.
b. Locations and depths of underground utilities.
c. Revisions to routing of piping and conduits.
d. Revisions to electrical circuitry.
e. Actual equipment locations.
f. Locations of concealed internal utilities.
g. Changes made by change order or Construction Change Directive.
h. Changes made following the Architect/Engineer’s written orders.
i. Details not on original Contract Drawings.

2. Mark record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

3. Mark record sets with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

4. Mark important additional information that was either shown schematically or omitted from original Drawings.

5. Note Construction Change Directive numbers, alternate numbers, change-order numbers, and similar identification.

B. Responsibility for Markup: The individual or entity who obtained record data, whether the individual or entity is the Installer, subcontractor, or similar entity, shall prepare the markup on record drawings.

1. Accurately record information in an understandable drawing technique.

2. Record data as soon as possible after obtaining it. Record and check the markup prior to enclosing concealed installations.

3. At time of Substantial Completion, submit record drawings to the Architect for the Owner’s records. Organize into sets and bind and label sets for the Owner’s continued use.

1.4 RECORD SPECIFICATIONS

A. During the construction period, maintain 3 copies of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.

1. Mark the Specifications to indicate the actual installation where the installation varies from that indicated in Specifications and modifications issued. Note related project record drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later.
a. In each Specification Section where products, materials, or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.

b. Record the name of the manufacturer, supplier, installer, and other information necessary to provide a record of selections made and to document coordination with record Product Data submittals and maintenance manuals.

c. Note related record Product Data, where applicable. For each principal product specified, indicate whether record Product Data has been submitted in maintenance manual instead of submitted as record Product Data.

2. Upon completion of markup, submit record Specifications to the Architect for the Owner's records.

3. Each prime contractor is responsible for marking up Sections that contain its own Work.

   a. The Contractor for General Construction is responsible for collecting marked-up record Sections from each of the other prime contractors. The Contractor for General Construction is also responsible for collating these Sections in proper numeric order with its own Sections to form a complete set of record Specifications.

   b. The Contractor for General Construction is responsible for submitting the complete set of record Specifications as specified.

1.5 RECORD PRODUCT DATA

   A. During the construction period, maintain one copy of each Product Data submittal for Project Record Document purposes.

      1. Mark Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation.

      2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

      3. Note related Change Orders and markup of record Drawings, where applicable.

      4. Upon completion of markup, submit a complete set of record Product Data to the Architect for the Owner's records.

      5. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data.
PART 3 - EXECUTION

3.1 RECORDING

A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

V. OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:

1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.

2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.

3. Instruction of the Owner's operating personnel in the operation and maintenance of building systems and equipment.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.

2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the Owner's operation and maintenance personnel.
1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:

1. Submit one (1) copy of data in final form at least 15 days before final inspection. The Engineer will return this copy after final inspection, with comments.

2. After final inspection, make corrections or modifications to comply with the Engineer’s comments. Submit the specified number of copies of each approved manual within 15 days of receipt of the Engineer’s comments.

B. Form of Submittal: Prepare operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.

   a. Where 2 or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

   b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, date, and subject matter covered. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.

3. Protective Plastic Jackets: Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

4. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.
5. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.
   
   a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
   
   b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:
   
   a. Name of manufacturer.
   b. Model number.
   c. Serial number of each component.

5. Operating instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of Product Data, supplemented by Drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:

   a. Subject matter covered by the manual.
   b. Name and address of the Project.
   c. Date of submittal.
d. Name, address, and telephone number of the Contractor.
e. Name and address of the Architect.
f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.

3. General Information: Provide a general information Section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or Installer and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.

4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.

7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.
1.8 INSTRUCTIONS FOR THE OWNER'S PERSONNEL

A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.

2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

VI. WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

   1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

B. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.

   1. Provide copies of each required warranty, as necessary, for inclusion in each required O&M manual.

END OF SECTION 260100
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SECTION 260500 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Raceways.
   2. Building wire and connectors.
   4. Electrical identification.
   5. Cutting and patching for electrical construction.

1.2 SUBMITTALS

A. Product Data: For utility company electricity-metering components.

B. Shop Drawings: Dimensioned plans and sections or elevation layouts and single-line diagram of electricity-metering component assemblies specific to this Project.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.

C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
PART 2 - PRODUCTS

2.1 RACEWAYS

A. IMC: Intermediate metal conduit; ANSI C80.6, zinc-coated steel, with threaded fittings.
B. GRA: Galvanized Rigid Aluminum conduit.
C. LFMC: Liquidtight flexible metal conduit; zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
D. RMC: Rigid metal conduit; galvanized rigid steel; ANSI C80.1.
E. RNC: Rigid nonmetallic conduit; NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
F. Raceway Fittings: Specifically designed for raceway type with which used.

2.2 WIRES, CABLES, AND CONNECTIONS

A. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
B. Conductors, Larger Than No. 10 AWG: Stranded copper.
C. Insulation: Thermoplastic, rated 600 V, 75 deg C minimum, Type THW, THWN.
D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

A. Refer to Wiring Methods Schedule on project drawings for proper supporting materials.
B. Nonmetallic Slotted Channel and Angle: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (203 mm) o.c., in at least one surface. Strength rating to suit structural loading.
C. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.
   1. Materials: Same as channels and angles, except metal items may be stainless steel.
D. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized rigid Aluminum, plain ends.
E. Expansion Anchors: Stainless-steel wedge or sleeve type.
F. Toggle Bolts: Stainless-steel springhead type.

2.4 ELECTRICAL IDENTIFICATION

A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).

C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
   1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
   2. Embedded continuous metallic strip or core.
   3. Printed legend that indicates type of underground line.

F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.
   1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
   2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch (1-mm), galvanized-steel backing. 1/4-inch (6-mm) grommets in corners for mounting.

H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION
A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. WIRING METHODS SCHEDULE: See wiring methods schedule included in the project drawings for acceptable wiring methods to be used on this project. Note: the information on this chart supersedes any other information pertaining to conduit and supports found in the project documents.

3.2 RACEWAY AND CABLE INSTALLATION

A. Keep legs of raceway bends in the same plane and keep straight legs of offsets parallel.

B. Use RMC elbows where RNC turns out of slab.

C. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or woven polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wires.

D. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inches (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

3.3 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. Application: Use wiring methods specified below to the extent permitted by applicable codes as interpreted by authorities having jurisdiction.

B. Exposed Feeders: Insulated single conductors in raceway.

C. Concealed Feeders in Ceilings and Walls: Insulated single conductors in raceway.

D. Concealed Feeders in Concrete and below Floors on Grade: Insulated single conductors in raceway.

E. Exposed Branch Circuits: Insulated single conductors in raceway.

F. Concealed Branch Circuits in Ceilings and Walls: Insulated single conductors in raceway.

G. Concealed Branch Circuits in Concrete and below Floors on Grade: Insulated single conductors in raceway.
H. Underground Feeders and Branch Circuits: Insulated single conductors in raceway.

I. Remote-Control Signaling and Power-Limited Circuits, Classes 1, 2, and 3: Insulated conductors in raceway unless otherwise indicated.

3.4 WIRING INSTALLATION

A. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

3.5 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Refer to Wiring Methods Schedule.

3.6 SUPPORT INSTALLATION

A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.

C. Support individual horizontal single raceways with separate metal straps.

D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

E. Seal around sleeves with fire caulking/sealant material on both sides of wall/ceiling. Mortar may be used for seals in non-fire rated walls/ceilings

F. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:

1. Masonry: Toggle bolts on hollow block and expansion bolts on solid block.

2. New Concrete: Concrete inserts with machine screws and bolts.


4. Light Steel: Sheet-metal screws.

5. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.
3.7 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

G. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

H. For Panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each breaker. Do NOT use plan room numbers on schedules. Obtain proper terminology for room from owner and utilize it on schedules.

I. Utilize permanent marking methods on each j-box to identify the circuits that are contained in the box. Black permanent marker is acceptable for this method.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION 260500
SECTION 260600 – GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.2 SUBMITTALS

A. Product Data: For ground rods and chemical rods.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Apache Grounding/Erico Inc.
2. Boggs, Inc.
3. Chance/Hubbell.
4. Copperweld Corp.
5. Dossert Corp.
7. Framatome Connectors/Burndy Electrical.
8. Galvan Industries, Inc.
10. Ideal Industries, Inc.
11. ILSCO.
2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Conductor Material: Copper only.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

E. Bare, Solid-Copper Conductors: ASTM B 3.

F. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.

G. Bare, Tinned-Copper Conductors: ASTM B 33.

H. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

I. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

J. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

K. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.

L. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Bolted type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In all raceways, use insulated equipment grounding conductors.

C. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
1. Install insulated equipment grounding conductors in feeders and branch circuits.

2. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

3. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

4. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

5. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install an insulated equipment grounding conductor to each electric water heater, heat-tracing, and anti-frost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

E. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

F. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.


5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486.

10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.2 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81. Provide a report detailing the testing method and results.

END OF SECTION 260600
SECTION 260750 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.
B. Comply with NFPA 70.
C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend over-laminated with a clear, weather- and chemical-resistant coating.
B. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.
C. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide (0.08 mm thick by 25 to 51 mm wide).
D. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
E. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- (0.4-mm-) thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
F. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

G. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch (0.05 mm) thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

H. Brass or Aluminum Tags: 2 by 2 by 0.05-inch (51 by 51 by 1.3-mm) metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS


B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers, or strong adhesive specifically made for the application.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength: 50 lb (22.3 kg) minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
B. Paint: Formulated for the type of surface and intended use.
   1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
   2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
   3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
   4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:
   1. Clean surfaces of dust, loose material, and oily films before painting.
   2. Prime surfaces using type of primer specified for surface.
   3. Apply one intermediate and one finish coat of enamel.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Labeling shall be visible on outside cover of box.
   1. Junction Boxes: Utilize black, permanent marker on cover to identify circuits located within j-box. Writing shall be neat and legible.

H. Color-Coding of Secondary Phase Conductors: Use the following colors for service feeder and branch-circuit phase conductors:
   1. 208/120-V Conductors:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
2. **480/277-V Conductors:**
   a. Phase A: Yellow.
   b. Phase B: Brown.
   c. Phase C: Orange.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch (25-mm) wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
   b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches (76 mm) from the terminal and spaced 3 inches (76 mm) apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

I. **Power-Circuit Identification:** Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
   1. Legend: 1/4-inch (6.4-mm-) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
   2. Tag Fasteners: Nylon cable ties.

J. **Apply identification to conductors as follows:**
   1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
   2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits’ voltage and phase.
   3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

K. **Apply warning, caution, and instruction signs as follows:**
   1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

L. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high lettering on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Access doors and panels for concealed electrical items.
2. Motor-control centers.
3. Disconnect switches.
4. Enclosed circuit breakers.
5. Motor starters.

M. Panelboard Identification: For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker. Do NOT use plan room numbers on schedules. Obtain proper terminology for room from owner and utilize it on schedules.

END OF SECTION 260750
SECTION 261200 – CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 REQUIREMENTS
   A. All wiring associated with this project shall be installed in raceway. No open cabling will be allowed, except as specifically noted and appliance cords.

1.3 QUALITY ASSURANCE
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES
   A. Manufacturers:

   2. General Cable Corporation.
5. Stonewall Cable Corp.
6. Belden

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper only, Conductors shall be, solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THW, THWN, XHHW, and SO complying with NEMA WC.

E. Fiber Optic Cable: Multi-mode – 67.5/125, full duplex indoor / outdoor cable. Cable shall be equivalent to Stone cable Corp. #F625-C141-BBA or as called for on project drawings.

F. Shielded cable shall be a minimum of 2 pair, #22 gauge with full shield or as called for on project drawings.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Exposed Feeders: Type THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THWN, single conductors in raceway.

C. Feeders Concealed in Concrete and below Slabs-on-Grade: Type THWN, single conductors in raceway.

D. Exposed Branch Circuits, including in Crawlspace: Type THWN, single conductors in raceway.
E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THWN, single conductors in raceway.

G. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.


I. Class 1 Control Circuits: Type THWN, in raceway.

J. Class 2 Control Circuits: Type THWN, in raceway.

3.2 IDENTIFICATION

A. Provide typed labels at each Control wire termination point. Utilize identification on label that corresponds to control drawings in order to allow for easy tracing/troubleshooting.

3.3 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

E. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods" & “Electrical Identification”.

F. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

G. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

H. Follow manufacturer recommended methods and criteria for pulling and installing shielded cable.

I. Follow manufacturer recommended methods and criteria for pulling and installing fiber optic cable.

END OF SECTION 261200
SECTION 261300 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

C. See Division 26 Section "Wiring Devices" for devices installed in boxes.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw type, steel only.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

H. LFNC (PVC) Conduit: Use gasketed fittings/bushings where conduit enters a box.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
B. RNC: NEMA TC 2, Schedule 40 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Manufacturers:
   1. Hoffman.
   2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 12.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type, flanged-and-gasketed type.

F. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. Emerson/General Signal; Appleton Electric Company.
   3. Erickson Electrical Equipment Co.
   6. O-Z/Gedney; Unit of General Signal.
   7. RACO; Division of Hubbell, Inc.
  10. Spring City Electrical Manufacturing Co.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
D.  Non-metallic Outlet, Junction and Device Boxes:  NEMA OS 2.

E.  Cast-Metal Pull and Junction Boxes:  NEMA FB 1, cast aluminum with gasketed cover.

F.  Hinged-Cover Enclosures:  NEMA 250, Type 12, with continuous hinge cover and flush latch.
   1.  Metal Enclosures:  Steel, finished inside and out with manufacturer's standard enamel.

G.  Cabinets:  NEMA 250, Type 12, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.  Hinged door in front cover with flush latch and concealed hinge.  Key latch to match panelboards.  Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6  FACTORY FINISHES

A.  Finish:  For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1  RACEWAY APPLICATION

A.  In all cases installation shall comply with Wiring Methods Schedule located on project drawings.

B.  Minimum Raceway Size:  Home runs = 3/4-inch trade size (DN 21).

C.  Refer to Wiring Methods Schedule on drawings for directions on raceway & boxes use in various areas.

3.2  INSTALLATION

A.  Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes.  Install horizontal raceway runs above water and steam piping.

B.  Complete raceway installation before starting conductor installation.

C.  Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D.  Install temporary closures to prevent foreign matter from entering raceways.

E.  Protect stub-ups from damage where conduits rise through floor slabs.  Arrange so curved portions of bends are not visible above finished slab.
F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
   1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
   2. Space raceways laterally to prevent voids in concrete.
   3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
   4. Change from non-metallic conduit to rigid steel conduit, or IMC before rising above floor.

H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
   1. Run parallel or banked raceways together on common supports.
   2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

I. Join raceways with fittings designed and approved for that purpose and make joints tight.
   1. Use insulating bushings in all conduits to protect conductors.

J. Tighten set screws of threadless fittings with suitable tools.

K. Terminations:
   1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
   2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box.
with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces or building interior to building exterior boundaries.

2. Where otherwise required by NFPA 70.

N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with LFMC (length not to exceed 36 inches). Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

O. Flexible Connections: Use maximum of 36 inches of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Install separate ground conductor across flexible connections.

P. Surface Raceways: Install a separate, green, ground conductor in all raceways containing AC/DC power conductors.

Q. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 261300
SECTION 261400 – WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Single and duplex receptacles, ground-fault circuit interrupters, and integral surge suppression units.
   3. Device wall plates.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.
C. Receptacles shall have Federal Specification grade rating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Wiring Devices:
      b. Eagle Electric Manufacturing Co., Inc.
      c. Hubbell Incorporated; Wiring Device-Kellems.
      d. Leviton Mfg. Company Inc.
      e. Pass & Seymour/Legrand; Wiring Devices Div.
2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.


D. GFCI Receptacles: Straight blade, feed-through type, Federal Specification grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 SWITCHES


C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

   2. Receptacle: NEMA WD 6, Configuration 5-15R.

2.4 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

   1. Plate-Securing Screws: Metal with head color to match plate finish.

   2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel.


   4. Material for Wet Locations: Thermoplastic or Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 FINISHES

A. Color:
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Basic Electrical Materials and Methods Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped, or typed adhesive labels with lettering on face of plate.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

C. Utilize pigtales to connect devices to circuit. Circuit shall not rely on device to maintain circuit continuity.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.

2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 261400
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SECTION 262913.03 - MAGNETIC MOTOR CONTROLLERS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   2. Combination full-voltage magnetic motor controllers.
   3. Accessories.
   4. Identification.

1.3 DEFINITIONS
A. CPT: Control power transformer.
B. MCCB: Molded-case circuit breaker.
C. MCP: Motor circuit protector.
D. NC: Normally closed.
E. OCPD: Overcurrent protective device.
F. SCCR: Short-circuit current rating.
G. SCPD: Short-circuit protective device.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
B. Shop Drawings: For each type of magnetic controller.
   1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.

3. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.

4. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Product Schedule: List the following for each enclosed controller:

1. Each installed magnetic controller type.
2. NRTL listing.
3. Factory-installed accessories.
5. SCCR of integrated unit.
6. For each combination magnetic controller include features, characteristics, ratings, and factory setting of the SCPD and OCPD.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals.

1. Include the following:
   a. Routine maintenance requirements for magnetic controllers and installed components.
   b. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
   c. Manufacturer's written instructions for setting field-adjustable overload relays.
   d. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.
1.7 FIELD CONDITIONS

A. Ambient Environment Ratings: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 23 deg F (minus 5 deg C) and not exceeding 104 deg F (40 deg C).

PART 2 - PRODUCTS

2.1 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 use.

B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL.

2.2 MANUAL MOTOR CONTROLLERS

A. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.


2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.

3. Overload Relays: NEMA ICS 2, bimetallic class as schedule on Drawings.

4. Pilot Light: [Red] <Insert color>.

2.3 COMBINATION FULL-VOLTAGE MAGNETIC MOTOR CONTROLLER

A. Description: Factory-assembled, combination full-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, SCPD and OCPD, in a single enclosure.

B. Starters shall be installed in MCC bucket construction and shall be fully compatible for installation in existing General Electric “Evolution Series E9000”.

C. Manufacturer: General Electric.
D. Standard: Comply with NEMA ICS 2, general purpose, Class A.

E. Configuration: Non-reversing.

F. Contactor Coils: Pressure-encapsulated type.
   1. Operating Voltage: Manufacturer's standard, unless indicated.

G. Control Power:
   1. For on-board control power, obtain from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
      a. Spare CPT Capacity: 100 VA.

H. Overload Relays:
   1. Solid-State Overload Relay:
      a. Switch or dial selectable for motor-running overload protection.
      b. Sensors in each phase.
      c. Class 20 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.

I. MCP Disconnecting Means:
   1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
   2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.4 ENCLOSURES
A. Starter shall be constructed in MCC bucket construction, suitable for installation in existing General Electric Evolution Series E9000 MCC line up.

2.5 ACCESSORIES
A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
   1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty or oil-tight.
a. Selector Switch: Door mounted H-O-A switch. Switch shall be furnished with contacts that indicate Hand and Auto position of switch. These contacts shall be wired in the Control System as indicated in project Control drawings.

b. Pushbutton: Door mounted Reset pushbutton.

c. Pilot Lights: Door mounted, Green LED “Running” light.

B. Motor protection built into electronic overload block.

1. Protect against Phase-failure.
2. Protect against Under/overvoltage.

2.6 IDENTIFICATION

A. Controller Nameplates: provided Engraved label on starter door indicating: Motor name, motor number, motor HP.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install starters in existing MCC line up as indicated on project Electrical sheets.

C. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

2. Visual and Mechanical Inspection:
a. Compare equipment nameplate data with drawings and specifications.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, and grounding.
d. Verify the unit is clean.
e. Inspect contactors:
   1) Verify mechanical operation.
   2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.
f. Motor-Running Protection:
   1) Verify overload element rating is correct for its application.
   2) If motor-running protection is provided by fuses, verify correct fuse rating.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:
   1) Use a low-resistance ohmmeter. Compare bolted connection resistance values with values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
   2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

3. Electrical Tests:
   a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be according to manufacturer's published data or NETA ATS Table 100.1. In the absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than those of this table or manufacturer's recommendations shall be investigated and corrected.
   b. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
   c. Test motor protection devices according to manufacturer's published data.
   d. Test circuit breakers as follows:
1) Operate the circuit breaker to ensure smooth operation.

2) For adjustable circuit breakers, adjust protective device settings according to the coordination study. Comply with coordination study recommendations.

e. Perform operational tests by initiating control devices.

4. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove all necessary covers prior to the inspection.


b. Prior to project Final Acceptance, perform infrared inspection of the electrical power connections of each motor controller.

c. Report of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used, and lists the following results:

   1) Description of equipment to be tested.
   2) Discrepancies.
   3) Temperature difference between the area of concern and the reference area.
   4) Probable cause of temperature difference.
   5) Areas inspected. Identify inaccessible and unobservable areas and equipment.
   6) Load conditions at time of inspection.
   7) Photographs and thermograms of the deficient area.
   8) Recommended action.

C. Motor controller will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 SYSTEM FUNCTION TESTS

A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.

2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.

3. Verify the correct operation of sensing devices, alarms, and indicating devices.
B. Motor controller will be considered defective if it does not pass the system function tests and inspections.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchgear.

B. Provide written proof of training signed by owner’s representative.

END OF SECTION 262913.03
SECTION 264100 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers, rated 600 V and less, used for disconnecting and protection functions.

B. See Division 26 Section "Fuses" for fuses for fusible disconnect switches.

1.2 SUBMITTALS

A. Product Data: For each type of switch and circuit breaker indicated.

B. Shop Drawings: Include wiring diagrams for shunt-tripped circuit breakers.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Source Limitations: Obtain switches and circuit breakers through one source from a single manufacturer.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. General Electric Co.; Electrical Distribution & Control Division.
4. Square D Co.
5. Bussman.

2.2 ENCLOSED SWITCHES

A. Enclosed, Non-fusible Switch: NEMA 4X, Type HD, with lockable handle, interlocked with cover.
B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA 4X, Type HD, with clips to accommodate specified fuses, and lockable handle, interlocked with cover.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
   1. Lugs: Suitable for number, size, trip ratings, and material of conductors.
   2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2.4 ENCLOSURES

A. Listed for environmental conditions of installed locations, including:
   1. Outdoor Locations: NEMA 250, Type 4X.
   2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4X.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Provisions: Remove temporary lifting provisions and blocking of moving parts.
B. Identify components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods and Electrical Identification."
3.2 FIELD QUALITY CONTROL

A. Testing: After installing disconnect switches and circuit breakers and after electrical circuits have been energized, demonstrate product capability and compliance with requirements.

B. Inspections and Tests for Switches and Circuit Breakers: Make internal and external inspections and perform tests, including the following:

1. Inspect for freedom from physical damage, proper unit rating, mechanical condition, enclosure integrity, cover operation, unit anchorage, clearances, and tightness of electrical connections. If a loose electrical connection is observed on any unit, check each electrical connection for each switch and circuit breaker with a torque wrench for compliance with manufacturer's torquing instructions.

2. Test cover and other interlocks and interlock release devices for proper operation.

C. Additional Inspections and Tests for Switches: Include the following:

1. Inspect for proper rating and fuse provisions.

2. Check adequacy and integrity of fuse holders by removing and installing fuses.

3. Check integrity of phase barriers.

4. Inspect blade alignment visually while operating switch to observe adequacy of blade pressure.

D. Additional Inspections and Tests for Circuit Breakers: Include the following:

1. Inspect for proper frame, trip, and fault current interrupting rating.

2. Test shunt trip devices, circuits, and actuating components for proper operation.

E. Correct defective and malfunctioning units on-site, where possible, and reinspect and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 264100
SECTION 264910 - FUSES

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes fuses rated 600 V and less.

1.2 SUBMITTALS
   A. Product Data: For each fuse type indicated.

1.3 QUALITY ASSURANCE
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   B. Source Limitations: Obtain fuses from one source by a single manufacturer.
   C. Comply with NFPA 70 for components and installation.

1.4 EXTRA MATERIALS
   A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than one set of three of each type and size.
      2. Furnish a spare fuse cabinet to be mounted in the Electric Room.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Main Feeders: Class L, time delay, RK1, time delay.

B. Motor Branch Circuits: Class RK1, time delay.

C. Other Branch Circuits: Class RK1, time delay.

3.2 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

3.3 IDENTIFICATION

A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION 264910
SECTION 40 0000 – INTEGRATOR COORDINATION

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:

1. Definition of the various “integrators” responsibilities

B. Related Sections include but are not necessarily limited to:

1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract
2. Division 1 – General Requirements
3. Division 23 – Mechanical
4. Division 26 – Electrical
5. Division 40 - Process Integration
6. Division 40 - Instrumentation and Control for Process Systems
7. Divisions 44 and 46 for equipment requirements and control

1.2 SYSTEM DESCRIPTION

A. The control system update and modification shall be the result of the combined efforts of the Control System Integrator, Electrical Sub-Contractor, and Process Equipment Suppliers. Descriptions are provided as follows:

1. **Control System Integrator** – The Control System Integrator shall be a sub-contractor of the General Contractor for this project and provide all the labor and materials necessary for the modification to the existing PLC control panels and SCADA Interface required in this project and provide terminals for all the sensors and control devises specified in other sections. The Control System Integrator will be responsible for the following:

   a. The hardware modifications to the existing PLC panels
   b. Hardware testing of all PLC control panels
   c. Overseeing and verifying the field connections and functionality of all sensors and devices provided in other sections of the specifications that are connected to the PLC system
   d. Assisting with the start-up and field verification of the various control loops in the system
   e. Updating the O&M Manuals regarding all equipment supplied for the PLC control system.
   f. Coordinate with Process Equipment Supplier (Boiler and Recirculation Pumps) supplied by equipment vendors on the project.
   g. Define and refine the control loop requirements with the Engineer.
   h. Develop and test PLC programs for the PLC Control System.
   i. Modify HMI software interface screens and reports.

2. **Electrical Sub-Contractor** – The Electrical Sub-Contractor shall be a sub-contractor of the General Contractor for this project and provide the installation and wiring of the PLC Control System. All of the signal wiring, communications wiring, fiber optic cable, and coaxial cable and terminations will be provided by the Electrical Sub-Contractor.

   a. Electrical Sub-Contractor shall be responsible for providing and installing all conduit and wire as shown on project plan sheets.
3. **Process Equipment Suppliers** – The Process Equipment Suppliers (Boiler and Pumps) are the equipment suppliers that are providing the equipment that must interface as specified in Section 40 9000. The Process Equipment Suppliers shall provide the following:
   a. Provide a boiler contact as required for status communication to the in-plant PLC.

4. **Instrumentation Supplier** – If the Instrumentation Supplier providing the “Instrumentation and Control for Process Systems” in Section 409100 is different from the Control System Integrator, the Instrumentation Supplier shall be responsible for the overseeing the installation and field calibration of all items supplied. Field calibration shall be witnessed by the Owner or Control System Integrator and require a signed “calibration” sheet for each instrument prior to acceptance of the equipment.

B. The Control System Integrator, Electrical Sub-Contractor, Process Equipment Supplier, and Instrumentation Supplier shall meet in person with the Engineer prior to the start of construction to go through the above responsibilities and submittal process for the project.

1.3 **SUBMITTALS**

A. See Section 01 3300 “Submittals” for requirements for the mechanics and administration of the submittal process.

B. **Operation and Maintenance Manuals:**
   1. See Section 01 3300 “Submittal Procedures” for requirements for:
      a. The mechanics and administration of the submittal process
      b. The content of Operation and Maintenance Manuals

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)

PART 4 - MEASUREMENT AND PAYMENT - (NOT APPLICABLE TO THIS SECTION)

END OF SECTION 40 0000
SECTION 40 9000 – PROCESS INTEGRATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Work shall consist of performing all labor and furnishing all material to provide a complete and workable control system for the proposed process boiler and pump replacement improvements. This section includes specifications for the associated materials and equipment. This section also defines responsibilities and requirements for coordination of the Work, shop drawing submittals, operator training, system checkout, spare parts, and warranty.

1. The instrument and control system consists of all primary elements, transmitters, switches, controllers, relays, indicators, signal converters, signal boosters, special or shielded cable, special grounding or isolation, auxiliaries, wiring, and other devices required to provide complete control of the systems as specified in the Contract Documents.

2. Unless otherwise required for instrument compatibility, electric control signals shall be 4 to 20 mA, 24 V DC, and pneumatic signals shall be 3 to 15 psi.

3. All signals shall be directly linearly proportional to measured variable unless specifically noted otherwise.

1.2 CONDITIONS AND SYSTEMS RESPONSIBILITY

A. The Control System Integrator shall be responsible for coordination of all aspects of control system work including:

1. Interfacing of control system via the existing Network.
2. Interfacing of controls with instruments and equipment,
3. Testing of control systems,
4. Coordinating with the Electrical Sub-Contractor, Process Equipment Suppliers, and Instrumentation Suppliers,
5. Coordination with the Engineer,
6. Provide all necessary Operator Training,
7. Provide system checkout and repair during the warranty period, and
8. Provide complete system documentation.

B. The Control System Integrator shall be responsible for working closely with the Process Equipment Suppliers and Instrumentation Suppliers to integrate all the individual processes into a system that appears to be seamless to the Owner.

1. It shall be the responsibility of the Control System Integrator to closely schedule his work so that his work will be installed at the proper time and without delaying the completion of the entire project. The plan for the sequence of operations shall be reviewed with the Owner, Engineer, and General Contractor prior to starting installation of the equipment to minimize impact on project schedule.

2. It is the responsibility of the General Contractor and his Electrical Sub-Contractor to install all controls equipment in strict accordance with manufacturer’s recommendations, with adequate on-site supervision being provided by the manufacturer of the equipment or his authorized representative.
3. The authorized representative of the manufacturers supplying equipment shall notify the Engineer that the equipment has been satisfactorily installed and is ready for operation. No form of energy shall be turned on to any part of the control and monitoring system prior to receipt by the Engineer of a statement of approval of the installation from the Contractor containing his Supplier's authorization for turning on energy to the system.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract
2. Division 1 – General Requirements
3. Division 23 – Mechanical
4. Division 26 – Electrical
5. Division 40 - Process Integration
6. Division 40 - Instrumentation and Control for Process Systems
7. Divisions 44 and 46 for equipment requirements and control

B. The materials specifications for wire, appurtenances, and equipment apply to the materials required for the control system. The Control System Integrator shall coordinate control and monitoring system wiring requirements. Programmable controllers furnished with process equipment shall be connected to the existing network.

1.4 QUALITY ASSURANCE

A. Referenced Standards:

1. Canadian Standards Association (CSA)
2. FM Global (FM)
3. The Instrumentation, Systems, and Automation Society (now International Society of Automation, ISA):

   a. S5.1, Instrumentation Symbols and Identification
   b. S5.2, Binary Logic Diagrams for Process Operations
   c. S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems
   d. S5.4, Standard Instrument Loop Diagrams
   e. S20, Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves
   f. RP7.1-56, Pneumatic Control Circuit Pressure Test

4. National Electrical Manufacturers Association (NEMA)
5. National Institute of Standards and Technology (NIST)
6. Underwriters Laboratories, Inc. (UL)

B. Miscellaneous:

1. Comply with electrical classifications and NEMA enclosure types shown on Drawings.

1.5 QUALIFICATIONS OF CONTROL SYSTEM INTEGRATORS

A. The following Control System Integrators are approved for this Contract:
1.6 SHOP DRAWINGS REQUIREMENTS

A. Submit copies of shop drawings in accordance with Division 1 Section “General Requirements” for all hardware items and software products listed under “Products”. Shop drawings shall include all catalog cuts, descriptive data, and drawings for the entire control system. If catalog cuts are furnished, the specific model number, color, and all requirements shall be indicated on each copy of the shop drawings.

B. Submit copies of the proposed method of control system expansion, including a listing of additional hardware required, additional software required, and implementation requirements. The data acquisition and monitoring system supplier shall also submit a detailed explanation of the procedure for integrating the Work process controls into the existing facilities.

C. Submit system documentation as described in paragraphs 3.1 of this Specification.

D. Submittals shall be prepared from original printed material or clear unblemished photocopies of original printed material. Facsimile information is not acceptable.

E. Product technical data including:

1. Acknowledgement that products submitted meet requirements of standards referenced
2. Equipment catalog cut sheets
3. Instrument data sheets:
   a. ISA S20 or Engineer approved equal
   b. Separate data sheet for each instrument
4. Materials of construction
5. Minimum and maximum flow ranges
6. Pressure loss curves
7. Physical limits of components including temperature and pressure limits
8. Size and weight
9. Electrical power requirements and wiring diagrams
10. NEMA rating of housing
11. Submittals shall be marked with arrows to show exact features to be provided.

F. Loop diagrams per ISA S5.4.

1. Each loop diagram on a separate sheet
2. Each sheet shall contain the following minimum information:

   a. All loop devices clearly identified
   b. Identification of the loop and each loop component, including connections to such things as recorders and computers. Numbering and tagging must agree with the P&ID.
   c. All interconnections with identifying numbers for:
      1) Electrical cables
      2) Conductor pairs
      3) Pneumatic or hydraulic tubing
   d. Identification of connections including:
      1) Junction boxes
2) Terminals
3) Bulkheads
4) Ports
5) Computer input/output connections
6) Grounding systems

e. Signal levels and ranges
f. Device location
g. Energy sources designating voltage, pressure, and other applicable requirements
h. Enough process lines and equipment to clearly show the process side of the loop and provide clarity of control action. This includes:

1) What is being measured
2) What is being controlled
3) Other information required to complete the process loop

i. Reference to supplementary records and drawings to show inter-relation to other control loop.
j. Controller action
k. Control valve action upon electronic, hydraulic, or pneumatic failure

G. Process connected instrument installation details containing the following minimum information:

1. Bill of materials providing as a minimum the following information:
   a. Tube material and size
   b. Connection size
   c. Fitting size, material, and rating
   d. Valve type and material
   e. Instrument description
   f. Pipe stand size and material

2. Tube slope requirements
3. Required elevations and dimensions

H. Comprehensive set of point-to-point wiring diagrams showing all interconnections between packaged systems or equipment control panels, motor control centers, instrumentation, and all other electrical equipment as required to depict a complete and functional electrical control system. Instrumentation wiring already shown on loop diagrams need not be included on point-to-point wiring diagrams.

1. Diagrams shall provide the following minimum information:
   a. Terminal block identification (includes terminals on remote equipment furnished by Others
   b. Wire identification number.
   c. Wire size
   d. Wire type
   e. Wire color
   f. Wire shielding and insulation type
   g. Conductor quantities and associated conduit size
   h. Ground points
   i. Interconnection requirements to existing systems or equipment furnished by Others
2. Diagrams shall be provided on Drawings of sufficient size so as to minimize the number of drawings.
   a. Drawing size: 11 x 17 IN

I. Electrical schematic control diagrams. Diagrams shall include:
   1. Terminal identification
   2. Unique identification of all control devices and contacts
      a. Utilize Owner's device identification numbers where applicable
   3. Wire identification
   4. Equipment identification
   5. Indication of remote and local devices and wiring
   6. Overcurrent protection indication
   7. Voltage
   8. All control logic

J. PLC/DCS equipment drawings

K. Graphic component construction

L. Nameplate layout drawing

M. Drawings, systems, and other elements are represented schematically in accordance with ISA S5.1 and ISA S5.3.
   1. The nomenclature, tag numbers, equipment numbers, panel numbers, and related series identification contained in the Contract Documents shall be employed exclusively throughout submittals.

N. Certifications:
   1. Documentation verifying that calibration equipment is certified with NIST traceability.
   2. Approvals from independent testing laboratories or approval agencies, such as UL, FM, or CSA. Certification documentation is required for all equipment for which the specifications require independent agency approval.

O. Testing reports:
   1. Source quality control reports

P. Warranties: Provide copies of warranties and list of factory authorized service agents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Coordinate with Process Equipment Suppliers (Boiler, Pumps, & Biogas Flow Meter) to ensure that necessary wiring, conduits, contacts, relays, converters, and incidentals are provided in order to transmit,
receive, and control necessary signals to other control elements, to control panels, and to receiving stations.

B. The functions and features specified herewith are the minimum acceptable requirements for the SCADA system. The provided system shall equal or exceed each requirement.

C. In some cases, the specifications may allow the accomplishing of certain functions by means of more than one hardware/firmware/software approach. Any approach that is proposed shall equal or exceed all functional, operational, convenience, and maintenance aspects of the one described.

D. Major equipment, component, and software items are specified; however, the Contractor shall provide all appurtenant items necessary to achieve the required operation as hereinafter specified.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. System Operating Criteria:

1. Stability: After controls have taken corrective action, as result of a change in the controlled variable or a change in setpoint, oscillation of final control element shall not exceed two cycles per minute or a magnitude of movement of 0.5 percent full travel.
2. Response: Any change in setpoint or change in controlled variable shall produce a corresponding corrective change in position of final control element and become stabilized within 30 seconds.
3. Agreement: Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 3 percent of full scale over a 6:1 operating range.
4. Repeatability: For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5 percent of full travel regardless of force required to position final element.
5. Sensitivity: Controls shall respond to setpoint deviations and measured variable deviations within 1.0 percent of full scale.
6. Performance: All instruments and control devices shall perform in accordance with manufacturer's specifications.

2.3 DESCRIPTION OF WORK

A. General: The scope of Work under this Contract includes installation and configuring of new and replacement equipment that is installed under this Contract and development of the appropriate displays, reports, and logs to record the information generated by the new equipment and instruments. All wiring and appurtenances required for a complete and functional system shall be provided under this Contract. The monitoring and control functions are described in the functional description of the control system. The control equipment and material specifications are described in the Specifications for control system hardware and materials.

B. The following subsections define the Work that will be completed under this Contract.

1. Modification to Main Process Control Panel (RTU-3.0): The Control System Integrator shall furnish temperature transmitters (TT-301 & TT-302) and required RTU-3.0 hardware to provide a fully functional upgrade to existing RTU-3.0. Additional I/O required for this RTU is shown on the Series 19 Plan Sheets. All measurements, logic, status alarms, and HMI reconfiguration respective to new and existing instrumentation, boilers, and pumps shall be performed.

2. Motor Control Center (MCC-301): Control System Integrator shall be responsible for coordinating with the Electrical Sub-Contractor and pump supplier to verify that proper wiring contacts are made for Pumps DRP-301, DRP-302, STP-301, & STP-302 as shown on the Series 19 plan sheets.
and are properly integrated into and communicate successfully to the RTU 3.0. These four (4) pumps are replacement pumps therefore some existing I/O space may be available in the existing PLC. Controls System Integrator shall develop and/or update and integrate a minimum of one (1) graphic screen or forms on the HMI software to accurately show the operation of the pumps and format it so as to appear seamless to existing HMI and main plant computer layout.

3. Fire Tube Boiler (B-1): Control System Integrator shall be responsible for coordinating with the Electrical Sub-Contractor and boiler supplier to verify that proper wiring contacts are made for the new Fire Tube Boiler as shown on the Series 19 plan sheets and properly integrated into RTU 3.0. Controls System Integrator shall develop and integrate a minimum of one (1) graphic screen or forms on the HMI software to accurately show the operation of the boiler and format it so as to appear seamless to existing HMI and main plant computer layout.

4. Digester Gas Feed Flow Meter: Control System Integrator shall coordinate with equipment supplier. Equipment is specified under specification section 43 1300.

5. Belimo Valve: An existing Belimo Valve (BV-301) will be located to the sludge return line on the incoming side of the new heat exchanger. This valve is capable of on/off control (24 VDC) that shall be controlled from temperature transmitter (TT-302).

6. Boiler Pump (BP-1): The boiler pump shall be interlocked with the existing boiler supply line temperature transmitter that shall call for the boiler pump to run in the event that the return sludge drops below a temperature setpoint. A separate and unique set of setpoints for low temperature (call to run) and high temperature (pump off) shall be determined by operations staff at time of startup. This existing temperature transmitter is also interlocked to an existing Boiler Pump (BP-2E) with existing setpoints.

2.4 PROCESS CONTROL FUNCTIONS

A. Summary Listing of Points: The point list provided in the plans indicates the number of new inputs and outputs to and from the control system. The number of wires and terminations will vary with configuration of the control system. The list of points is provided as a reference list for the functional specifications. The control system shall monitor and control the Analog/Discrete inputs and outputs summarized on the plan sheets.

B. The lists do not include the contact closure points required to drive status and alarm lights and horns on the control panels. The analog output lists do not include the outputs required to drive displays. The outputs necessary to drive the displays, indicators, and recorders are described in the functional specifications and in the P&ID drawings included in the Plans.

C. Operational Description – General Control Functions:

1. General: The main plant computer system with HMI software installed and an Operator Interface on RTU-3.0 shall provide the means for monitoring the new or reconfigured equipment in the wastewater treatment plant.

   a. General Requirements: The control and monitoring system uses a Programmable Logic Controller based system sized to handle all analog and contact closure signals necessary for the monitoring and control functions specified. Two modes of control shall be available to the Operator.

      1) Operator Setpoint Control: In this mode, the Operator shall set desired flow, level, and time interval setpoints as required by the various control loops. Adjustment of a setpoint shall not hinder the operation of other control loops. The control loop shall operate the system within the setpoint limits if the controlled equipment is in the automatic mode. Dead bands, signal averaging, and signal damping will be necessary to prevent unnecessary and too frequent control adjustments. Signal averaging shall be operator-adjustable over a span of 0 to 30 minutes.
2) Manual Control: In this mode, the Operator shall be able to take direct control of any device connected to a “HAND-OFF-AUTO” switch on the MCC. The manual mode of control shall be completely independent of the programmable controller and failure of the programmable controller shall in no way limit manual control functions. The “OFF” position of the manual control switch will override all other controls. The “HAND” position will permit control of the unit operation from either switch on the MCC or the process control panel. The “AUTO” position will permit control of the unit operation from the PLC.

3) Local Control: In this mode, the Operator shall be able to take direct control of any device connected to a “JOG-OFF-REMOTE” switch near the hot water recirculation pumps (STP-301, STP-302, DRP-301, & DRP-302). The manual mode of control shall be completely independent of the programmable controller and failure of the programmable controller shall in no way limit manual control functions. The “OFF” position of the manual control switch will override all other controls. The “JOG” position will permit control of the unit operation from the switch on the provided pump switch box. The “REMOTE” position will permit control of the unit operation from the PLC.

b. Status and Alarm Monitoring: Equipment alarms shall be designed to inform the Operator of any un-commanded change of status. Equipment failure alarm logic shall include adjustable time delays to prevent nuisance alarms due to time delays in the starting controls. The motor starter controls for process equipment generally include time delay relays to sequence restart after power failure. The time delays for the alarms shall be set longer than the time delay for start to prevent nuisance alarms.

1) Analog input alarms shall be annunciated when a setpoint limit is violated or a signal is lost AND an operator selected timer expires. Zero flow signals on flow meters will not necessarily be an alarm condition; setpoints for low flow must be adjustable to prevent nuisance alarms at zero flow. Operator shall enter alarm limits using the keyboard for the process control interface.

2) Status and alarm engraving is shown on the Plans. The engraving schedules and arrangements shown are intended as a guide for control panel layouts. Variations to the shown arrangements will be reviewed at the time of shop drawing submittal.

2. Functional Description of Process Controls: The following is narrative of the normal operation procedures for each major piece of equipment associated with the Base Bid. The parameters in brackets are initial setpoints for operator selected variables. All operator selected setpoints shall allow the Operator to change or modify variables in the control of the equipment.

a. Panel Locations: Existing control panels (RTU-3.0) and (MCC-301) are located in the Digester Building. All I/O signals as listed on the PLC I/O plan sheet shall be configured to function as described with the equipment here in these specifications.

b. Instrumentation and Process Equipment:

1) Belimo Valve and Sludge Return Temperature Transmitter: Temperature in the sludge return line on the incoming side to the new heat exchanger will be monitored by temperature transmitter (TT-302) which shall be interlocked with the relocated belimo valve (BV-301) through RTU 3.0. The temperature transmitter (TT-302) shall annunciate a high temperature alarm through the SCADA system when the temperature reaches an operator selectable high temperature of [150 degrees F]. Logic in the PLC will close the belimo valve in the event that temperature transmitter (TT-302) detects an operator adjustable setpoint of [160 degrees F] and
annunciate a valve closed alarm through the SCADA system. The temperature transmitter shall be capable of transmitting real-time temperature and annunciate an operator selectable low temperature alarm of [80 degrees F].

2) Sludge Transfer Pumps: Sludge Transfer Pumps (STP-310 & STP-320) are replacement pumps and shall retain existing logic and setpoint conditions. Integrator shall work with Engineer and Operators during startup for fine tuning of control & monitoring conditions during startup.

3) Digestor Recirculation Pumps: Digestor Recirculation Pumps (DRP-310 & DRP-320) are replacement pumps and shall retain existing logic and setpoint conditions. Integrator shall work with Engineer and Operators during startup for fine tuning of control & monitoring conditions during startup.

4) Hot Water Circulation Pumps: The control for the Hot Water Recirculation Pumps (HWRP-330, 340) shall use the existing “HAND-OFF-AUTO” selectors within MCC-301 and a provided local “JOG-OFF-REMOTE” switch. The “HAND” and “OFF” positions of the switch on the motor starter shall override all other control from the process control panel. When the switch on MCC-301 is in the “AUTO” position, the control of pump operation shall be from the RTU-3.0. The “JOG” and “OFF” positions of the local switch shall override all other control from the process control panel. When the local switch is in the “REMOTE” position, the control of pump operation shall be from the RTU-3.0. Only one pump shall run at a time with an Operator adjustable setpoint time of [1 day] before alternating. The control status, motor status, and alarm conditions, as shown on the project plans, shall be displayed locally on the Operator Interface and on main control system display.

Normal Mode of Operation

i) The digester sludge temperature is monitored by temperature transmitter (TT-308) and is hardwired to RTU-3.0. The temperature in the digester sludge line shall be displayed on the operator interface and on main control system display. The anticipated temperature range is between 0 and 100 degrees F.

ii) Each pump will have a “READY” or “OUT OF SERVICE” software tag associated with it on the operator interface to determine controls the operation of the pumps.

iii) A pump alternating sequence for hot water recirculation pumps (HWRP-310, 320) shall be programmed into the RTU-3.0 for pump operation. The pumps shall be alternated so that upon the expiration of an operator selected timer [1.0 day] the “LAG” pump shall become the “LEAD” pump. The alternating sequence shall be used to help balance the number of run hours between the pumps.

iv) If a pump call is generated and the “LEAD” pump fails to operate for any conditions, an alarm condition shall be generated and the “LAG” pump will be called to start.

v) If a pump is tagged with the “OUT OF SERVICE” tag the logic within RTU-3.0 shall skip over the appropriate pump during the normal operation of starting and stopping pumps and in the pump alternating sequence.

vi) Under no condition shall RTU-3.0 allow both pumps to operate concurrently.

2.5 MONITORING AND CONTROL SYSTEM HARDWARE AND MATERIALS

A. General: The monitoring and control system work under this Contract shall consist of the following major items:

1. Integrate the I/O addresses for the HMI system to include all the new input/output signals;
2. Provide system to include automatic and manual capabilities to monitor and control the processes.

B. The control panel shall also contain the power supplies necessary to power the field transmitters requiring 12 VDC and 24 VDC power. Terminals shall be supplied for all input signals, in addition to the signals necessary to support the control system, and a connection to the communications network. Electrical circuits for instrumentation shall be separate from the electrical circuit for the process control system even if they are located within the same process control panel.

C. Equipment connections shall be made with screw-type connections torqued to the manufacturer’s recommended tightness except where devices specified are available only with solder-type terminals. Connections shall be made as recommended by the manufacturer.

D. The circuit breaker panel board shall be mounted inside the control panel at a readily accessible location.

E. The complete installation shall be done such that all relays, control devices, and panel instruments are completely accessible without major dismantling of panel equipment.

F. Relays, timers, and other control panel mounted control devices shall be plug-in design for convenient maintenance. All relays and timers for similar use shall be identical and interchangeable.

1. Conductors: Conductors for receptacles, interior lighting, and other similar loads shall be AWG No. 14, 41 strand, copper (minimum). Conductors for low power loads of 120 VAC or lower voltages shall be AWG No. 18, 16 strand, copper (minimum). All conductors shall be identified at both ends with wire tags. Conductors for 4-20 mA low level signals shall be AWG No. 22 twisted shielded pair with thermo-plastic insulation

2. Terminal Blocks: Terminal blocks for all external connections shall be rated at 600 VAC. Terminal blocks for internal panel connections of AWG No. 14 conductor and smaller shall be rated at 300 VAC. White terminal marking strips indicating point identification and diode or capacitor polarity shall be installed on each terminal block. Terminal blocks shall include disconnect switch terminal block sections suitable for interrupting control voltages where a control voltage source enters the enclosure from a remote location.

3. Fused Terminal Blocks: Fused terminal blocks shall be used for all analog input and output signals. The fused terminal blocks shall be provided with an indicator light. Fused terminal blocks shall be Allen Bradley 1492-H5 or Engineer approved equal.

4. Receptacles: A duplex receptacle shall be mounted inside the panels. Duplex receptacles shall be of the 20 ampere, 125 VAC, 2 pole, 3 wire, grounding type complete with box.

5. All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire color code and number shall be clearly shown on the drawings, with each wire's color and number indicated.

G. Circuit Breaker Protection: Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip-indicating and have a common trip on all multiple breakers. Provisions for additional breakers shall be such that field addition of connectors or mounting hardware will not be required to add breakers to the panelboards. All instrumentation systems, annunciator panels, lighting circuits, or similar major devices requiring 120 VAC power shall have an individual circuit breaker. Circuit breaker trip ratings shall be as recommended by the manufacturer of the equipment being protected. Each control panel shall have space provided for a minimum of two additional circuit breakers. Control circuits including flow pacing signals to each chemical feeder shall be independent and independently-fused so that a circuit problem with one feeder does not interrupt operation of other feeders.
H. Control Relays: Control relays shall be plug in relays. Relay contacts on 110 VAC circuits shall be rated for 300 VAC and up to 10 amps of load. Coil voltage and contact configuration shall be as required to implement the control and instrumentation loops indicated.

1. Control relays shall be General Electric, Allen Bradley, Square D, IDEC RR series, Potter Brumfield, or an Engineer approved equal.

I. Timing Relays: In general, timer control functions may be provided in the control logic furnished for the type which begins the time delay upon energizing the coil and reset automatically when de-energized. The timing relays shall contain contacts of the voltage and current ratings required to implement the control functions indicated.

1. Timing relays for periods greater than 200 seconds shall utilize solid state electronics. Timers shall have 11 pin base which matches other timers used. Timers shall be ATC 328 Series or an Engineer approved equal.

2. Timing relays for periods of 200 seconds and less shall be solid state with adjustable timing ranges of 10-180 seconds, suitable for interior panel mounting. Timers shall have an 11 pin base which matches the other timers used.

3. Timers shall be as manufactured by Allen Bradley, General Electric, Square D, AGASTAT Series 7000, IDEC RTY series, or an Engineer approved equal.

J. Fuse Holders: Fuse holders for AC and DC instrument systems shall be Buss Snap-Lock Type HLD fuse holders or an Engineer approved equal.

1. Each power supply, process instrument, and motor control circuit operating within the panel shall be individually-fused using terminal block fuse connectors installed per the manufacturer's recommendations.

2. Provide spare fuses for each AC and DC circuit. Spare fuses shall be stored in a spare fuse cabinet located inside the panel enclosure near the fuse holder mounting brackets.

PART 3 - EXECUTION

3.1 CONTROL SYSTEM

A. General: In addition to the shop drawings and descriptive literature required by the General Requirements, the Control System Integrator shall provide complete system documentation necessary for installation, operation, and maintenance. The documentation shall be provided prior to shipment of hardware. The documentation shall include, but not necessarily be limited to, the following:

1. General description of equipment.
2. Wiring diagrams for panels and MCC’s.
   a. Control system documentation listing the control system address for each and every analog and contact closure input and output in the system. Documentation must include an English language descriptor for each input and output and the scale for the analog inputs and outputs.
   b. Control schematics including field wiring requirements and identification of terminal numbers for both the control panels and the field terminations.
3. Listing and description of routine maintenance, requirements and equipment necessary to perform required maintenance. (Update in O&M Manual only).
4. Specifications and descriptions of panel mounted hardware including lights, switches, annunciators, controllers, displays, and power supplies, etc.

5. Equipment shall be delivered to the site in undamaged condition. Equipment shall be stored above ground and protected from the weather. Equipment shall be installed in strict accordance with manufacturer’s recommendations, the Plans, and Specifications. The Control System Integrator shall supply all materials, labor, and appurtenances to provide a functional Process Instrumentation.

6. The Control System Integrator shall provide at least three (1) day system start-up assistance by a team of factory-based engineering and programming personnel after installation and wiring is complete. During this start-up period, the personnel are to thoroughly check all equipment and repeat the factory acceptance test specified earlier.

7. Operational Training: Operator training for operation and maintenance of the process control panels shall be provided. The training shall include all instruction necessary to provide operating personnel the ability to perform all control functions, routine periodic maintenance, and light emergency maintenance on the system.

8. Operator training for operation, maintenance, and troubleshooting shall be provided. The training shall be conducted at the job site. At least two (2) individuals representing the Owner shall receive the training. The training sessions shall be a minimum of one (1) four-hour day and shall include "hands-on" training on the system furnished under this Contract. The Owner reserves the right to videotape the training sessions for future reference.

9. The Control System Integrator shall provide:
   a. Programmable Logic Controller and RTU system documentation shall include three (3) copies of descriptions for all loops and the operator's manual describing procedures for routine adjustments to process control and communications loops. Description of control loops shall be copies of printout of the ladder logic diagram used for control with explanatory annotation.
   b. Two (2) printed copies of the entire documentation package shall be provided along with one (1) electronic copy. One of the hard copies shall be provided for use by the Operator. This copy shall be in loose leaf form bound in ring binders to facilitate modifications and additions. The manual shall detail steps required for operator interface with the process control system.

10. After successful completion of the control and telemetry system, but prior to final acceptance of the work, the Control System Integrator must submit to Owner and Engineer complete documentation of the ladder logic for each PLC in the system. Control System Integrator is to submit two (2) printed copies and one (1) electronic copy prior to final completion.

3.2 SYSTEMS ACCEPTANCE

A. System acceptance shall be defined as that point in time when the complete system has passed the mutually defined field acceptance test and has performed as a functioning unit for 30 consecutive days without the loss of process control functions or process management functions. Loss of process control functions shall be defined as follows:

1. Loss of a process loop controller. Loss of the alarm annunciator subsystem.
2. Loss of process variable display and recording functions.
3. Loss of communication with SCADA system without automatic restart.
4. One (1) year warranty on the equipment begins upon successful completion of the field acceptance test.

3.3 INSTALLATION OF INSTRUMENTATION CONDUIT AND CABLES
A. Furnishing and installation of the instrumentation or control wiring shown on the Plans shall be the responsibility of the General Contractor. General Contractor shall coordinate sub-contractors, including but not limited to the Electrical Contractor and Control System Integrator, to provide a fully-functional control system. Control System Integrator shall supervise and authorize wiring connections in the process control and monitoring panels.

B. Use bottom entry for all conduit entry to instruments and junction boxes.

C. Install electrical components per Division 26.

D. Panel-Mounted Instruments:
   1. Mount and wire so removal or replacement may be accomplished without interruption of service to adjacent devices.
   2. Locate all devices mounted inside enclosures so terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.

3.4 FIELD QUALITY CONTROL

A. Maintain accurate daily log of all startup activities, calibration functions, and final setpoint adjustments.
   1. Documentation requirements include the utilization of the forms located at the end of this section.
      a. Loop Checkout Sheet
      b. Instrument Certification Sheet
      c. Final Control Element Certification Sheet

B. Instrumentation Calibration:
   1. Verify that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.
   2. Calibrate all field-mounted instruments, other than local pressure and temperature gauges, after the device is mounted in place to assure proper installed operation.
   3. Calibrate in accordance with the manufacturer's specifications.
   4. Bench calibrate pressure and temperature gauges. Field mount gauge within 1 day of calibration.
   5. Check the calibration of each transmitter and gauge across its specified range at 0, 25, 50, 75, and 100 percent. Check for both increasing and decreasing input signals to detect hysteresis.
   6. Replace any instrument which cannot be properly adjusted.
   7. Stroke control valves to verify control action, positioner settings, and solenoid functions.
   8. Mark range, date, setpoint and calibrator's initials on each instrument by means of blue or black ink on a waterproof tag affixed to the instrument.
   9. Calibration equipment shall be certified by an independent agency with traceability to NIST. Certification shall be up-to-date. Use of equipment with expired certifications shall not be permitted.
   10. Calibration equipment shall be at least three times more accurate as the device being calibrated.

C. Loop checkout requirements are as follows:
   1. Check control signal generation, transmission, reception, and response for all control loops under simulated operating conditions by imposing a signal on the loop at the instrument connections. Use actual signals where available. Closely observe controllers, recorders, alarm and trip units,
remote setpoints, radio systems, and other control components. Make corrections as required. Following any corrections, retest the loop as before.

2. Stroke all control valves, cylinders, drives, and connecting linkages from the control room operator interface.

3. Check all interlocks to the maximum extent possible.

4. In addition to any other as-recorded documents, record all setpoint and calibration changes on all affected Contract Documents and turn over to the Owner.

D. Provide verification of system assembly, power, ground, and I/O tests.

E. Verify existence and measure adequacy of all grounds required for instrumentation and controls.

3.5 GRAPHICS DISPLAY OF HMI AND GUI

A. The new SCADA system requires development of graphical screens using a development software package. This specification details the guidelines for the development of state of the art graphical screens. The graphics builder shall be interactive and menu-driven, requiring no programming.

PART 4 - MEASUREMENT AND PAYMENT

4.1 TELEMETRY AND CONTROLS

A. The entire control system including all instrumentation equipment, modification of the existing control system, wiring, relays, terminal blocks, and other appurtenances required to complete the Work in accordance with the Drawings and Specifications shall be measured as a completed item of work. Payment shall be made as part of the lump sum Bid price, which price and payment shall be full compensation for furnishing all labor, materials, tools and equipment, and all other incidentals required to furnish a complete and operating controls system in accordance with the Drawings and Specifications.

END OF SECTION 40 9000
SECTION 40 9100 –PROCESS MEASUREMENT DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work shall consist of furnishing and installing all material and equipment to provide a complete and workable upgrade of the existing process instrumentation for the Vermillion Wastewater Treatment Plant. This Section includes specifications for the process instrumentation, and associated materials and equipment. This section also defines responsibilities and requirements for coordination of the work, shop drawing submittals, operator training, system checkout, spare parts, and warranty.

1.2 CONDITIONS AND SYSTEMS RESPONSIBILITY

A. The Contractor shall refer to Appendix A (at the end of this specification section) for In-Control Fixed Price Package and the integrators scope of supply. In-Control, upon reviewing all work described in this specification section and respective plan sheets have been prior approved as the Control System Integrator for all the work related to Primary Process Measurement Devices for the negotiated price as stated in the quotation attached in Appendix A. Any work not stated in In-Control’s scope of supply will fall under the responsibility of the General Contractor at no additional cost to the owner. Instrumentation installation is the responsibility of the General Contractor. Final Terminations points within the RTU Panel will be shown by the Control System Integrator and handled by the electrical sub-contractor.

B. The instrumentation equipment supplier shall be responsible for operator training, system checkout and repair during the warranty period, and documentation including submittal drawings and installation operation and maintenance manuals.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract
2. Division 1 – General Requirements
3. Division 23 – Mechanical
4. Division 26 – Electrical
5. Division 40 - Process Integration
6. Division 40 - Instrumentation and Control for Process Systems
7. Divisions 44 and 46 for equipment requirements and control

B. The materials specifications for wire, appurtenances, and equipment apply to the materials required for the control system. The treatment process equipment specifications detail requirements for new and relocated process equipment. The control contractor shall coordinate control and monitoring system wiring requirements. Programmable Controllers furnished with process equipment shall be connected to the network.
1.4 PRIOR APPROVAL

A. The following items of materials and/or equipment must receive approval prior to bidding if it is intended to furnish products other than those specifically named in the Specifications.

1. Temperature Transmitters

B. The requirements for obtaining such approval are specified herein and in the Division 1 Section “General Requirements”.

C. Contractors must submit to the Engineer within seven (7) calendar days before the scheduled bid opening date design information, including drawings they wish to have considered as an approved alternate. The design pre-submittal shall be complete and shall include as a minimum the following:

1. Drawings, specifications, and product literature with adequate detail to determine that the proposal will meet the requirements of the plans and specifications.
2. A list of installations of similar type presently in service.
3. A complete listing of changes that will be required in the contract plans and specifications to accommodate the alternate equipment.

D. Alternate bidders shall state in writing that the equipment offered will provide comparable or superior features, performance quality, and materials of construction as the equipment specified. Prior approval of the alternate equipment shall not constitute final approval of specific equipment, but rather constitutes only approval of the respective equipment manufacturers to provide price quotations based on equipment meeting the specifications. Alternate equipment manufacturers shall modify their standard products as necessary to meet all provisions of the specifications without exception.

E. The cost of any changes incidental to installation of the alternate equipment such as electrical wiring, relocation of piping, engineering supervision, as-built drawings, etc. shall be borne by the Contractor with no additional expense to the Owner.

F. If after installation the alternate equipment does not perform in accordance with the specifications or other deficiencies are noted, the Owner will require the modification or replacement of such equipment to meet the specifications at no additional expense.

1.5 SHOP DRAWINGS AND BIDDING REQUIREMENTS

A. Submit copies of shop drawings in accordance with Division 1 Section “General Requirements” for all hardware items and software products listed under “Products”. Shop drawings shall include all catalog cuts, descriptive data, and drawings for the entire control system. If catalog cuts are furnished, the specific model number, color, and all requirements shall be indicated on each copy of the shop drawings.

B. Submit copies of the proposed instrumentation, including a listing of additional hardware required, software required, and implementation requirements.

C. Submit instrumentation documentation as described in paragraphs 3.1 of this Specification.

D. Submittals shall be prepared from original printed material or clear unblemished photocopies of original printed material. Facsimile information is not acceptable.

E. Product technical data including:

1. Acknowledgement that products submitted meet requirements of standards referenced
2. Equipment catalog cut sheets
3. Instrument data sheets:
   a. ISA S20 or Engineer approved equal
   b. Separate data sheet for each instrument

4. Materials of construction
5. Minimum and maximum flow ranges
6. Pressure loss curves
7. Physical limits of components including temperature and pressure limits
8. Size and weight
9. Electrical power requirements and wiring diagrams
10. NEMA rating of housing
11. Submittals shall be marked with arrows to show exact features to be provided.

F. Process connected instrument installation details containing the following minimum information:

1. Bill of materials providing as a minimum the following information:
   a. Tube material and size
   b. Connection size
   c. Fitting size, material, and rating
   d. Valve type and material
   e. Instrument description
   f. Pipe stand size and material

2. Tube slope requirements
3. Required elevations and dimensions

G. Electrical schematic control diagrams. Diagrams shall include:

H. Terminal identification

1. Unique identification of all control devices and contacts
   a. Utilize Owner's device identification numbers where applicable

2. Wire identification
3. Equipment identification
4. Indication of remote and local devices and wiring
5. Overcurrent protection indication
6. Voltage
7. All control logic

I. Certifications:

1. Documentation verifying that calibration equipment is certified with NIST traceability.
2. Approvals from independent testing laboratories or approval agencies, such as UL, FM, or CSA. Certification documentation is required for all equipment for which the specifications require independent agency approval.

J. Warranties: Provide copies of warranties and list of factory authorized service agents.
PART 2 - PRODUCTS

2.1 PROCESS MEASUREMENT DEVICES

A. Temperature Transmitters: Furnish and install temperature transmitters that generate a 4-20 mA signal proportional to the water and digester sludge temperatures.

1. General Requirements: Transmitter shall be an RTD transmitter with aluminum head and probe length sufficient for installation into 3-inch piping for both probes. Integrator to verify with Electrical & Mechanical Plan Sheets. RTD shall be 100 ohm.
   a. Mount transmitter with LC Display integral to the unit at each of the locations as shown in the project plans.
   b. Provide 304 SS Thermowell to allow removal of temperature transmitter without taking the system out of service.

2. Specific Application Requirements:

<table>
<thead>
<tr>
<th>Installation Identification</th>
<th>ID Code</th>
<th>Range</th>
<th>Size and Installation Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge Return Temperature</td>
<td>TT-302</td>
<td>0-275°F</td>
<td>Installation location shall be approved by the Engineer</td>
</tr>
<tr>
<td>Boiler #1 Supply Temp</td>
<td>TT-301</td>
<td>0-275°F</td>
<td>Installation location shall be approved by the Engineer</td>
</tr>
</tbody>
</table>

3. Acceptable Manufacturers:
   a. Endress Hauser

B. Digester Gas Feed Flow Meter: See Specification Section 43-1300 for requirements. Meter shall generate a 4-20 mA signal proportional to gas flow. Measuring element shall be install according to 19 Series Plan Sheet Detail and transmitter shall be located in existing Control Panel (RTU-3.0).

C. Pressure Switches

1. Materials
   a. Wetted switch elements: 316 stainless steel
   b. Diaphragm seal housing: 316 stainless steel
   c. Pressure snubber:
      1) Filter disc: 316 stainless steel
      2) Housing: 316 stainless steel

2. Accessories:
   a. Provide ball valve to isolate pressure switch from source
   b. Utilize pressure snubbers with porous metal discs to provide pulsation dampening on pressure switch as shown on schedule.
   c. On applications where a pressure switch and pressure gauge are used at the same location, it is permissible to utilize one pulsation damper and diaphragm seal to isolate both elements from the process fluid.

3. Design and fabrication:
a. Utilize hermetically sealed mercury contact switches.

b. Two SPDT contacts rated:

1) According to existing PLC DI card voltage.

c. Switch set points:

1) Setpoint activation shall be adjustable over the entire range of the switch
   a) Set points between 30 and 70 percent of switch rated working range
   b) Operating pressure not to exceed 75 percent of switch rated working range

d. Accuracy: Better than 1 percent of full scale

e. Process connection: minimum of ¼ inch

<table>
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<tr>
<th>Installation Identification</th>
<th>ID Code</th>
<th>Range</th>
<th>Size and Installation Notes</th>
</tr>
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<tr>
<td>STP #1 Pressure Switch</td>
<td>PS-301</td>
<td>0-50 psi</td>
<td>Tap or SS Pipe Saddle</td>
</tr>
<tr>
<td>STP #2 Pressure Switch</td>
<td>PS-302</td>
<td>0-50 psi</td>
<td>Tap or SS Pipe Saddle</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.1 GENERAL

A. General: In addition to the shop drawings and descriptive literature required by the General Requirements, the Supplier shall provide complete system documentation necessary for installation, operation, and maintenance. The documentation shall be provided prior to shipment of hardware. The documentation shall include, but not necessarily be limited to, the following:

1. General description of equipment.
2. Dimension drawings.
3. Wiring diagrams for connection to process control system.
4. Listing and description of routine maintenance requirements and equipment necessary to perform required maintenance. (Include in O&M Manual only).
5. Installation and Startup: Process Instrumentation installation shall be inspected by a qualified representative of the manufacturer. Installation shall include, but not necessarily be limited to, setting equipment in place and connection of power and signal wiring. Power wiring shall consist of connecting 120 VAC circuits from distribution panels supplied by the Electrical Contractor. Connections shall be made to screw-type terminals. The Control System Integrator will provide terminal to terminal interconnection drawings for all terminations between control panels and field mounted instruments. The Electrical Contractor will install wiring between the process control panels and instruments and shall make wiring terminations. The Control System Integrator shall verify terminations in the process control and monitoring panels.

B. Equipment shall be delivered to the site in an undamaged condition. Equipment shall be stored above ground and protected from the weather. Equipment shall be installed in strict accordance with manufacturer’s recommendations and the Plans and Specifications. Contractor shall supply all materials, labor, and appurtenances, to provide functional Process Instrumentation.

C. The Contractor and Manufacturer shall be responsible for coordinating with the Control System Integrator to supply all the necessary equipment.

3.2 PRODUCT HANDLING
A. Comply with the pertinent provisions of the delivery schedule.

B. Fabricated parts when delivered to the site shall be stored off the ground and protected from weather and damage. Control and electrical devices shall be stored indoors.

C. Do not remove shipping blocks, plugs, caps, and desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent connections are made.

3.3 INSTALLATION OF EQUIPMENT

A. The Contractor shall erect and install equipment in strict conformance with the printed manuals provided by the equipment manufacturer.

B. All anchor bolts and miscellaneous hardware shall be stainless steel. All bolted connections shall be provided with lock washer.

C. The Contractor shall adjust equipment for proper alignment, both horizontal and vertical, in strict conformance with the printed manuals provided by the equipment manufacturer.

3.4 ACCEPTANCE

A. The Contractor shall field test instruments after erection in the presence of the Engineer and equipment manufacturer to verify operation, uniformity, and compliance with the requirements specified by the manufacturer.

B. The Contractor shall provide all labor, materials, and test apparatus necessary to conduct testing at no additional cost to the Owner.

3.5 INSTALLATION OF INSTRUMENTATION CONDUIT AND CABLES

A. Furnishing and installation of all conduits needed for instrumentation and/or any other instrumentation or control conduit shall be the responsibility of the Electrical Contractor. Furnishing and installation of the instrumentation or control wiring shown on the Plans shall be the responsibility of the Electrical System Contractor. Control System Integrator shall supervise wiring connections in the process control and monitoring panels.

3.6 INSTALLATION, OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall furnish Operation and Maintenance Manuals for each instrument provided in accordance with Division 1 – Submittal Procedures.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CONTROLS AND INTERFACE SCREEN UPDATES

A. The modification of the existing control system, wiring, relays, terminal blocks, and other appurtenances required to complete the Work in accordance with the Drawings and Specifications shall be measured as a completed item of work. Payment shall be made as part of the lump sum Bid price, which price and payment shall be full compensation for furnishing all labor, materials, tools and equipment, and all other
incidentals required to furnish a complete and operating controls system in accordance with the Drawings and Specifications.

END OF SECTION 40 9100
APPENDIX A

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SECTION 43 1300 – GAS PROCESS EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL

A. Description: Gas process equipment shall be provided for safe distribution and disposal of biogas produced in the digesters, and to insure maximum protection against fire, explosion and fume hazard. This section of the Specifications includes drip traps, manometers, flowmeter, pressure relief valves, flame trap assembly, low-pressure check valve, backpressure regulator, appurtenant equipment and facilities, and all work incidental thereto, as shown on the Contract Drawings and specified herein. All gas process equipment shall be provided by one manufacturer for uniformity and interchangeability of parts.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these specifications:

1. Division 1: Cutting and Patching.
2. Division 26 – Electrical
3. Division 40 – Instrumentation and Control
4. Division 44 – Pollution Control Equipment

1.3 SUBMITTALS

A. Submittals: Submittals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures” for the following items.

1. Manually operated drip traps.
2. Manometers.
3. Flow meters.
4. Pressure (explosion) relief valves.
5. Flame trap assembly.
6. Low pressure check valve.

B. O&M Manuals: O&M Manuals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures” and Division 01 Section 7823 “Operation and Maintenance Data”.

1.4 PRIOR APPROVAL

A. The following items of materials and/or equipment must receive approval prior to bidding if it is intended to furnish products other than those specifically named in these Specifications.

B. The requirements for obtaining such approval are specified in the Instructions to Bidders and the “General Requirements”.

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C. Contractors must submit to the Engineer in accordance with Section 01 3300 “Submittal Procedures” date, design information including drawings they wish to have considered as an approved alternate. The design pre-submittal shall be complete and shall include as a minimum the following:

1. Drawings, specifications, and product literature with adequate detail to determine that what is proposed will meet the requirements of the plans and specifications.
2. A list of installations of similar type presently in service.
3. Evidence of manufacturing capability including a description of facilities, the number and professional qualifications of personnel, and quality control practices. The alternate equipment supplier shall identify major outside fabricators for the purpose of determine experience.
4. Evidence of technical capability to design and check the complete gas safety system, including modifications that may be required in structures and equipment provided by others.
5. Evidence of financial responsibility adequate to complete the project and assure viability of equipment warranty.
6. A complete listing of changes that will be required in the contract plans and specifications to accommodate the alternate equipment.

D. Alternate bidders shall guarantee, in writing, signed by an officer of the company, that the equipment offered will provide comparable or superior features, performance quality, and materials of construction as the equipment specified. Prior approval of the alternate equipment shall not constitute final approval of specific equipment, but rather constitutes only approval of the respective equipment manufacturers to provide price quotations based on equipment meeting the specifications. Alternate equipment manufacturers shall modify their standard products as necessary to meet all provisions of the specifications without exception.

E. The cost of any changes incidental to installation of the alternate equipment such as electrical wiring, relocation of piping, engineering supervision, as-built drawings, etc., shall be borne by the Contractor with no additional expense to the Owner.

F. If after installation the alternate equipment does not perform in accordance with the specifications or other deficiencies are noted, the Owner will require the modification or replacement of such equipment to meet the specifications at no additional expense.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED DRIP TRAPS

A. There shall be furnished and installed a 1” manually operated drip trap at all low points in the gas piping system as indicated in the Contract Drawings. There shall be furnished drip traps having a minimum capacity of 2 ½ quarts or 6 quarts. Drip trap shall be the rotating disc type. Gas escaping to atmosphere is not possible regardless of the disc position. An air inlet port shall be provided to permit free flow of condensate from reservoir when draining. Construction shall be low copper cast aluminum body, cover plate, disc, and handle. Disc shall be anodized. Internal working parts and fasteners shall be stainless steel. “O” rings shall be Neoprene. Maximum working pressure shall be 5 psig (34.5kPa). The units shall be provided with 1” pipe threads arranged to connect by 1” vertical pipe nipples through service shut-off cocks to fittings in the gas piping system. The drip traps shall be as manufactured by Varec, GROTH, Shand & Jurs or approved equal. The Contractor shall provide 1” drain piping on all drip traps located more than 2’ off the floor, drain piping to terminate approximately 1’-6” above floor elevations.
2.2 MANOMETERS

A. There shall be furnished and installed at locations as indicated in the biogas piping system one (1) manometer. Manometer shall be titled as follows: Boiler Feed. Well-type manometers shall be a single tube pressure gauge with direct reading scale. It shall be suitable for pressure. A duplex scale shall be provided. Scale shall be graduated in English units, inches and tenths WC and metric units, millimeters and centimeters for use with indicating oil. Zeroing of scale adjustment shall be accessible from exterior of housing. Housing shall be suitable for indoor and outdoor service and shall be fitted for wall or panel mounting. Indicating tube shall be gland packed to prevent leakage. Manometer housing shall be extracted aluminum with epoxy paint finish. Housing shall include machined end blocks and a tight fitting, polished plate glass window to protect internals. Gas connection shall be ¼" NPT. Indicating fluid shall be red or green oil.

<table>
<thead>
<tr>
<th>Manometer</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler Feed</td>
<td>20&quot;</td>
</tr>
</tbody>
</table>

B. Indicating oil shall be oil with specific gravity 1.0, temperature range 30° to 100° F (-1° to +38° C).

C. A venting petcock shall be supplied for field installation at the inlet of the manometer to permit routine maintenance calibration. When closed, the petcock bleeds the gas from the manometer well to atmosphere, allowing the manometer’s zero position to be checked. Material shall be brass. Connection shall be ¼” NPT.

D. A float check valve shall be supplied for field installation at the outlet of the manometer. It shall be used to protect fluid from being blown-out by pressure increase beyond the manometer pressure range. Construction shall be stainless steel body and head with Teflon® float. Connection shall be ¼” NPT.

E. The Gas Pressure Indicating Gauges shall be as manufactured by the Varec, Groth, Shand & Jurs or approved equal.

2.3 FLOW METER

A. The single-point insertion flowmeters shall be designed for measurement of velocity and flow of condensing gas environments, in this biogas application. Furnish and install insertion flowmeters for the measurement point listed herein and at the location as generally indicated on the Drawings.

B. Thermal Mass Flowmeter shall utilize the Constant Temperature technique to directly measure the mass flow rate of the specified gas unaffected by moisture or fog in the line. The sensor shall incorporate one reference RTD to measure the process gas temperature, and a second RTD which shall be heated to a constant temperature difference above the reference temperature. The electronics shall sense the drop-in temperature difference between the two sensors as the mass flow rate of the gas increases. The electronics shall immediately sense the drop and increase the power to the velocity sensor to maintain a constant temperature differential. The amount of power required to maintain the constant temperature differential shall be directly related to the mass flow of the gas. The power supplied to the heated sensor shall be at its minimum amount at zero flow to reduce self-heating of the reference sensor at low flows. The raw signal from the constant temperature sensor shall increase with increasing flow.

C. Performance requirements for each transducer and transmitter are as follows:

1. The constant temperature delta or overheat between the sensors shall be greater than 300 °C
2. Dry gas flow calculation for saturated processes
3. Velocity Response Time: 1.5 second for velocity changes at 4000 SFPM
4. Turndown 100:1 ratio minimum
5. Velocity Angle Sensitivity: <0.25% per degree angle up to ±15° of pitch and yaw to reduce the need for mechanical flow conditioners
6. Accuracy +/- 1.0% of reading +30 SFPM
7. Repeatability +/- 0.25% of reading > 100 SFPM
8. Process Temperature Range: -40° C to + 125° C
9. Electronics Temperature Rating: -40° C to + 65° C
11. Pressure Drop: Negligible

D. Sensor
1. Materials: Hastelloy C-276 sensors in an all welded support tube assembly with protective shroud and immune to water entrapment
2. Sensor elements shall have a minimum clearance to any surface of 0.2 inches
3. Probe support material: SS with sensor physical protection shield
4. Length: Per manufacturer’s recommendations
5. Installed sensor orientation shall be at ~45 degree upward position

E. Electronics
1. Interchangeable circuit board that can be configured in-situ to operate with any process sensor
2. Outputs: 4-20 mA DC outputs, user changeable, scalable and compliant with NAMUR NE43.
3. Communications: MODBUS, ASCII, RTU Protocol or Hart 7
4. Remote Display: LCD/Keypad. Microprocessor-based display of flow rate, temperature, flow area, flow totalization, alarms and elapsed time
5. Flow Conditioning: Electronics shall have built in electronic flow conditioning for digital profile corrections with seven velocity dependent correction factors and no added system pressure drop
6. Sensor Area Compensation: The electronics have the capability to compensate for the area in the process piping that the sensor and the sensor support probe occupies.
7. Self-Diagnostics
8. Trend Memory: 56 hours of stored trend data points for flow and temperature.
10. Min/Max Memory: Electronics store daily history; lows and highs for events in flow, temperature and electronics enclosure internal temperature, flow rate, process temperature, flow area, flow totalization, alarms and elapsed run time.
11. Methane Gas % Adjustment: Meter shall be ability to change CH4 % to reflect more accurate readings with changing Digester Gas conditions.

F. Configuration:
1. Transmitter Enclosure: NEMA 4X enclosure
2. Probe Support Material: 316L Stainless Steel
3. Probe Support Diameter: 3/4”
4. Probe Support Length: 18”
5. Remote Digital Display (mount on wall at eye level where noted on plans): Transmitter and Sensing Element Separate. Wall mountable Polycarbonate Enclosure, Non-Incendive.
6. Sensor Enclosure: Aluminum
7. Power Supply: 24 Vac
8. Process Connection: Compression Fitting, Flange or Retraction Assembly
9. Mount Flowmeter to provide at least 15 straight pipe diameters upstream and 5 straight pipe diameters downstream free of valves.
G. Specific Application Requirements:

<table>
<thead>
<tr>
<th>Installation Identification</th>
<th>ID Code</th>
<th>Velocity Range</th>
<th>Size and Installation Notes</th>
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</thead>
<tbody>
<tr>
<td>Biogas Flow</td>
<td>FIT- with number to be</td>
<td>0-4000 SFPM (Air), 0-2000 SFPM (Biogas)</td>
<td>3” (0 to 2,000 SFPM)</td>
</tr>
</tbody>
</table>

H. Acceptable Manufacturers:

a. Kurz, Model 454FTB-WFG
b. Engineer approved equivalent.

2.4 PRESSURE (EXPLOSION) RELIEF VALVES

A. Pressure relief valves shall be furnished and installed in the biogas piping as shown in the Contract Drawings. Pressure (explosion) relief valve shall have a flanged connection of the size shown in the Contract Drawings. Pressure relief shall be set at 12” WC. Supplier to provide 4 additional 1/2” of WC weights for owners use in adjustments. The weights shall be labeled. Capacity shall be not less than 3500 SCFH of biogas, at ½” WC over pressure.

B. Valve pressure port shall be oversized to keep overpressure to a minimum. Pallets and seat rings shall be replaceable and interchangeable. Pallets shall be dead weight loaded, and both center and side guided for stability. They shall incorporate replaceable “air cushion” Teflon seat inserts. HDPE protective screens shall be provided at the pressure ports, located external of the pallets.

C. The valve body and cover shall be low copper cast aluminum construction. Spun hood, seat rings, and pallet assemblies shall be low copper aluminum. Guideposts shall be 304 stainless steel. Flanges shall be drilled to ANSI 125 FF flanged dimensions.

D. “All Weather” feature shall be provided to protect the valve in temperatures ranging from -25°F to +200°F. “All Weather” feature shall include special anti-freeze coating applied to seat ring tip, pallet periphery and stem, and guide posts.

E. Pressure (Explosion) Relief Valves shall be Varec, GROTH, Shand & Jurs or approved equal.

2.5 FLAME TRAP ASSEMBLY

A. Flame trap assembly shall be furnished and installed in the biogas piping as shown in the Contract Drawings. Flame trap assembly shall have a flanged connection of the size shown in the Contract Drawings. Flow capacity shall be not less than 3,000 SCFH of biogas, at a total pressure drop of 2” WC. Assembly shall include thermal shut-off valve and flame arrester. Unit shall be suitable for installing in horizontal or vertical piping.

B. Thermal valve shall include a fusible element designed to close the valve within 15 seconds upon reaching 260°F. Fusible element shall control a spring-operated pallet. An isolated sight glass shall be provided so that pallet position can be determined without having to remove the valve from service. Fuse plug shall be gas tight and shall be removable for replacement of the fusible element.

C. Valve construction shall be low copper cast aluminum body and cover. Inner valve shall include low copper aluminum pallet assembly, with 304 stainless steel compression spring. Sight glass shall be acrylic with neoprene gaskets.
D. Entire bank assembly shall slide easily out of the arrester housing to facilitate inspection and cleaning. Removing or replacing the bank assembly shall not require support for alignment, jackscrew for extending the housing, and shall not place a strain on the connecting piping. Bank assembly shall be filled with corrugated rectangular shaped bank sheets or spiral round crimped ribbon sheets. When installed on a horizontal position, the flame arrester shall include an offset housing with a 1/2” NPT drain connection. Arrester housing construction shall be low copper cast aluminum.

E. Arrester housing construction shall be low copper cast aluminum. Bank assembly shall include a low copper aluminum frame and low copper aluminum bank sheets.

F. Thermal shut-off and flame arrester shall be factory assembled as one unit. Flanges shall be drilled to ANSI 125 FF flanged dimensions. Assembly shall be leak proof to 5 psig.

G. Flame trap assembly shall be Varec, GROTH, Shand & Jurs or approved equal.

2.6 LOW PRESSURE CHECK VALVE

A. Low pressure check valves shall be furnished and installed in the biogas piping as shown in the Contract Drawings. Low pressure check valve shall have a flanged connection of the size shown in the Contract Drawings. Flow capacity shall be not less than 3,000 SCFH of biogas, at a total pressure drop of 1” WC. Unit must be installed in horizontal piping.

B. Valve construction shall be low copper cast aluminum body and cover. The pallet, pallet arm and removeable seat ring are also manufactured of low copper aluminum. The pallet arm shaft and all hardware are manufactured of corrosion-resistant stainless steel.

C. Low pressure check valve shall be Varec, GROTH, Shand & Jurs or approved equal.

PART 3 - EXECUTION

3.1 PAINTING

A. All ferrous metal parts of gas process equipment shall be supplied to the Owner with the prime and finish coat paint which must be compatible with the finish coat paint specified in Section 09 9600 “High Performance Coatings”.

1. Touch-up painting of the gas process equipment shall be the responsibility of the contractor and shall be performed in accordance with Specification Section 09 9600 “High Performance Coatings”. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site.

3.2 INSTALLATION

A. Installation of Gas Process Equipment shall be installed as shown on the Contract Drawings and in strict accordance with manufacturer’s recommendations with these Specifications. Regulators requiring atmospheric vents shall be granted to the building exterior. Vent lines shall be protected from precipitation.
3.3 SUPERVISION AND START-UP

A. The manufacturer shall furnish the services of a factory-trained representative to supervise the installation and start-up of Gas Process Equipment for a minimum of 1 eight-hour day. Start-up all include operator training in the proper operation and maintenance of the equipment. In addition to the normal Installation, Operation and Maintenance Manuals required by contract, a spare manual will be shipped with the equipment to allow for proper installation and operation prior to release of all final Installation, Operation and Maintenance Manuals to the end user.

END OF SECTION 43 1300
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SECTION 44 4256 – PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION
   A. This section of the Specifications includes pumps, motor, appurtenant equipment, and all work incidental thereto, as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE
   A. The following items of related work are specified and included elsewhere in these Specifications:
      1. Division 1 – Existing Conditions
      2. Division 26 – Electrical
      3. Division 40 – Process Integration
      4. Division 44 – Process Piping

1.3 SUBMITTALS
   A. Submittals: Submittals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures”.
   B. O&M Manuals: O&M Manuals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures” and Division 01 Section 7823 “Operation and Maintenance Data”.

1.4 PRIOR APPROVAL
   A. The following items of materials and/or equipment must receive approval prior to bidding if it is intended to furnish products other than those specifically named in the Specifications.
      1. Screw Centrifugal Pumps – Sludge Recirculation
      2. Rotary Lobe Pumps – Sludge Transfer
   B. The requirements for obtaining such approval are specified in the “Instruction to Bidders”, “General Requirements” and Section 01 3300 - “Submittal Procedures”.

PART 2 - PRODUCTS

2.1 SLUDGE RECIRCULATION PUMPS
   A. General:
1. Sludge recirculation pumps shall be Weir SFD3-Y Horizontal or Hayward Gordon XCS5-B Screw Centrifugal Pumps or approved equal.

2. Furnish and install dry-pit, screw centrifugal sludge recirculation pumps, direct-coupled and specifically designed to pump wastewater sludge, biosolids and other fibrous materials without clogging. Sludge recirculation pumps shall be installed in the sludge handling facility as shown in the Contract Drawings.

3. The pumps shall be designed for continuous operation and will be operated continuously under normal service. To minimize operation power costs, the hydraulic efficiencies listed for each pump are the minimum acceptable and must be guaranteed by the manufacturer. Pumps shall be rated for the following conditions:

   a. Qty. of Pumps: 2
   b. Design Flow Rate: 265-285 gpm
   c. Design Total Dynamic Head: 27-30 feet
   d. Maximum Pump RPM: 1800 RPM
   e. Minimum Pump Efficiency: 52% (At Design Duty Point)
   f. Pump Shut-Off: 45 TDH
   g. Pump Run-Out: 800 gpm at 10 TDH
   h. Maximum Motor Size: 5.0 HP
   i. Maximum Motor RPM: 1800 RPM
   j. Discharge Size: 3 to 5 inches, Contractor to coordinate connection to discharge piping to accommodate pump discharge size
   k. Suction Size: 4 to 6 inches, Contractor to coordinate connection to suction piping to accommodate pump suction size

B. Design:

1. The basic design shall be a single-passage, clog-free pump, utilizing a screw-centrifugal impeller. The overall pump design shall combine high efficiency, low required NPSH, a large solid passage, and the ability to handle rags or other fibrous material without plugging. The pump shall be capable of passing a non-compressible 3-inch sphere. B-10 bearing life shall be rate at a minimum of 100,000 hours.

2. The hydraulic design of the impeller shall combine the action of a positive displacement screw with the action of a single-vane centrifugal impeller to provide a single, non-bifurcated flow stream with only gradual changes in flow direction.

   a. The leading edge of the impeller vane shall blend into the impeller body in such a way that any rag or other fibrous material caught on the leading edge and folded over both sides of the vane will be unfolded and released as the textile follows the flow stream through the pump.

   b. The impeller flange or impeller shall contain a spiral groove on the rear face so that any solids in the pumped media are discharged from the space between the back plate and the rear of the impeller.

3. In order to maintain optimum running clearances along the entire length of the impeller to maintain design hydraulic efficiencies, the geometry of the impeller and suction piece shall be conical, so any axial adjustment of the impeller will cause the clearance between the impeller and suction piece to change uniformly along the entire length of the impeller. Designs incorporating curved, or combination curved/conical impeller and suction piece are not acceptable because in such designs clearances cannot be adjusted uniformly over the full length of the impeller.

4. Suction and discharge flanges shall be drilled to meet ANSI 125 lb. bolting.
C. Materials of Construction:
   1. The pump volute, backplate, and suction piece shall be of closed-grained cast iron, ASTM A 48-CL30.
   2. The impeller shall be of Nodular Iron, ASTM A 536-60-06, and shall be both statically and dynamically balanced.
   3. The suction piece or impeller shall be externally adjustable to compensate for wear by means of shims or regulating screws so that the necessary running clearances between the liner and impeller can be maintained for optimum hydraulic efficiency.

D. Bearing Housing
   1. The bearing housing shall be of cast iron, ASTM A 48CL-30 and shall be of the back pull out design so that the bearing housing and impeller can be removed without disconnecting the casing from the suction and discharge piping.
   2. The shaft shall be steel and provided with suitable bearings capable of taking all mechanical and hydraulic loads. Unless otherwise specified, bearings shall provide a minimum B10 bearing life of 50,000 hours without credit for hydraulic balancing by pump-out vanes, grooves, or wear rings.
   3. The stuffing box shall be isolated from contaminants in the pumped media by a labyrinth fit between the impeller backside and the volute backplate, as well as by pump-out grooves machined into the impeller back shroud and into the volute backplate, to prevent debris from reaching the shaft seal.

E. Shaft Sealing
   1. Shaft sealing shall be by independently-mounted, tandem mechanical seals contained in an oil chamber that is formed as an intrinsic part of the bearing frame and allows the seals to be completely submerged in and lubricated by the oil bath. Externally-mounted oil reservoirs are not acceptable.
      a. The mechanical seal nearest the bearing shall utilize carbon/ceramic faces and shall isolate the seal cooling oil from the bearing frame. When mounted in a vertical configuration, this shall allow the pump to operate continuously submerged within 4" of the upper bearing cap.
      b. The mechanical seal nearest the impeller shall be a stainless steel or rubber bellows-type construction firmly attached to the rotating face and clamped to the shaft, to prevent contaminants from contacting the stainless-steel spring which loads the seal face. The seal faces shall be a solid tungsten-carbide or silicon-carbide rotating face running against a solid silicon-carbide stationary face.
      c. The mechanical seal nearest the impeller shall be contained in a seal chamber formed by the impeller flange and a recess cast into the motor frame. To prevent debris from entering the chamber and to prolong the mechanical seal life, a flush port shall be provided so that an optional external water flush can be supplied directly into the seal chamber.
      d. The mechanical seal nearest the impeller shall be isolated from contaminants in the pumped media by a labyrinth-fit between the backside of the impeller and the backplate, as well as by pump-out grooves cast into the impeller back shroud and into the backplate, to minimize debris reaching the shaft seal.
      e. Seals requiring a water flush shall not be acceptable.

F. Mounting:
   1. The pump manufacturer shall provide a common pump and motor base constructed of a minimum of 3/8 inch thick fabricated steel, suitably reinforced to support the full weight of the motor,
pump, motor, coupling, and guard. A 316 stainless steel guard shall be provided to safely enclose the drive.

G. Motor:

1. Motor shall be furnished with each pump and shall be connected to the pump by the drive method specified. All motors shall be of nationally known manufacture and shall conform to NEMA standards and specifications. Motor shall be NEMA premium energy efficiency motor and shall meet the following requirements:
   a. Horsepower 5
   b. Volts: 480
   c. Phase/ Hertz: 3,60
   d. Service Factor 1.15
   e. Speed 1800 RPM
   f. Enclosure TEFC
   g. Drive: Direct

H. Painting:

1. Pump, motor and their appurtenances shall be supplied to the Owner primed and finished coated, which must be compatible with the finish coat paint specified in Section 09 9600 “High Performance Coatings”.
   a. Touch-up of finish painted surfaces on the pump equipment shall be the responsibility of the contractor and shall be performed in accordance with Specification Section 099600 “High Performance Coatings”. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site.

2. All stainless steel surfaces are to be shipped bare. Clean all stainless steel surfaces and provide glass bead blast or chemically treat all external non-wetted stainless steel to a uniform finish.

I. Spare Parts: The manufacturer shall furnish a complete pump repair kit which shall include but not be limited to:

1. One (1) set of seals.
2. One (1) set of bearings.

2.2 SLUDGE TRANSFER PUMP

A. Pump Units: Furnish and install digested sludge pumps. The digested sludge pumps shall be either Boerger PL 300 or LobePro SL133 rotary lobe positive displacement type pumps. Each pump supplier shall submit a scope of supply to the Engineer to verify that all necessary equipment has been provided prior to purchase of the pumps and appurtenances.

1. General Requirements:

<table>
<thead>
<tr>
<th>Application</th>
<th>Sludge Recirculation Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qty</td>
<td>2</td>
</tr>
<tr>
<td>Solids Content</td>
<td>2.0 to 2.8%</td>
</tr>
<tr>
<td>Design Capacity</td>
<td>180 GPM @ 23-35 feet TDH</td>
</tr>
<tr>
<td>Suction Condition</td>
<td>Flooded</td>
</tr>
<tr>
<td>Temperature</td>
<td>Ambient to 95 Deg. F Sludge</td>
</tr>
<tr>
<td>Duty</td>
<td>Continuous</td>
</tr>
<tr>
<td>Model</td>
<td>PL 300</td>
</tr>
</tbody>
</table>
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## Drive Type
- Gear Reducer and Electric Motor

## Motor Power
- 7.5 hp

## Maximum Pump Speed @ Design Capacity
- No more than 300 RPM

## Suction Flange
- 6” ANSI-150lb.-Galvanized Carbon Steel

## Discharge Flange
- 6” ANSI-150lb.-Galvanized Carbon Steel

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a. The equipment covered by these Specifications shall be of standard units of proven ability as manufactured by reputable concerns 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 proportioned 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 adjustment shall be provided.

d. 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.

e. 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.

f. 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 3 meters from the unit under free field conditions while operating on utility power.

g. 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, housings, or guards.

h. Minimum Required Features:

1) Pumps must be designed with an air space or outlet between the pumping head containing the sludge and the timing gear box such that a leak in the shaft seal will allow sludge to run onto the floor and not into the timing gear box.

2) Pumps must be designed with replaceable radial wear plates.

3) Pumps must be designed with a ductile-iron rotor case

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B. Pump Construction

1. The sludge transfer pumps are to be positive displacement rotary lobe type. The sludge transfer pumps and all necessary appurtenances shall be furnished and installed. Supplier shall submit operating curves and pump specifications to the Engineer for his written approval prior to purchase of the pumps. Pumps shall be of suitable construction for pumping both primary and secondary wastewater sludges.
a. The aerobic digester sludge pumps shall be designed to be abrasion resistant for applications in wastewater treatment plants. The pump shall have a minimum displacement of 75 gal / 100 rev.
b. The ratio of the axial length of the lobe as compared to the lobe diameter (length / diameter) shall not exceed 1.0.

C. Pump Casing
1. The pump casing shall be manufactured in a single block construction (Cast iron ASTM A48 grade 40, Brinell hardness 264 Brinell or Ductile Iron). Multiple-piece design pump casings are not acceptable.
2. The internal rotor case surface shall provide a smooth transition from circular port connections at the flanges, to a full width rectangular port at the rotor chamber, with a greater cross-sectional area than at the flanged port connection, to allow for unimpeded passage of solids.
3. The front of the rotor case shall incorporate an O-ring to form a reusable seal for the front cover.
4. All fasteners shall be stainless steel.
5. The rotor case bore shall be fitted with removable restriction bushings enabling the removal of the shaft sleeve or mechanical seals and O-rings through the rotor case without requiring its removal.
6. The rotor case shall have an open area between it and the gear case. This area shall allow for physical, visual inspection and/or adjustment of the mechanical seal. The area shall also isolate the gear case in the event of failure of seal.

D. Radial Wear Plates
1. 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.

E. Front/Rear Wear Plates
1. The rear of the pump casing and the front cover shall be protected with replaceable wear plates.

F. Front Cover
1. All fluid-wetted parts including the mechanical seal shall be replaceable through a quick release front cover without disassembly of coupling, drive unit or the pipe system.
2. The front cover (or front wear plate) shall be reversible.

G. Pump Rotors
1. Rotors shall be tri-lobe screw rotor design and shall consist of a non-sludge-wetted cast iron or ductile core entirely coated with abrasion-resistant Buna-N or similar material with a minimum Durometer hardness of 70.
2. The rotors shall be able to be removed and/or replaced individually. Rotors that require removal and/or replacement as a set and/or with special pullers are not acceptable.
3. Pumps that incorporate product wetted-bearings such as replaceable rotor tips that are required for shaft support shall not be acceptable.

H. Pump Shafts
1. The shafts shall be non-sludge-wetted, the rotor / shaft connection shall be lubricated with quench fluid of the intermediate chambers. They 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.

2. The shafts shall be constructed from carbon steel AISI 4140 or AISI 4340 HT and be appropriately sized and heat treated to ensure a smooth operation and concentric positioning on the rotors.

3. The rotor/shaft connection shall be oil-lubricated fed by an intermediate chamber and shall not come in contact with the pumped fluid.

4. The motor driven shaft shall be either the upper shaft or lower shaft as determined by the centerline height of the driver.

I. Pump Seals

1. The pumps shall be fitted with maintenance free, quenched mechanical seals with Duronit seal faces or front-loading cartridge type water flushed, double mechanical seals. (Quench for lubrication and cooling).

2. Design of the pump shall allow removal and replacement of the seal via the front cover.

3. Silicon carbide to silicon carbide or tungsten carbide to tungsten carbide seal faces shall be provided.

4. Designs requiring the removal of the rotor case or the disturbance of both seals will not be acceptable.

J. The pumps shall be designed to temporarily run dry and to operate in either direction.

K. Shaft Sleeves (if applicable)

1. The shaft sleeves shall be of the O-ring sealed, hooked typed design. An O-ring shall be positioned at the back end of the sleeve and the front-end shall be compressed by the elastomeric surface of the rotor. The shaft sleeves shall fully extend to the labyrinth bearing isolators, thereby leaving no exposed surface of the shaft.

2. The shaft sleeve shall be constructed from AISI 216 stainless steel.

3. The shaft sleeves shall be easily removable from the pump without the removal of the rotor case. Pumps that require removal of the rotor case are not acceptable.

L. Bearings

1. Each shaft shall be supported by pre-loaded heavy-duty duplex taper roller bearing of the anti-friction type. The positioning of the shafts relative to the gearcase shall be such to permit removal of one shaft bearing without disturbing the bearings of the opposing shaft.

2. Pumps incorporating ball bearing or single roller bearing designs shall not be acceptable.

M. Bearing Isolators (if applicable)

1. Bearings shall be completely protected from water or sludge by grease packed stainless steel labyrinth bearing isolators providing full protection with pump either operating or idle. The design shall incorporate a double lip oil seal to contain the gearcase oil and provide additional bearing protection. The design shall ensure that no water or dirt enters the gearcase adjacent to the seal housing area, permitting periodic hose down of any eventual sludge run-off in the gland area.

N. Pump Gearbox

1. Bearings and timing gear shall be located in a common oil-filled cast iron gearbox, fitted with a built-in sight class to monitor oil level.

2. 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.
O. Intermediate Chamber

1. 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

   1) Oil drain of gearbox and intermediate chamber shall be easily accessible with side mounted drain screw. Oil drain under the pump is not acceptable.

P. Pump Base: Heavy duty fabricated base with machined pads under all equipment components such as pump, speed reducer and motor with alignment tabs for future field alignment. Factory mount pump, speed reducer and motor, coupled together, on a common steel base, properly braced to form a rigid support for the entire unit. Factory align the units on the base prior to shipment.

Q. Vibration: Pumps and motors shall operate at any point within their operating range without undue noise and vibration. Vibration at any point in the operating range shall not exceed the limits allowed by the Hydraulic Institute.

R. Pump Connections: Suction and discharge connections shall be 6" ANSI 150-pound flanges.

S. Motors Construction:

1. Each pump shall be driven by a 7.5 HP motor having a maximum speed of 1800 rpm.
2. The pump shall be suitable for operation on 480 VAC, 3 phase, 60 Hertz motor with a 1.15 service factor.
3. The motor shall be TEFC inverter duty type.

T. Reducer: Each pump shall be furnished with a gear reducer. Each reducer shall be SEW Eurodrive compact MC series, foot mounted, or equal by Nord, Textron or others.

U. Pressure Gauges: Ashcroft stainless steel liquid filled pressure gauges with a scale equal to the pumps specified minimum and maximum operating pressures. The gauges shall be capable of operating in wastewater sludge with the use of a diaphragm and include appropriate pulsation dampening to extend gauge life. The Contractor shall install one (1) gauge on the suction side of the pump and one (1) gauge on the discharge side of each pump.

V. Painting:

1. Pump, motor and their appurtenances shall be supplied to the Owner primed and finished coated, which must be compatible with the finish coat paint specified in Section 09 9600 “High Performance Coatings”.
   a. Touch-up of finish painted surfaces on the pump equipment shall be the responsibility of the contractor and shall be performed in accordance with Specification Section 099600 “High Performance Coatings”. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site.

2. All stainless steel surfaces are to be shipped bare. Clean all stainless steel surfaces and provide glass bead blast or chemically treat all external non-wetted stainless steel to a uniform finish.

W. Pump Accessories
1. Run Dry Protection: Each pump shall be equipped with run-dry protection to prevent undue wear on the stator and rotor. Stator temperature shall be continuously monitored. The controller shall be capable of switching the pump off automatically if the stator temperature exceeds a user specified temperature.

2. Spare Parts: The Manufacturer shall furnish a complete pump repair kits which shall include but not be limited to:

   a. One set of mechanical seals and O-rings for each pump
   b. One set of lobes and O-rings for each pump
   c. One set of axial protection plates for each pump
   d. One set of radial liners for each pump
   e. One set of special tools for each pump model

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND INSTALLATION

A. Pumps shall be delivered to the site in undamaged condition. Pumps shall be stored above ground and protected from the weather. Pumps shall be installed in strict accordance with manufacturer’s recommendations and these Specifications. Pumps installation shall be supervised by a factory-trained representative on the site. Vibration testing and harmonic frequency analysis shall be performed by the authorized factory representative for all centrifugal pumps.

B. Install pumps to provide access for periodic maintenance, including removing motors impellers, couplings, and accessories.

C. Pumps and piping shall be supported separately so piping is not supported by pumps.

3.2 CERTIFIED PUMP CURVES

A. The pump manufacturer shall factory test each pump with its respective drive and motor for compliance with maximum and preset capacities as specified in this section. One electronic copy of these certified test results shall be submitted to the Engineer for review and approval prior to shipment.

3.3 CONNECTIONS

A. Install all connections as stated in the Contract Drawings.

3.4 FIELD SERVICES

A. Each pump manufacturer shall provide the services of a factory trained service technician for a minimum of one (1) eight (8) hour day for installation and checkout of each pump or pump system and to instruct plant operating personnel in the proper operation and maintenance procedure for the installation. Manufacturer’s sales representatives that have not had complete factory service training will not be an acceptable substitute. Two (2) paper copies of the operation and maintenance manuals and one (1) electronic copy shall be provided for each pump or pump system specified herein. Startup services shall include checking the natural frequencies and vibrations amplitudes and frequencies of centrifugal pumps.
Complete reports including the results of frequency and vibration testing shall be submitted to the Engineer for approval. Vibration amplitude in excess of three (3) mils will not be acceptable for any centrifugal pump.

3.5 WARRANTY

A. All equipment shall be guaranteed against defects in materials, workmanship, and design for a period of two (2) years from the date of startup to the effect that any part or equipment that should prove to be defective during the warranty period shall be repaired or replaced at no cost to the Owner. The Contractor is hereby notified that the responsibility for the complete and satisfactory operation or function of all equipment and materials is definitely a part of the Contract, regardless of the manufacturer’s guarantee of any item furnished. The Contractor is responsible for placing all equipment in operation, furnishing all lubrication, packing, and other accessories necessary for initial operation, and seeing that proper operating and maintenance instructions are prepared.

END OF SECTION 44 4256
SECTION 44 6013 - PROCESS PIPING AND VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers furnishing and installing all process piping and valves including piping under structures and control air systems and all work incidental thereto, as shown on the Contract Drawings and as specified herein. Process piping shall include all piping to point five feet outside of treatment plant structures or as shown on the Contract Drawings.

B. Piping and valves shall be furnished and installed as shown on the Contract Drawings. The Contractor shall be responsible for coordinating the fabrication of pipe to correct lengths and conditions with respect to valve and other equipment laying dimensions. Pipe, valves and fittings have been shown on the Contract Drawings to assist the Contractor, however, the Contractor shall verify all dimensions and quantities. Where pipe is not specifically located on the Contract Drawings, it shall be installed on lines parallel and/or perpendicular to wall and/or floor surfaces and shall be securely fastened in a workmanlike manner.

1.2 SEWAGE LEAKS OR SPILLS

A. The Contractor shall notify SD DENR and be responsible for all clean-up costs for sewage leaks and spills. Spill reporting requirements are to the following numbers.

1. National Response Center 800-424-8802
2. SD Notification 605-773-3296
3. After Hours 605-773-3231

B. Sewage spills shall be reported to SD DENR regarding municipal waste spills at 1-800-GET-DENR (1-800-438-3367).

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

1. Division 9-Finishes
2. Division 22-Plumbing
3. Division 40-Process Integration
4. Division 44-Pollution Control Equipment

1.4 SUBMITTALS

A. Submittals: Submittals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures”.

B. O&M Manuals: O&M Manuals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures” and Division 01 Section 7823 “Operation and Maintenance Data”.

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1.5 PRIOR APPROVAL

A. The following items of materials and/or equipment must receive approval prior to bidding if it is intended to furnish products other than those specifically named in the Specifications.

1. Plug Valves and Operators
2. Ball Check Valves
3. Pipe
4. Gas Plug Valves

B. The requirements for obtaining such approval are specified in the “Instruction to Bidders”, “General Requirements” and Section 01 3300-“Submittal Procedures”.

1.6 MANUFACTURER’S CERTIFICATION LETTER

A. A letter from the pipe and fitting manufacture’s stating the product(s) are supplied new from the manufacturer and is covered by the manufacturer’s warranty shall be supplied to the Engineer.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL PROCESS PIPING

A. General: Type 304L stainless steel piping shall be used for all stainless steel process piping as indicated on the Contract Drawings. The Contract Drawings show size and general arrangements of pipe and appurtenances. Responsibility for furnishing exact lengths of various sizes of pipe for proper pipe system construction rests with the Contractor. Pipe shall be shop fabricated.

B. Pipe: Stainless steel pipe shall be welded stainless steel pipe. Stainless steel pipe shall conform to ASTM specifications A269. Maximum hardness shall be Rockwell B80. Maximum yield strength shall be 42,000 PSI. Piping sections between, flanged connections, flanged fittings, sleeves or couplings shall be no longer than 10 ft. for piping located in the interior of building structures and no more than 20 ft. for piping located outside of building structures.

C. Diameters and Wall Thickness: Pipe shall be of sufficient wall thickness as designated by the manufacturer to withstand all internal and external forces based on design procedures set forth in AWWA M11. All piping and fittings shall be a minimum of schedule 10 S.

1. Pipe passing through link seals shall be of greater thickness to provide the rigidity required for proper sealing.

D. Gaskets: High temperature resistant gasket capable of withstanding temperatures up to 300 Degrees F shall be used on all connections and fittings that are not welded.

E. Pipe and Fitting Connections:

1. General: Pipe connections and fittings 3” to 20” in diameter shall be Van Stone flanged or welded.
2. Flanged (3” to 20” Diameter): All flanged pipe connections shall be Van Stone flanged. Locations of Van Stone flanged connections shall receive approval by the Engineer upon shop drawing review prior to fabrication. At a minimum, flanged fittings shall be provided wherever pipe size increase or decreases. Welded connection will be allowed at location not requiring flanged
connections, flanged fittings, sleeves or couplings. Contractor shall furnish an adequate number of flanged connections, sleeves or couplings to allow for easy disassembly of the piping system without cutting the pipe.

F. Fittings: Stainless steel fittings shall be of the same material, thickness and connections style as the adjacent pipe. All fittings shall be die sized to the same out-of-round tolerance as the pipe. Elbows shall be die formed, long radius, smooth flow, butt welded type.

G. Bolts, Nuts, and Washers: Stainless steel ASTM A-193 Grade B8M, Class 2, hex head bolts shall be supplied. Stainless steel washers and lock washers shall be supplied on all nuts and bolts.

H. Pipe Identification: Pipe exteriors shall be identified in accordance with the Pipe Identification Schedule, provided in Specifications Section 09 9600 “High-Performance Coatings”.

I. Pipe Insulation: Stainless steel piping and fittings for biogas conveyance shall be insulated according to Specification 22 0719 “Plumbing Piping Insulation”.

2.2 PVC SCHEDULE 80 PIPE

A. PVC Schedule 80 pipe intended for pressure applications where the temperature will not exceed 140°F. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 per ASTM D 1784 and conform with NSF International Standards 14 and 61. Pipe shall be iron pipe size (IPS) conforming to ASTM D 1785. Socket fitting shall conform to ASTM D 2467; threaded fittings shall conform to ASTM D 2464 or D 2467. Flanges shall meet the bolt pattern requirements of ANSI/ASME B 16.5. Flanges shall be molded 2-piece VanStore type flanges with slip/socket connection.

B. All pipe and fittings shall be produced by a single manufacturer and shall be installed in accordance with the manufacturer’s recommendations and applicable code requirements. Solvent cements shall conform to ASTM D 2564, primer shall be IPS P-70 or Oatey Industrial Grade.

C. All straight-line pipe lengths of PVC pipe that shall be tapped for instrumentation connections, including but not limited to pH analyzer, pressure transmitters, pressure gauges, and temperature gauges, shall use a saddle to protect the integrity of the PVC pipe. Saddles shall be on stainless steel construction and be Power Seal Model 3411AS or engineer approved equal. General Contractor shall be responsible for drilling and tapping the pipe to mount the instrumentation equipment. General Contractor shall coordinate with the Controls System Integrator for location and size of taps.

D. Bolts, Nuts, and Washers: Stainless steel ASTM A-193 Grade B8M, Class 2, hex head bolts shall be supplied. Stainless steel washers and lock washers shall be supplied on all nuts and bolts.

2.3 STAINLESS STEEL GAS PIPING

A. General: Type 316L stainless steel piping shall be used for all gas piping as indicated on the Contract Drawings. The Contract Drawings show size and general arrangements of pipe and appurtenances. Responsibility for furnishing exact lengths of various sizes of pipe for proper pipe system construction rests with the Contractor. Pipe shall be shop fabricated.

B. Pipe: Stainless steel pipe shall be welded stainless steel pipe. Stainless steel pipe shall conform to ASTM specifications A269. Maximum hardness shall be Rockwell B80. Maximum yield strength shall be 42,000 PSI. Piping sections between, flanged connections, flanged fittings, sleeves or couplings shall be...
no longer than 10 ft. for piping located in the interior of building structures and no more than 20 ft. for piping located outside of building structures.

C. Diameters and Wall Thickness: Pipe shall be of sufficient wall thickness as designated by the manufacturer to withstand all internal and external forces based on design procedures set forth in AWWA M11. All piping and fittings shall be a minimum of schedule 10 S.

1. Pipe passing through link seals shall be of greater thickness to provide the rigidity required for proper sealing.

D. Gaskets: High temperature resistant gasket capable of withstanding temperatures up to 300 Degrees F shall be used on all connections and fittings that are not welded.

E. Pipe and Fitting Connections:

1. General: Pipe connections and fittings 3” to 20” in diameter shall be Van Stone flanged or welded.

2. Flanged (3” to 20” Diameter): All flanged pipe connections shall be Van Stone flanged. Locations of Van Stone flanged connections shall receive approval by the Engineer upon shop drawing review prior to fabrication. At a minimum, flanged fittings shall be provided wherever pipe size increase or decreases. Welded connection will be allowed at location not requiring flanged connections, flanged fittings, sleeves or couplings. Contractor shall furnish an adequate number of flanged connections, sleeves or couplings to allow for easy disassembly of the piping system without cutting the pipe.

3. Threaded (Less than 3” Diameter): Threaded connections shall 150-pound connections with N.P.T connections. Locations of all threaded connections shall receive approval by the Engineer upon shop drawing review prior to fabrication. At a minimum, threaded fittings shall be provided wherever pipe size increase or decreases. Welded connection will be allowed at location not requiring threaded connections, threaded fittings, sleeves or couplings. Contractor shall furnish an adequate number of threaded connections, sleeves or couplings to allow for easy disassembly of the piping system without cutting the pipe.

F. Fittings: Stainless steel fittings shall be of the same material, thickness and connections style as the adjacent pipe. All fittings shall be die sized to the same out-of-round tolerance as the pipe. Elbows shall be die formed, long radius, smooth flow, butt welded type.

G. Bolts, Nuts, and Washers: Stainless steel ASTM A-193 Grade B8M, Class 2, hex head bolts shall be supplied. Stainless steel washers and lock washers shall be supplied on all nuts and bolts.

H. Pipe Identification: Pipe exteriors shall be identified in accordance with the Pipe Identification Schedule, provided in Specifications Section 09 9600 “High-Performance Coatings”.

2.4 PIPE SYSTEM APPURTENANCES

A. Flexible Connections: Flexible expansion joints on intake and discharge sides of pumps and in other locations shown on the Contract Drawings shall be of the reinforced rubber type with minimum elongation of 1/2” and minimum compression of 3/4”. Coupling shall allow ease of installation by the means of a floating pipe flange or compression bolt. Flexible expansion joints shall be similar and equal to Proco Products, Inc., Invincible as manufactured by Mercer Rubber Co., Flex/Pard/R as manufactured by ThermoTech, or Spanflex by Holz Rubber Co. Tie bolts shall be provided at joints to reduce excessive expansion. Flexible connections shall be of the same material and connection style as adjacent pipe.
B. Pipe Hangers and Supports:

1. It shall be the responsibility of the Contractor to provide the pipe support system adequate to properly support the size and type of pipe installed. Pipe supports and hangers shall be designed and spaced in accordance with the design procedures recommended in AWWA M11.

2. Pipe supports of the adjustable type shall be similar and equal to Clow, Carpenter and Patterson, Inc. or Grinnell. Pipe supports, anchors, and appurtenances shall be stainless steel. Concrete shall conform to Division 3.

3. Pipe hangers shall be the adjustable clevis type and shall be similar and equal to Grinnell or Carpenter and Patterson, Inc. Pipe hangers and appurtenances shall be stainless steel. All threaded rod for pipe hangers shall be stainless steel.

C. Wall Sleeves: Wall sleeves for pipe penetrations shall be cast iron or steel with a water seal collar and equipped with link seals or equal. The link seals shall be supplied with stainless steel hardware, (bolts, nuts, washers, etc.). Wall sleeves passing through walls of basins containing water shall be equipped with double sets of link seals to provide pipe support at the wall penetration and additional protection against leakage.

D. Adapter Flanges: Adapter flanges shall be installed at the locations shown on the Contract Drawings and as needed for complete piping system. Flange material shall be manufactured from ductile iron ASTM A536, Grade 60-42-10. Gaskets shall be suitable for use with wastewater and treated, chlorinated water. Flange adapters for grooved piping shall be flat face, ductile iron housings with elastomer pressure responsive gaskets for connection to ANSI Class 125 or 150 flanged components.

E. Restrained Joints: All buried mechanical joint fittings below floor slabs shall be restrained with retainer glands. Glands shall be manufactured of ductile iron conforming to ASTM A536, grade 60-42-10. Set screws shall be of hardened ductile iron. Straight runs of pipe shall be equipped with gaskets w/stainless steel grips similar to Fast-Grip gaskets by American Ductile Iron Pipe.

F. Concrete Encasement: All buried mechanical joint pipe and fittings located below floor slabs and extending to 1 foot outside the building shall be minimum 6” thick concrete encasement as shown on the Drawings. Concrete shall meet the Specifications set forth in Division 3.

2.5 VALVES

A. Plug Valves:

1. Valves shall be cast ductile iron or semi-steel with heavy duty bearings to resist corrosion and prevent binding and to assure lasting easy valve operation. The plug shall be manufactured of one-piece construction of the same material as the valve body, with a resilient EPDM rubber coating. Valves shall have ANSI 21.15 Class 125 flanged connections. A large square nut shall be connected to the valve stem to permit manual operation in case of pneumatic operator failure. All plug valves in sludge lines and grit lines shall be installed with the valve shaft in the horizontal position with plug rotating to the top side of the valve when in the open position.

2. Plug valves installed on drain lines under floor slabs shall be designed for direct bury, and be installed with box, extension stem and operating nut. Contractor shall furnish three (3) valve wrenches with cross bar handle to operate direct buried plug valves.

3. Plug valves shall meet the below listed minimum Cv values and be “Standard Port” type. “Standard Port” type is to mean that the port area through the valve is not less than 100% of pipe area for 4” and smaller valves, 85% on 16” and smaller, 80% on 18”-24”, and 75% on 30” and larger.
4. Stem seal packing shall be in a machined packing chamber and shall consist of multiple V-rings and an adjustable gland, or two complete sets of adjustable U-cup type seals. Packing shall be able to be replaced and adjusted with valve under pressure and without removal of valve operator or valve disassembly.

5. All valves shall be as manufactured by DeZurik, Val-Matic, Milliken or Engineer approved equal.

6. Manual Actuators:
   a. Manual actuators shall be levers with position indicators for valves 8 inches in diameter and smaller. The levers shall be furnished with an adjustable open position memory stop to permit closing and reopening to the same throttled position. All valves located more than 8.5 feet above the operating floor shall be equipped with chain wheel operators.
   b. Manual actuators for valves larger than 8-inch shall have right angle gear actuators; 12-inch and larger valves shall be equipped with handwheels. All manual actuators shall be sized for the full rating of the valve in bi-directional service.
   c. Manual actuator systems for extended shaft operation shall include the operating nut, couplings, and extension rod. Valve shall be gear operated. Gear operated valves shall have right angle gear type actuators. Nut operated shall be provided with nut extension pipe, bearing plate and couplings. Top of nut operators shall be within 2” below the top of floor. Tee wrenches shall be provided, minimum of three (3).

7. Interior and Exterior Coating: The interior and exterior of the valve body shall be factory coated with a 2-part epoxy lining system. Refer to Section 09 9600 “High Performance Coatings” for all specified coating requirements.

B. Gas Plug Valves

1. General: New Plug Valves shall be provided as shown on the Contract Drawings.
2. Valves: Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with Flanged end connections and drilled to the ANSI 125/150 lb. standard.
3. Bodies: Bodies shall be of cast iron or ductile iron. Interior of valve bodies shall be rubber lined suitable for biogas application.
4. Plugs: Plugs shall be of ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be Nitrile Butadiene (NBR) or resilient facing suitable for biogas application.
5. Bearings: Bearings shall have sleeve type metal bearings and shall be of sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CF8M in 1/2 - 36” sizes. Non-metallic bearings shall not be acceptable.
6. Shaft seals: Shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the actuator or bonnet from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
7. Pressure ratings: Pressure ratings shall be 175 psi on sizes 1/2 - 12" and 150 psi for 14 - 72". Every valve shall be given a hydrostatic and seat.
8. Approved Suppliers: All gas plug valves shall be as manufactured by DeZurik or engineer approved equivalent.

C. Painting and Surface Preparation: All valves shall be supplied primed and finish coated, which shall be compatible with the finish coat paint specified in Specifications Section 09 9600 “High-Performance Coatings”.

1. Touch-up of finish painted surfaces shall be the responsibility of the Contractor and shall be in accordance with Specifications Section 09 9600 “High-Performance Coatings”. The Contractor shall touch-up all shipping damage to painted surfaces upon arrival to the job site.

D. Identification: Valve exteriors shall be identified in accordance with the Pipe Identification Schedule, provided in Specifications Section 09 9600 “High-Performance Coatings”.

2.6 FLUSHING ASSEMBLY

A. Flushing assembly shall consist of 1 ½-inch diameter PVC pipe and 1 ½-inch stainless steel ball valve. Pipe and fittings shall be schedule 80, PVC with NPT & coupler connections. Ball valve shall be threaded, 1-Piece, full or standard port, all stainless steel body, and 1000 psi cold working pressure rating. Lever and nut shall be stainless steel. Ball valve shall be manufactured by Apollo Valve, Nibco or approved equal.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND INSTALLATION

A. General: Process piping and valves shall be delivered to the site in an undamaged condition. Process piping and valves shall be stored above ground and protected from weather. Installation of process piping and valves and appurtenances specified herein shall be as shown on the Contract Drawings and in strict accordance with the manufacturer's recommendations. It is the intent of this section that it shall be the Contractor's option to use any of the pipe connection types listed for the pipe material type used even though the Contract Drawing details show one particular connection type. The pipe material type used shall be as indicated on the Contract Drawings.

B. Couplings: Couplings indicated on the Contract Drawings or specified herein are the minimum number allowed. More couplings may be required by the Engineer or may be required to facilitate installation of equipment.

C. Grooved Joints: Grooved joints shall be installed in accordance with the manufacturer’s latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. A distributor’s representative is not considered qualified to conduct the training or jobsite visits.

D. Pipe Supports and Hangers: Pipe Supports and Hangers indicated on the Contract Drawings are the minimum allowed. More supports and hangers may be required to properly support equipment.
E. Valves and Gates: Valves and gates shall be installed in strict accordance with manufacturer’s instructions. All valves shall be labeled as indicated on Contract Drawings. Locations for valves and gates for major process areas are shown in the Contract Drawings.

1. Valves for small diameter piping such as control air piping are not shown. Valves shall be installed at each point of connection to a device such as the receiver tank, an instrument, or a pneumatic operator on a valve.

2. Plug valves in sludge lines and grit lines shall be installed with the valve shaft in the horizontal position with plug rotating to the top side of the valve when in the open position.

3.2 JOINTING

A. The type of joint used shall conform to the requirements for the applicable type of pipe specified. Jointing operations shall be carried out in strict adherence to the manufacturer's recommendations.

3.3 FIELD PREPARATION

A. Prior to assembly all bolts and nuts shall be coated by the Contractor with non-seizing compound.

3.4 SUPERVISION AND START-UP

A. General: Each valve and gate manufacturer shall provide services of a factory trained field service technician for start-up services and personnel training. Manufacturer’s sales representative that has not had complete factory service training will not be an acceptable substitute. A minimum of one (1) eight (8) hour day and one (1) trip to the jobsite shall be provided. If additional days or trips are needed to fully provide all start-up services and training they shall come at no additional cost to the Owner.

B. Start-up Services: Prior to start-up the field service technician shall provide the following services:

1. Inspection and approval of the installation of each valve, gate and operator
2. Calibration of each operator

C. Personnel Training: The field service technician shall instruct operating personnel in the proper operation and maintenance of all valves, gates and operators.

3.5 OPERATION AND MAINTENANCE MANUAL

A. In addition to the normal Installation, Operation and Maintenance Manuals required by contract, a spare manual will be shipped with the equipment to allow for proper installation and operation prior to release of all final Installation, Operation and Maintenance Manuals to the end user.

3.6 TESTING

A. All piping systems, air and liquid, shall be tested for leakage. The Contractor shall certify completion of tests and correction of any deficiencies found during testing. Testing procedures and pressures shall be submitted to the Engineer for approval prior to testing.

END OF SECTION 44 6013
SECTION 46 7849 – PROCESS HEAT EXCHANGERS

PART 1 - GENERAL

1.1 DESCRIPTION
A. The work specified herein consists of spiral heat exchanger to heat municipal wastewater digested sludge in an anaerobic digestion process. This section includes the furnishing and installation of complete heat exchanger process including but not limited to heat exchanger unit and piping.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE
A. The following items of related work are specified and included in other sections of these specifications:
   1. Division 22 – Plumbing
   2. Division 23 – HVAC
   3. Division 26 – Electrical
   4. Division 40 – Instrumentation and Control
   5. Division 44 – Pollution Control Equipment
   6. Division 43 Section 1300 “Gas Process Equipment”

1.3 SUBMITTALS
A. Submittals: Submittals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures”.
B. O&M Manuals: O&M Manuals shall be prepared in accordance with Division 01 Section 3300 “Submittal Procedures” and Division 01 Section 7823 “Operation and Maintenance Data”.

1.4 SOURCE QUALITY CONTROL
A. Factory Inspections: Inspect equipment for required construction and intended function.
B. Hydrostatic testing shall be in accordance with ASME Section VIII, Division 1.

1.5 PRIOR APPROVAL
A. The following items of materials and/or equipment must receive approval prior to bidding if it is intended to furnish products other than those specifically named in these Specifications.
B. The requirements for obtaining such approval are specified in the Instructions to Bidders and the “General Requirements”.
C. Contractors must submit to the Engineer in accordance with Section 01 3300 “Submittal Procedures” date, design information including drawings they wish to have considered as an approved alternate. The design pre-submittal shall be complete and shall include as a minimum the following:
1. Drawings, specifications, and product literature with adequate detail to determine that what is proposed will meet the requirements of the plans and specifications.
2. A list of installations of similar type presently in service.
3. Evidence of manufacturing capability including a description of facilities, the number and professional qualifications of personnel, and quality control practices. The alternate equipment supplier shall identify major outside fabricators for the purpose of determine experience.
4. Evidence of technical capability to design and check the complete gas safety system, including modifications that may be required in structures and equipment provided by others.
5. Evidence of financial responsibility adequate to complete the project and assure viability of equipment warranty.
6. A complete listing of changes that will be required in the contract plans and specifications to accommodate the alternate equipment.

D. Alternate bidders shall guarantee, in writing, signed by an officer of the company, that the equipment offered will provide comparable or superior features, performance quality, and materials of construction as the equipment specified. Prior approval of the alternate equipment shall not constitute final approval of specific equipment, but rather constitutes only approval of the respective equipment manufacturers to provide price quotations based on equipment meeting the specifications. Alternate equipment manufacturers shall modify their standard products as necessary to meet all provisions of the specifications without exception.

E. The cost of any changes incidental to installation of the alternate equipment such as electrical wiring, relocation of piping, engineering supervision, as-built drawings, etc., shall be borne by the Contractor with no additional expense to the Owner.

F. If after installation the alternate equipment does not perform in accordance with the specifications or other deficiencies are noted, the Owner will require the modification or replacement of such equipment to meet the specifications at no additional expense.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.

B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

C. Store materials off the ground, under cover, and in a dry location.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. The heat exchanger(s) shall meet the Specifications listed in this Section and manufactured by Gooch Thermal Systems or Alfa Laval.

B. Each Manufacturer shall have not less than 10 years of experience manufacturing the specified heat exchangers in the United States and have not less than 10 wastewater installations in the United States.
2.2 SPIRAL HEAT EXCHANGER

A. General

1. Quantity: One (1) heat exchanger responsible for heating the digester sludge to maintain the contents of the primary digester at a temperature of 98°F.
2. A Manufacturer's Data Report for Unfired Pressure Vessels, Form U-1, as required by the provisions of the ASME Code Rules, shall be furnished to the Contractor for transmittal to the Owner. This form must be signed by a qualified inspector, holding a National Board commission, certifying that construction conforms to the latest revision of the ASME Code. The ASME "U" symbol shall also be stamped on the heat exchanger nameplate.
3. The heat exchanger shall be hydrostatically tested in the shop to ASME Code requirements after the unit(s) have been assembled.

B. Performance

1. General
   a. Hot Side Inlet/Outlet Size = 3 inch minimum
   b. Cold Side Inlet/Outlet Size = 4 inch minimum
   c. Hot Side Maximum Pressure Loss = 5 psig
   d. Cold Side Maximum Pressure Loss = 5 psig
   e. Maximum Operating Pressure = 30 psig

2. Design Condition 1 – Average Day
   a. Required Heat Transfer = 600 MBH
   b. Operating Conditions: Sludge Side
      1) Flow Rate In = 265-285 GPM, final flow rate to be determined during submittals
      2) Inlet Temperature: 95 degrees F
      3) Outlet Temperature: 100 degrees F
      4) Operating Pressure: 12-13 psig
      5) Maximum Pressure Loss: 5 psi
      6) Sludge Concentration: 2.0 % TSS
   c. Operating Conditions: Hot Water Side
      1) Fluid Type = Water/Glycol
      2) Flow: 150 GPM
      3) Inlet Temperature: 155 degrees F
      4) Outlet Temperature: 147 degrees F
      5) Operating Pressure: 10-25 psig
      6) Maximum Pressure Loss: 5 psi

C. Materials and Construction:

1. Heat Exchanger:
   a. Each heat exchanger shall be external spiral type with two (2) concentric spiral channels for counter current circulation of each fluid.
   b. Cold fluid channel provided with large inlet compartment offering tangential entry and a 4 inch clean out hole.
   c. Cold side channel spacing shall be no less than 1". Cold fluid channel shall be free of any sharp bends, support pins or any other obstruction in the flow channel.
d. Hinged covers shall be fastened with a minimum of 1-1/8” hook-bolts and clamps to easily access the cold fluid channel for cleaning, attached to spiral shell. Access shall be without interference from peripheral piping or ancillary equipment.

e. Minimum center tube diameter is 14” to reduce sludge turbulence and flow eddy current in center.

f. Materials of construction shall be SA-516 carbon steel coil construction. Minimum thickness of 0.25” for internal coil and 0.25” diameter spacer pins on hot fluid side. Coil to be continuous with no butt welds in channel.

g. Cold and hot sides shall have removable NPT drain plugs, at each low point, for draining of the heat exchanger prior to servicing. Sludge and wastewater drains shall be a minimum of 1” diameter. Water drains shall be a minimum of 1/8”.

h. Cold and hot side inlets and outlets shall have ¾” NPT connections for insertion of pressure/temperature monitoring.

i. Cold side shall have a 2” NPT connection on the inlet and outlet for back flush connection and flushing assembly.

j. Connections ANSI B16.5, Class 150 flange, for all connections 3-inch and larger.

k. Gaskets shall be full-face non-asbestos fiber sheet minimum 0.125-inch thick, Klingersil C4401 or equal.

l. Lifting lugs shall be furnished an installed for each cover and the heat exchanger.

m. An equipment identification plate of 16-guage stainless steel with ¼-inch die-stamped equipment tag number securely mounted in a readily visible location shall be provided.

2.3 Accessories:

1. Flushing Assemblies:

   a. Each flushing assembly shall consist of 2-inch diameter stainless steel pipe and 2” ball valve. Pipe and fittings shall be schedule 10S, 304 stainless steel with NPT connections. Ball valve shall be threaded, 1-Piece, full or standard port, all stainless steel body, and 1000 psi cold working pressure rating. Lever and nut shall be stainless steel. Ball valve shall be manufactured by Apollo Valve, Nibco or approved equal.

2. Anchor Bolts:

   a. Provide 316 stainless steel anchor bolts for mounting heat exchanger on concrete equipment pad.

B. Finishes:

1. Heat exchanger unit(s) shall be supplied with the prime and finish coats as specified in Specification Division 09, Section 9600 “High Performance Coatings”.

   a. Touch-up painting of the equipment shall be the responsibility of the contractor and shall be performed in accordance with Specification Division 09, Section 9600 “High Performance Coatings”. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site and after installation.

C. Spare Parts:

1. One (1) spare replacement gasket for each gasket.

2. One (1) spare drain plug for each drain plug size.

3. Three (3) spare hook-bolt and clamp sets.
PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Equipment shall be installed where indicated and in accordance with the manufacturer’s written instructions and under the supervision of the manufacturer’s representative. Sufficient clearances shall be provided around all equipment to allow for proper operation and maintenance. Installation shall be coordinated and interfaced with other digester equipment and accessories and meet the requirements of the ASME Boiler and Pressure Vessel Codes, Section VIII, rules for construction and testing of pressure vessels, latest edition. Mount heat exchanger level on concrete equipment pad and grout bases.

3.2 SUPERVISION AND STARTUP

A. The manufacturer shall furnish the services of the factory trained representative to supervise the installation and startup of the heat exchanger(s) and provide Owner operations and maintenance training. This service shall be in the form of one (1) trip to the site and one (1), eight (8) hour day of service.

B. Prior to start-up of the equipment, Draft Copies of the Operation and Maintenance Manuals shall be submitted to the Engineer in accordance with Division 01 Section 3300 “Submittal Procedures”. And, at least two (2) hard copies of the Draft O&M Manual shall be provided to the Owner prior to start-up.

1. Maintenance instructions listing routine maintenance procedures, possible breakdowns, and repairs shall be furnished. The instructions shall include simplified diagrams for the system as installed.

3.3 FIELD QUALITY CONTROL


1. Alignment: Test complete assemblies for proper alignment and connection and leakage.

B. Performance Test:

1. Conduct on each exchanger.
2. Test for a continuous 30-minute period on cold fluid and hot fluid channels without malfunction or leakage.
3. After completion of installation, heat exchanger shall be field tested to ensure compliance with the performance requirements, as indicated.

END OF SECTION 46 7849
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