Snyderville Basin Water Reclamation District

SNYDERVILLE BASIN WATER RECLAMATION DISTRICT
PARK CITY, UTAH

ROTARY FAN PRESS DEWATERING EQUIPMENT

PROCUREMENT DOCUMENTS

VOLUME 1 OF 1

OCTOBER 2024

carollo®

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SNYDERVILLE BASIN WATER RECLAMATION DISTRICT

ROTARY FAN PRESS DEWATERING EQUIPMENT

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DOCUMENT 00101

REQUEST FOR PROPOSAL AND LEGAL NOTICE - PROCUREMENT

SNYDERVILLE BASIN WATER RECLAMATION DISTRICT

2800 HOMESTEAD RD.

PARK CITY, UTAH, 84098

For procurement of Rotary Fan Press Dewatering Equipment

PROPOSAL DUE DATE

Sealed Proposals will be received at the office of Carollo Engineers, Inc., until 2:00 p.m. local time on November 13, 2024.

Proposals may also be emailed to Craig Ashcroft, P.E. at cashcroft@carollo.com.

DESCRIPTION OF THE GOOD AND SERVICES

The Goods and Services are generally described as follows: Two new rotary fan presses, flocculators, and new controls for entire system.

All Proposals must be in accordance with the Procurement Documents on file with the Snyderville Basin Water Reclamation District and at the offices of Carollo Engineers.

Copies of the Procurement Documents may be obtained from Carollo Engineers at the address indicated in this Document.

OWNER'S RIGHTS

Owner reserves the right to reject any or all Proposals, including without limitation the rights to reject any or all nonconforming, nonresponsive, or conditional Proposals, and to reject the Proposal of any Supplier if Owner believes that it would not be in the best interest of Owner to make an award to that Supplier. Owner also reserves the right to waive formalities.

Snyderville Basin Water Reclamation District

END OF DOCUMENT

DOCUMENT 00204

INSTRUCTIONS TO SUPPLIERS - PROCUREMENT

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Suppliers will have the meanings indicated in Document 00701 - General Conditions - Procurement and Document 00801 - Supplementary Conditions - Procurement. Additional terms used in these Instructions to Suppliers have the meanings indicated below.

A. Manufacturer, Supplier, and Seller are used synonymously in these Procurement Documents.

ARTICLE 2 - PROCUREMENT DOCUMENTS

2.01 Supplier may obtain complete sets of the Procurement Documents, as stated in the Request for Proposal.

2.02 Supplier must use a complete set of the Procurement Documents in preparing the Proposal; neither Buyer nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Procurement Documents.

2.03 Buyer and Engineer make copies of Procurement Documents available on the above terms only for obtaining Proposals for furnishing Goods and Special Services, and do not authorize or confer a license for any other use.

ARTICLE 3 - QUALIFICATIONS OF MANUFACTURERS

3.01 Buyer may at any time conduct such investigations as Buyer deems necessary to establish the responsibility, qualifications, and financial ability of Bidder, and after the opening of Bids may require a Bidder to submit documentation of its qualifications, including but not limited to financial data and documentation (references) of previous experience providing goods and services comparable to the specified Goods and Special Services.

ARTICLE 4 - SITE VISIT

4.01 Supplier may visit the Point of Destination and the site where the Goods are to be installed, and Special Services will be provided, taking into account observable local and site conditions that may affect the delivery, cost, progress, and furnishing of the Goods and Special Services. Arrangements for such a visit may be made through Engineer.

4.02 A pre-bid conference will not be held for this procurement.

4.03 Interpretations or clarifications considered necessary by Engineer in response to questions will be issued by Addenda delivered to all parties recorded by Engineer as having received the Procurement Documents. Only answers in the Addenda will be binding. Oral statements, interpretations, and clarifications may not be relied upon in the preparation of a Bid and will not be binding or legally effective.

ARTICLE 5 - INTERPRETATIONS AND ADDENDA

5.01 All questions about the meaning or intent of the Procurement Documents are to be submitted to Engineer in writing to: Craig Ashcroft at cashcroft@carollo.com.

5.02 Interpretations or clarifications considered necessary by Engineer in response to such written questions will be issued by Addenda emailed to all parties recorded as having received the Procurement Documents. Questions received less than 5 days prior to the date for opening of Bids will not be answered. Only answers in the Addenda will be binding. Oral statements, interpretations, and clarifications may not be relied upon in the preparation of a Bid and will not be binding or legally effective.

5.03 Addenda may be issued to clarify, correct, or change the Procurement Documents as deemed advisable by Buyer or Engineer.

ARTICLE 6 - PROCUREMENT CONTRACT TIMES

6.01 See applicable provisions in the Procurement Agreement.

ARTICLE 7 - LIQUIDATED DAMAGES

7.01 Any provisions for liquidated damages, such as those for Seller's failure to attain a specified Milestone such as the delivery of the Goods, are set forth in the Procurement Agreement.

ARTICLE 8 - CONFIDENTIALITY OF PROPOSAL INFORMATION

8.01 Confidential information is information in the Proposal, or in documents submitted by Supplier with the Proposal or submitted subsequent to the opening of Proposals in support of the Proposal, that Supplier clearly and prominently labels in writing to be a trade secret, proprietary, or confidential. Proposals will be opened and accompanying documents, if any, will be maintained in a manner that endeavors to avoid disclosing confidential information to third parties, to the extent allowed by Laws and Regulations.

8.02 Supplier shall clearly and prominently mark confidential information with the word "CONFIDENTIAL" on each page or sheet or on the cover of bound documents. Place "CONFIDENTIAL" stamps or watermarks so that they do not obscure any of the required information on the document, either in the original or in a way that would obscure any of the required information in a photocopy of the document.

8.03 If Buyer is requested to disclose confidential information, becomes legally compelled to disclose confidential information, or is required by a regulatory body, governing agency, or controlling authority to disclose confidential information, or make any other disclosure that is prohibited or otherwise constrained by these Procurement Bidding Requirements, Buyer will provide Supplier with prompt notice so Supplier may seek a protective order or other appropriate remedy. Supplier will be solely responsible for submitting to the regulatory body, governing agency, or controlling authority any arguments, briefs, memoranda, motions, authorities, or other information in opposition to disclosure.

8.04 Buyer's obligations with respect to confidential information are nullified by the following exceptions:

A. Confidential information becomes a part of the public domain through publication or otherwise, through no fault of the Buyer;

B. Buyer can demonstrate through suitable documentation that the confidential information was already in the Buyer's possession, and not previously marked as confidential, or was otherwise publicly available prior to the date of Proposal submittal;

C. The confidential information is subsequently and independently disclosed to the Buyer by a third party who has a lawful right to disclose such information;

D. Buyer concludes in good faith that the information is not confidential, or that disclosure is required or justified; or

E. Buyer is required to disclose the confidential information by court order or by applicable Laws and Regulations.

ARTICLE 9 - "OR EQUAL" ITEMS

9.01 The Procurement Contract, if awarded, will be based on materials and equipment specified or described in the Procurement Documents. Suppliers may propose "or equal" materials and equipment.

A. The materials and equipment described in the Procurement Documents establish a standard of required type, function, and quality to be met by any proposed "or equal" item.

ARTICLE 10 - PREPARATION OF PROPOSAL

10.01 The Proposal Form is included with the Procurement Documents. Additional copies of Procurement Documents may be obtained from the Issuing Office.

10.02 All blanks on the Proposal Form must be completed and the Proposal Form must be signed by an individual authorized to act on behalf of the Supplier. Alterations must be initialed by an individual authorized to act on behalf of the Supplier.

A Proposal price must be indicated for each item in the Proposal Form. In the case of optional alternates, the words “No Proposal” may be entered.

10.03 Supplier must acknowledge all Addenda by filling in the number and date of each Addendum in the Proposal Form and sign where indicated to verify that the Addenda were received. A Proposal that does not acknowledge receipt of all Addenda may be considered non-responsive.

10.04 Supplier shall:

A. Sign the Proposal Form as indicated in the Proposal Form.

B. Include evidence of authority to sign.

C. Provide information requested in Article 4 of the Proposal Form.

D. Provide information on the individual to be contacted for any communications regarding the Proposal.

E. Provide evidence of the Supplier’s authority and qualification to do business in the locality of the Project, to the extent required, or indicate the ability to obtain such authority and qualification prior to award of the Procurement Contract.

10.05 The responsibilities of each Supplier submitting a Proposal are described in the Supplier’s representations and certifications set forth in Article 6 of the Proposal Form.

ARTICLE 11 - SUBMITTAL OF PROPOSAL

11.01 Supplier shall refer to the Advertisement or Request for Proposals for specific identification of the date, time, and place where Proposals are to be submitted.

11.02 Supplier must submit one separate unbound copy of the completed Proposal Form, and the other documents required to be submitted under the terms of the Proposal Form.

11.03 A Proposal must be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Request for Proposals. Submit the Proposal in an envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Proposal is submitted) and the name and address of Supplier. Enclose the other documents required to be submitted with the Proposal as listed in the Proposal Form. If a Proposal is sent by mail or other delivery system, the sealed envelope containing the Proposal shall be enclosed in a separate package plainly marked on the outside with the notation “PROPOSAL ENCLOSED.”

ARTICLE 12 - PROPOSALS TO REMAIN SUBJECT TO ACCEPTANCE

12.01 All Proposals will remain subject to acceptance for the period stated in Document 00416 - Proposal Form - Procurement.

ARTICLE 13 - EVALUATION OF PROPOSALS AND AWARD OF PROCUREMENT CONTRACT

13.01 Buyer reserves the right to reject any and all Proposals, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Proposals.

13.02 Proposals will be evaluated by Engineer and Buyer, and will be ranked based on the following criteria:

Criteria	Weight
Capital Cost	50%
Reliability and Ease of Operation and Maintenance	25%
Spare Parts Availability/Service	25%

13.03 If Buyer awards the Procurement Contract, such award will be to the responsible Supplier submitting the Proposal with the best overall value.

ARTICLE 14 - BONDS AND INSURANCE

14.01 When the Successful Supplier delivers the signed Procurement Agreement to Buyer, it must be accompanied by required such bonds and acceptable evidence of insurance.

ARTICLE 15 - SIGNING OF PROCUREMENT AGREEMENT

15.01 When Buyer issues a Notice of Award to the Successful Supplier, it will be accompanied by 2 unsigned counterparts of the Procurement Agreement along with the other Procurement Contract Documents identified in the Procurement Agreement.

A. Within 15 days, Successful Supplier must execute and deliver the required number of counterparts of the Procurement Agreement and any bonds and acceptable evidence of insurance, together with printed and electronic copies of the Procurement Contract Documents.

B. Within 10 days, Buyer will deliver one fully executed counterpart of the Procurement Agreement to Successful Supplier, together with printed and electronic copies of the Procurement Contract Documents.

ARTICLE 16 - SALES AND USE TAXES

16.01 Sales and use taxes will not be included in the purchase price.

END OF DOCUMENT

DOCUMENT 00416

PROPOSAL FORM - PROCUREMENT

The terms used in this Proposal with initial capital letters have the meanings stated in Document 00204 - Instructions to Suppliers - Procurement, Document 00701 - General Conditions - Procurement, and Document 00801 - Supplementary Conditions - Procurement.

ARTICLE 1 - BUYER AND BIDDER

1.01 This Proposal is submitted to:

Snyderville Basin Water Reclamation District

1.02 The undersigned Supplier proposes and agrees, if this Proposal is accepted, to enter into a Procurement Contract with Buyer in the form included in the Procurement Documents, and to furnish the Goods and Special Services as specified or indicated in the Procurement Documents, for the prices and within the times indicated in this Proposal, and in accordance with the other terms and conditions of the Procurement Documents.

ARTICLE 2 - PROCUREMENT CONTRACT PRICE

2.01 Lump Sum Price

A. Rotary Fan Press Dewatering Equipment:

1. Supplier will furnish the Goods and Special Services as specified in the Procurement Contract Documents and Section 11359 - Rotary Fan Press Dewatering Equipment for the following Procurement Contract Price(s):

Item	Cost
Cost of Rotary Fan Press Dewatering Equipment	$
Cost of Controls and Power Panel	$
Cost of Shipping, Startup, and Other Services	$
Total Lump Sum Cost of Materials and Services	$

ARTICLE 3 - TIME OF COMPLETION

3.01 Supplier agrees that the furnishing of Goods and Special Services will conform to the schedule of Procurement Contract Times set forth in the Procurement Agreement.

3.02 Supplier accepts the provisions of the Procurement Agreement as to liquidated damages.

ARTICLE 4 - ATTACHMENTS TO THIS BID

4.01 The following documents are attached to and made a condition of this Proposal:

A. Proposal Form.

B. Detailed description of equipment/controls.

C. Operation and maintenance manual for similar equipment.

D. List of exceptions to the Specifications.

E. Drawings showing proposed equipment size/layout.

F. List of references of similar equipment with contact names and numbers.

ARTICLE 5 - SUPPLIER'S ACKNOWLEDGMENTS

5.01 Supplier accepts all terms and conditions of Document 00204 - Instructions to Suppliers - Procurement. This Proposal will remain subject to acceptance for 30 days after the Proposal opening, or for such longer period that Supplier may agree to in writing upon request of Buyer.

5.02 Bidder has examined and carefully studied the Procurement Documents, the related data identified in the Procurement Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date

ARTICLE 6 - SUPPLIER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Supplier's Representations

A. In submitting this Proposal, Supplier represents that:
   1. Supplier has examined and carefully studied the Procurement Contract Documents.
   2. If required by Document 00204 - Instructions to Supplier - Procurement to visit the Point of Destination and the site where the Goods are to be installed or Special Services will be provided, or if, in Supplier's judgment, any observable local or site conditions may affect the delivery, cost, progress, or furnishing of the Goods and Special Services, then Supplier has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided (as applicable) and become familiar with and is satisfied as to the observable

local and site conditions that may affect delivery, cost, progress, and furnishing of the Goods and Special Services.

3. Supplier is familiar with and is satisfied as to all Laws and Regulations that may affect the cost, progress, and performance of Seller's obligations under the Procurement Contract.
4. Supplier has carefully studied, considered, and correlated the information known to Supplier with respect to the effect of such information on the cost, progress, and performance of Seller's obligations under the Procurement Contract.
5. Supplier has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Supplier has discovered in the Procurement Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Supplier.
6. The Procurement Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of Seller's obligations under the Procurement Contract.
7. The submission of a Proposal will constitute an incontrovertible representation by Supplier that Supplier has complied with every requirement of the Bidding Requirements, that without exception the Bid (including all Bid prices) is premised upon furnishing the Goods and Special Services as required by the Procurement Contract Documents.

6.02 Supplier's Certifications

A. Supplier certifies that:
   1. This Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
   2. Supplier has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
   3. Supplier has not solicited or induced any individual or entity to refrain from bidding; and
   4. Supplier has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Procurement Contract. For the purposes of this Document:
      a. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
      b. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Buyer, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;
      c. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
      d. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process.

This Proposal is offered by:

Supplier:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Date: _____

(date signed)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

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

Attest: _____

(individual's signature)

Title: _____

(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

License No.: _____

Classification: _____

Limitation: _____

END OF DOCUMENT

DOCUMENT 00526

AGREEMENT BETWEEN BUYER AND SELLER - PROCUREMENT

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This Procurement Agreement is by and between Snyderville Basin Water Reclamation District (“Buyer”) and (“Seller”).

Terms used in this Procurement Agreement have the meanings stated in Document 00701 - General Conditions - Procurement and Document 00801 - Supplementary Conditions - Procurement.

Buyer and Seller hereby agree as follows:

ARTICLE 1 - PROCUREMENT CONTRACT

1.01 Goods and Special Services

A. Seller shall furnish the Goods and Special Services as specified or indicated in the Procurement Contract Documents. The Goods and Special Services are generally described as follows: Rotary Fan Press Dewatering Equipment and Controls.

1.02 The Project

A. The Project, of which the Goods and Special Services are a part, is generally described as follows: East Canyon Water Reclamation Facility Dewatering Prepurchase.

1.03 Engineer

A. Buyer has retained Carollo Engineer ("Engineer"), to prepare Procurement Contract Documents and act as Buyer's representative. Engineer assumes all duties and responsibilities and has the rights and authority assigned to Engineer in the Procurement Contract Documents in connection with Seller’s furnishing of Goods and Special Services.

1.04 Point of Destination:

A. The Point of Destination is designated as:

East Canyon Water Reclamation Facility
2909 West Sackett Rd.
Park City, Utah 84098

ARTICLE 2 - PROCUREMENT CONTRACT TIMES

2.01 Time of the Essence

A. All time limits for Milestones, including the submittal of Shop Drawings and Samples, the delivery of Goods, and the furnishing of Special Services as stated in the Procurement Contract Documents, are of the essence of the Procurement Contract.

2.02 Schedule of Procurement Contract Times

A. The following schedule sets forth the Procurement Contract Times:

Milestone	Date or Days	Notes
Submit Shop Drawings	75 calendar days	Date from fully signed Agreement
Deliver acceptable Goods to Point of Destination	250 calendar days	Date from approval of Shop Drawings

2.03 Shop Drawings and Samples

A. Submittal of Shop Drawings and Samples: Seller shall submit all Shop Drawings and Samples required by the Procurement Contract Documents to Engineer for its review and approval.

B. Engineer's Review: It is the intent of the parties that Engineer will conduct its review of Shop Drawings and Samples and issue its approval, or a denial accompanied by substantive comments regarding information needed to gain approval, within 30 days after Seller's submittal of such Shop Drawings and Samples, or within such longer period that is needed because of the quantity and quality of such submittals. Resubmittals will be limited whenever possible.

2.04 Liquidated Damages

A. Buyer and Seller recognize that time is of the essence, and that Buyer will suffer financial and other losses if the Goods are not delivered to the Point of Destination and ready for receipt of delivery by Buyer within the time specified in this Document, plus any extensions thereof allowed in accordance with this Procurement Contract.

B. The parties also recognize that the timely performance of services by others involved in the Project is materially dependent upon Seller's specific compliance with the delivery requirements.

C. Further, the parties recognize the time, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the loss (whether direct, consequential, or otherwise) suffered by Buyer if complete, acceptable Goods are not delivered on time.

D. Accordingly, instead of requiring any such proof, Buyer and Seller agree that as liquidated damages for delay (but not as a penalty) Seller shall pay Buyer $1,000 for each day that expires after the date specified in this Document for delivery of acceptable Goods.
   1. Liquidated damages will be capped at a maximum amount equal to 10 percent of the Procurement Contract price.

ARTICLE 3 - PROCUREMENT CONTRACT PRICE

A. The Procurement Contract Price is comprised of the Lump Sum set forth in the attached Proposal.

ARTICLE 4 - PAYMENT PROCEDURES

4.01 Submittal and Processing of Applications for Payment

A. Seller shall submit Applications for Payment in accordance with Article 13 of Document 00701 - General Conditions - Procurement and the following paragraphs. Engineer and Buyer will process such Applications for Payment in accordance with said Article 13.

4.02 Progress Payments; Final Payment

A. Seller may submit an Application for Payment requesting the stated percentage of Procurement Contract Price upon attainment of each of the following Payment Line Items:

Payment Line Item (Lump Sum)	**Percentage of Lump Sum**
Receipt of Approval of Shop Drawings and Samples	10
Delivery of Goods to Point of Destination in accordance with the Procurement Contract Documents	70
Final Payment: Completion of startup services, correction of nonconformities, provision of final Operations and Maintenance manuals, submittal of warranties and other final documentation required by the Procurement Contract Documents	20
Total Procurement Contract Price (Lump Sum)	**100**

ARTICLE 5 - ASSIGNMENT OF PROCUREMENT CONTRACT

5.01 Assignment of Contract

A. Buyer has the right to assign this Procurement Contract for furnishing Goods and Special Services, but only to a person or entity with sufficient and apparent ability to satisfy all of Buyer's obligations under this Procurement Contract, and Seller hereby consents to such assignment.

B. If so, assigned the following provisions apply:
   1. The Procurement Contract is initially executed in the name of the entity identified in this Document as Buyer and will be assigned by such Buyer (as assignor) to a construction contractor (Contractor/Assignee) designated by such Buyer. The assignment will occur on the effective date of the construction contract between such Buyer (Project Owner) and the Contractor/Assignee. Commencing on the date of acceptance of assignment by the Contractor/Assignee, all references in the Procurement Contract to “Buyer” shall mean the designated Contractor/Assignee.

2. The assignment of this Procurement Contract relieves the assignor from all further obligations and liabilities under this Procurement Contract. After assignment, Seller shall become a subcontractor or supplier to the Contractor/Assignee and, except as noted in this Document, all rights, duties, and obligations of Buyer under the Procurement Contract become the rights, duties, and obligations of the Contractor/Assignee.
3. After assignment:
    a. The Procurement Drawings and Procurement Specifications, and any modifying Addenda will become “Contract Documents” under the construction contract.
    b. If the Procurement Drawings or Procurement Specifications, as “Contract Documents” under the construction contract, are duly modified under such construction contract, then Seller and Contractor/Assignee shall enter into a corresponding Change Order under the applicable provisions of this Procurement Contract.
    c. The Procurement Drawings and Procurement Specifications may not be modified by Seller or Contractor/Assignee, singly or in tandem, except as such Procurement Drawings or Procurement Specifications, as “Contract Documents” under the construction contract, have been duly modified under such construction contract.
    d. All performance warranties, guarantees, and indemnifications required by the Procurement Contract will continue to run for the benefit of assignor (Project Owner) and, in addition, for the benefit of the Contractor/Assignee. However, if assignor (Project Owner) and Contractor/Assignee make the same warranty or guarantee claim, then Seller shall only be liable once for such claim. Other than its remedies under such warranties, guarantees, and indemnifications, assignor will not retain direct rights under this Procurement Contract, but will have rights and remedies as a party to the construction contract, whose scope of work will encompass the Procurement Drawings, Procurement Specifications, and modifying Addenda; provided, however, that any limitations on Seller’s liability in this Procurement Contract will continue to bind the original Buyer (assignor) after assignment.
    e. The Contractor/Assignee shall have all the rights of the Buyer under the Performance Bond and Payment Bond.
    f. Seller shall submit all Applications for Payment directly to Contractor/Assignee.
        1) Contractor/Assignee shall review each Application for Payment promptly, determine the amount that Contractor/Assignee approves for payment, and then include the amount approved in the next application for payment submitted to Project Owner (or Engineer) under the construction contract.
        2) Contractor/Assignee shall pay Seller within 30 days of receipt of payment from the Project Owner under the construction contract.
        3) After assignment Engineer will review, approve, or deny the content of Applications for Payment under the Procurement Contract only to the extent that Contractor/Assignee, as construction contractor, has incorporated such content into payment applications that Engineer reviews under the construction contract.

g. The Contractor/Assignee shall have all the rights of the Buyer under any pending Claim by Buyer.
h. All Claims and supporting documentation will be submitted directly by the claimant party (either Buyer, Contractor/Assignee, or Seller), to the other party, without submittal to Engineer.
    1) The other party will render a response in writing within 30 days of receipt of the last submittal of claimant.
    2) If the other party does not render a written response to a Claim within 30 days after receipt of the last submittal of the claimant, the other party shall be deemed to have approved the Claim in its entirety.
    3) The other party's written response to a Claim, or the approval of the Claim in its entirety as a function of failure to respond within 30 days, will be final and binding upon Buyer and Seller 30 days after it is issued, unless within such 30 days of issuance either Buyer or Seller appeals the result by initiating the mediation of the Claim in accordance with the dispute resolution procedures.
    4) Any Claim by Seller that Contractor/Assignee may choose to submit, present, or forward to Project Owner must be submitted to Buyer within sufficient time for Contractor/Assignee to preserve its rights under the construction contract, notwithstanding any procedures or time limits in this Procurement Contract.
i. Seller's recovery of additional cost, time, or both cost and time for any Claim attributable to the Project Owner will be limited to the proportionate recovery by Contractor/Assignee against Project Owner for such Claim. Seller will cooperate and assist Contractor/Assignee in pursuing any Claim by Contractor/Assignee against Project Owner on behalf of Seller, including the timely preparation and delivery of supporting documentation.
j. If the pursuit of any claim by Contractor/Assignee against Project Owner on Seller's behalf requires the expenditure by Contractor/Assignee of legal or consulting fees, or results in litigation, arbitration, or any dispute resolution procedures, Seller agrees to pay for a proportionate share of attorneys' fees, consultant fees, and litigation, arbitration, and other resolution costs incurred by Contractor/Assignee in pursuing the claim on behalf of Seller, based upon the amount claimed by Seller as compared to the total value of the claim pursued by the Contractor/Assignee.
k. All rights, duties, and obligations of Engineer to Contractor/Assignee and Seller under this Procurement Contract will cease.
l. Subject to the foregoing provisions, all references in the Procurement Contract to submitting items to Engineer, or to Engineer having tasks or obligations, will be read after such an assignment as requiring submittal to Contractor/Assignee, or as Contractor/Assignee having such tasks or obligations (which Contractor/Assignee may delegate when appropriate).
m. If the Procurement Contract includes a Buyer's Contingency Allowance, upon assignment such allowance will be automatically reduced to the amount previously authorized by Buyer (Project Owner) and cease to be operational.

C. No other assignment by a party hereto of any rights under or interests in the Procurement Contract will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, Procurement Contract payments or other money that may become due, and Procurement Contract payments or other money that are due, may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by Laws and Regulations). Unless specifically stated to the contrary in any written consent to such an assignment, such an assignment will not release or discharge the assignor from any duty or responsibility under the Procurement Contract Documents.

ARTICLE 6 - PROCUREMENT CONTRACT DOCUMENTS

6.01 List of Procurement Contract Documents

A. The Procurement Contract Documents consist of the following:
   1. This Procurement Agreement.
   2. Document 00701 - General Conditions - Procurement.
   3. Document 00801 - Supplementary Conditions - Procurement.
   4. Procurement Specifications.
   5. Procurement Drawings (not attached but incorporated by reference).
   6. Addenda Numbers _____.
   7. Bonds:
      a. Performance bond (together with power of attorney).
   8. Exhibits to this Procurement Agreement (enumerated as follows):
      a. Seller's Proposal, solely as to the prices set forth.
      b. Documentation submitted by Seller.
   9. The following which may be delivered or issued on or after the Effective Date of the Procurement Contract and are not attached hereto:
      a. Change Orders.
      b. Change Directives.
      c. Field Orders.
      d. Exhibit A, Assignment of Contract, Consent to Assignment, and Acceptance of Assignment.
      e. Exhibit B, Surety's Consent to Assignment.

B. The documents listed under List of Procurement Contract Documents are attached to this Procurement Agreement (except as expressly noted otherwise above).

C. There are no Procurement Contract Documents other than those listed above.

D. The Procurement Contract Documents may only be amended or supplemented as provided in Paragraph 11.01 of Document 00701 - General Conditions - Procurement.

ARTICLE 7 - SELLER’S REPRESENTATIONS AND CERTIFICATIONS

7.01 Seller’s Representations

A. In order to induce Buyer to enter into this Procurement Agreement, Seller makes the following representations:
   1. Seller has examined and carefully studied the Procurement Contract Documents.
   2. If required by the Instructions to Bidders to visit the Point of Destination and the site where the Goods are to be installed or Special Services will be provided, or if, in Seller’s judgment, any observable local or site conditions may affect the delivery, cost, progress, or furnishing of the Goods and Special Services, then Seller has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided (as applicable) and become familiar with and is satisfied as to the observable local and site conditions that may affect delivery, cost, progress, and furnishing of the Goods and Special Services.
   3. Seller is familiar with and is satisfied as to all Laws and Regulations that may affect the cost, progress, and performance of Seller's obligations under the Procurement Contract.
   4. Seller has carefully studied, considered, and correlated the information known to Seller with respect to the effect of such information on the cost, progress, and performance of Seller's obligations under the Procurement Contract.
   5. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Procurement Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Seller.
   6. The Procurement Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of Seller's obligations under the Procurement Contract.
   7. Seller’s entry into this Procurement Contract constitutes an incontrovertible representation by Seller that without exception all prices in the Procurement Agreement are premised upon furnishing the Goods and Special Services as required by the Procurement Contract Documents.

7.02 Seller’s Certifications

A. Seller certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Procurement Contract. For the purposes of this Document:
   1. “corrupt practice” means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Procurement Contract execution;
   2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Procurement Contract to the detriment of Buyer, (b) to establish bid or contract prices at artificial non-competitive levels, or (c) to deprive Buyer 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 Buyer, 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 Procurement Contract.

ARTICLE 8 - CONFIDENTIALITY

8.01 Confidential Information

A. Confidential information is information in documents submitted by Seller that Seller clearly and prominently labels in writing to be a trade secret, proprietary, or confidential. Such documents, if any, will be maintained in a manner that endeavors to avoid disclosing confidential information to third parties to the extent allowed by Laws and Regulations.

B. Seller shall clearly and prominently mark confidential information with the word “CONFIDENTIAL” on each page or sheet or on the cover of bound documents. Place “CONFIDENTIAL” stamps or watermarks so that they do not obscure any of the required information on the document, either in the original or in a way that would obscure any of the required information in a photocopy of the document.

8.02 Disclosure of Confidential Information

A. If Buyer is requested to disclose confidential information, or becomes legally compelled (by oral questions, interrogatories, requests for information or documents, subpoena, civil or criminal investigative demand, public information requests, or other requests under Laws and Regulations) to disclose confidential information, or is required by a regulatory body, governing agency, or controlling authority to disclose confidential information, or make any other disclosure that is prohibited or otherwise constrained by the Procurement Contract, Buyer will provide Seller with prompt notice so Seller may seek an appropriate protective order or other remedy. Seller will be solely responsible for submitting to the regulatory body, governing agency, or controlling authority any arguments, briefs, memoranda, motions, authorities, or other information in opposition to disclosure.

B. Buyer’s obligations with respect to confidential information are nullified by the following exceptions:
   1. Confidential information becomes a part of the public domain through publication or otherwise, through no fault of the Buyer;
   2. Buyer can demonstrate through suitable documentation that the confidential information was already in the Buyer’s possession, and not previously marked as confidential, or was otherwise publicly available prior to the Effective Date of the Procurement Contract;
   3. The confidential information is subsequently and independently disclosed to the Buyer by a third party who has a lawful right to disclose such information;
   4. Buyer has a good faith belief that disclosure is required or justified; or
   5. Buyer is required to disclose the confidential information by court order or by applicable Laws and Regulations.

8.03 Waiver of Immunity

A. Notwithstanding any other provision of the Procurement Contract, it is stipulated and agreed that by accepting confidential information, Buyer has not and does not waive its legal immunity (if any) from suit or liability.

ARTICLE 9 - MUTUAL WAIVER

9.01 Mutual Waiver of Consequential Damages

A. Buyer and Seller waive against each other, and against the other's officers, directors, members, partners, employees, agents, consultants, and subcontractors, any and all claims for or entitlement to incidental, indirect, or consequential damages arising out of, resulting from, or related to the Procurement Contract. If Buyer (Project Owner) assigns this Procurement Contract to a construction contractor (Contractor/Assignee), then the terms of this Paragraph will be binding upon the Contractor/Assignee with respect to Seller and assignor. The terms of this mutual waiver do not apply to or limit any claim by either Buyer or Seller against the other based on any of the following: (a) contribution or indemnification, (b) liquidated damages, (c) costs, losses, or damages attributable to personal or bodily injury, sickness, disease, or death, or to injury to or destruction of the tangible property of others, (d) intentional or reckless wrongful conduct, or (e) rights conferred by any bond provided by Seller under this Procurement Contract.

IN WITNESS WHEREOF, Buyer and Seller have signed this Procurement Agreement. Counterparts have been delivered to Buyer and Seller.

The Effective Date of the Procurement Contract is _____, 2023.

Buyer	Seller
_____ *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
	(If Seller is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices:	Address for giving notices:
_____	_____
_____	_____
_____	_____
Designated Representative:	Designated Representative:
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address:	Address:
_____	_____
_____	_____
_____	_____
Phone: _____	Phone: _____
Email: _____	Email: _____
(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)	

END OF DOCUMENT

DOCUMENT 00614

PERFORMANCE BOND - PROCUREMENT

Seller Name: _____ Address *(principal place of business)*: _____ _____	**Surety** Name: _____ Address *(principal place of business)*: _____ _____
Buyer Name: Snyderville Basin Water Reclamation District Mailing address *(principal place of business)*: 2800 Homestead Rd. Park City, Utah, 84098	**Procurement Contract** Description *(name and location)*: East Canyon Water Reclamation Facility 2909 Sackett Rd. Park City, Utah, 84098 Procurement Contract Price: _____ Effective Date of Procurement Contract: _____

Bond

Bond Amount: _____

Date of Bond: _____

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

Modifications to this Bond form:

☐ None ☐ See modifications in this Document

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

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

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

1. The Seller and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Buyer for the performance of the Procurement Contract, which is incorporated herein by reference.
2. If the Seller performs the Procurement Contract, the Surety and the Seller shall have no obligation under this Bond, except when applicable to participate in a conference as provided in this Document.
3. If there is no Buyer Default under the Procurement Contract, the Surety's obligation under this Bond will arise after:
    3.1. The Buyer first provides notice to the Seller and the Surety that the Buyer is considering declaring a Seller Default. Such notice may indicate whether the Buyer is requesting a conference among the Buyer, Seller, and Surety to discuss the Seller's performance. If the Buyer does not request a conference, the Surety may, within 5 business days after receipt of the Buyer's notice, request such a conference. If the Surety timely requests a conference, the Buyer shall attend. Unless the Buyer agrees otherwise, any conference requested under this provision will be held within 10 business days of the Surety's receipt of the Buyer's notice. If the Buyer, the Seller, and the Surety agree, the Seller shall be allowed a reasonable time to perform the Procurement Contract, but such an agreement does not waive the Buyer's right, if any, subsequently to declare a Seller Default;
    3.2. The Buyer declares a Seller Default, terminates the Procurement Contract, and notifies the Surety; and
    3.3. The Buyer has agreed to pay the Balance of the Procurement Contract Price in accordance with the terms of the Procurement Contract to the Surety or to a seller selected to perform the Procurement Contract.
4. Failure on the part of the Buyer to comply with the notice requirement in Document does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Buyer has satisfied the conditions specified in this Document, the Surety shall promptly and at the Surety's expense take one of the following actions:
    5.1. Arrange for the Seller, with the consent of the Buyer, to perform and complete the Procurement Contract;
    5.2. Undertake to perform and complete the Procurement Contract itself, through its agents or independent contractors;
    5.3. Obtain bids or negotiated proposals from qualified sellers acceptable to the Buyer for a contract for performance and completion of the Procurement Contract, arrange for a contract to be prepared for execution by the Buyer and a seller selected with the Buyer's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Procurement Contract, and pay to the Buyer the amount of damages as specified in this Document in excess of the Balance of the Procurement Contract Price incurred by the Buyer as a result of the Seller Default; or

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

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

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

6. If the Surety does not proceed as specified in this Document with reasonable promptness, the Surety shall be deemed to be in default on this Bond 7 days after receipt of an additional written notice from the Buyer to the Surety demanding that the Surety perform its obligations under this Bond, and the Buyer shall be entitled to enforce any remedy available to the Buyer. If the Surety proceeds as specified in this Document and the Buyer refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Buyer shall be entitled to enforce any remedy available to the Buyer.

7. If the Surety elects to act, then the responsibilities of the Surety to the Buyer will not be greater than those of the Seller under the Procurement Contract, and the responsibilities of the Buyer to the Surety will not be greater than those of the Buyer under the Procurement Contract. Subject to the commitment by the Buyer to pay the Balance of the Procurement Contract Price, the Surety is obligated, without duplication for:

   7.1. the responsibilities of the Seller for correction of defective or non-conforming Goods and Special Services, and completion of the Procurement Contract;

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

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

8. If the Surety elects to act, the Surety's liability is limited to the amount of this Bond.

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

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

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction where the Point of Destination is located and must be instituted within 2 years after a declaration of Seller Default, or within 2 years after the Seller ceased working, or within 2 years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

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

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Point of Destination, any provision in this Bond conflicting with said

statutory or legal requirement will be deemed deleted from this Bond and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

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

    14.2. Buyer Default—Failure of the Buyer, which has not been remedied or waived, to pay the Seller as required under the Procurement Contract or to perform and complete or comply with the other material terms of the Procurement Contract.

    14.3. Goods and Special Services—The full scope of materials, equipment, other items, and services to be furnished by Seller, as defined in the Procurement Contract.

    14.4. Point of Destination—The location where delivery of the Goods shall be made, as stated in the Procurement Contract.

    14.5. Procurement Contract—The contractual agreement between the Buyer and Seller identified on the cover page, including all Procurement Contract Documents and changes made to the Procurement Contract.

    14.6. Seller Default—Failure of the Seller, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Procurement Contract.

    14.7. Procurement Contract Documents—All the documents that comprise the contractual agreement between the Buyer and Seller.

15. Modifications to this Bond are as follows:

END OF DOCUMENT

DOCUMENT 00646

BUYER'S ACKNOWLEDGEMENT OF RECEIPT OF GOODS - PROCUREMENT

Buyer:	Buyer's Project No.:
Engineer:	Engineer's Project No.:
Seller:	Seller's Project No.:
Project:	
Contract Name:	

This Buyer's Acknowledgment of Receipt of Goods (Acknowledgment) applies to:

☐ All Goods ☐ The following specified portions of the Goods: _____

Date of delivery of the Goods to the Point of Destination: _____

Date of Buyer's visual inspection of the Goods: _____

Date of this Acknowledgment: _____

Buyer acknowledges:

1. The Goods to which this notice applies have been delivered to the Point of Destination.
2. Buyer has visually inspected such Goods pursuant to Paragraph 9.02.B.1 of Document 00701 - General Conditions - Procurement.
3. Based on the visual inspection, such Goods appear to comply with the requirements of the Procurement Contract Documents as to quantities and condition, subject to any exceptions and limitations in this Acknowledgment.
4. Such Goods are deemed received for purposes of Paragraph 9.02.B.2 of Document 00701 - General Conditions - Procurement.
5. Seller may submit its Application for Payment for the delivered Goods, subject to the terms of the Procurement Agreement.

Exceptions (if any) to this Acknowledgment: ☐ None ☐ As follows:

The responsibilities between Buyer and Seller for securing and storing the Goods, maintaining the Goods during storage, and for furnishing the Special Services, shall be as provided in the Procurement Contract.

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

_____

This Acknowledgment does not constitute an acceptance of any Goods not in conformance with the Procurement Contract Documents, nor is it a release of Seller's obligation to furnish all Goods and Special Services in accordance with the Procurement Contract.

	Buyer	**Engineer, on behalf of Buyer**
By (signature):		
Name (Printed):		
Title:		
Date:		

END OF DOCUMENT

DOCUMENT 00647

BUYER'S NOTICE REGARDING CONFORMITY OF GOODS AND SPECIAL SERVICES - PROCUREMENT

Buyer:	Buyer's Project No.:
Engineer:	Engineer's Project No.:
Seller:	Seller's Project No.:
Project:	
Contract Name:	
Notice Date:	Effective Date of the Procurement Contract:

Buyer hereby gives notice to Seller that, to the best of Buyer's knowledge, information, and belief, the Goods and Special Services:

☐ Are in conformance with the Procurement Contract Documents. Upon Seller's submittal of its final Application for Payment in accordance with the Procurement Contract Documents, Seller will be eligible for final payment, except as expressly indicated in the Procurement Contract.

☐ Are nonconforming with the Procurement Contract Documents for the following reason(s):

1. _____

Seller's Special Services were completed on: _____

Buyer has consulted with and received Engineer's recommendation on conformity of the Goods and Special Services.

This Buyer's Notice Regarding Conformity of Goods and Special Services (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice is expressly subject to the terms and conditions set forth in the Procurement Contract.
2. This Notice is not a guarantee or warranty of Seller's performance under the Procurement Contract, an acceptance of Goods and Special Services that are not in accordance with the related Procurement Contract Documents, including but not limited to nonconforming Goods and Special Services discovered after final inspection, nor an assumption of responsibility for any failure of Seller to furnish the Goods and Special Services thereunder in accordance with the Procurement Contract, or to otherwise comply with the Procurement Contract Documents or the terms of any special guarantees specified.
3. This Notice does not relieve Seller of any surviving obligations under the Procurement Contract and is subject to Buyer's reservations of rights with respect to completion and final payment.

Buyer

By (signature): _____ Name (Printed): _____

Date: _____ Title: _____

END OF DOCUMENT

DOCUMENT 00701

GENERAL CONDITIONS - PROCUREMENT

TABLE OF CONTENTS

ARTICLE 1 — DEFINITIONS

1.01 Defined Terms

A. Wherever used in these Procurement General Conditions or in the other Procurement Documents and printed with initial capital letters, the following terms have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Procurement 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 documents or the Procurement Documents.
2. Application for Payment—The document prepared by Seller, in a form acceptable to Buyer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Procurement Contract Documents.
3. Proposal or Bid--An offer or proposal of a prospective Seller submitted on the prescribed form setting forth the price(s) for furnishing the Goods and Services.
4. Supplier or Bidder—An individual or entity that, as a prospective Seller, submits a Bid to Buyer.
5. Buyer—The individual or entity purchasing the Goods and Special Services.
6. Change Directive—A written directive from Buyer to Seller issued on or after the Effective Date of the Procurement Contract, ordering an addition, deletion, or revision in the Goods and Special Services.
7. Change Order--A document which is signed by Seller and Buyer and authorizes an addition, deletion, or revision to the Procurement Contract Documents or an adjustment in the Procurement Contract Price or the Procurement Contract Times, issued on or after the Effective Date of the Procurement Contract. Change Orders may be the result of mutual agreement by Buyer and Seller, or of resolution of a Claim.
8. Claim—A demand or assertion by Buyer or Seller seeking an adjustment of Procurement Contract Price or Procurement Contract Times, or both, or other relief with respect to the terms of the Procurement Contract. A demand for money or services by a third party is not a Claim.
9. Contractor/Assignee—A construction contractor with which Project Owner enters into a construction contract, and to which Project Owner, as initial Buyer, assigns this Procurement Contract.
10. Effective Date of the Procurement Contract—The date indicated in the Procurement Agreement on which the Procurement Contract becomes effective.
11. Electronic Document—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
12. Electronic Means—Electronic mail (e-mail), upload/download from a secure Project website, or other communications methods that allow: the transmission or communication of Electronic Documents; the documentation of transmissions, including sending and receipt; printing of the transmitted Electronic Document by the recipient; the storage and archiving of the Electronic Document by sender and recipient; and the use by recipient of the Electronic Document for purposes permitted by this Procurement Contract. Electronic Means does not include the

use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

13. Engineer-- The individual or entity designated as such in the Procurement Agreement.
14. Field Order-- A written order issued by Engineer which requires minor changes in the Goods or Special Services, but which does not involve a change in the Procurement Contract Price or Procurement Contract Times.
15. Goods--The tangible and movable personal property that is described in the Procurement Contract Documents, regardless of whether the property is to be later attached to realty.
16. Goods and Special Services—The full scope of materials, equipment, other items, and services to be furnished by Seller, including Goods, as defined herein, and Special Services, if any, as defined herein. This term refers to both the Goods and the Special Services, or to either the Goods or the Special Services, and to any portion of the Goods or the Special Services, as the context requires.
17. Laws and Regulations; Laws or Regulations—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
18. Milestone--A principal event specified in the Procurement Contract that Seller must attain by the date or within the number of days indicated, including but not limited to the delivery of the Goods and the furnishing of Special Services.
19. Notice of Award-- The written notice, by Buyer to a Bidder, of Buyer's acceptance of the Bid.
20. Point of Destination-- The specific address of the location where delivery of the Goods will be made, as stated in the Procurement Agreement.
21. Procurement Agreement--The written instrument, executed by Buyer and Seller, that sets forth the Procurement Contract Price and Procurement Contract Times, identifies the parties and the Engineer, and designates the specific items that are Procurement Contract Documents.
22. Procurement Bidding Documents-- The Procurement Bidding Requirements and the proposed Procurement Contract Documents (including all Addenda).
23. Procurement Bidding Requirements—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and Bid Form with any supplements.
24. Procurement Contract—The entire and integrated written agreement between Buyer and Seller concerning the Goods and Special Services.
25. Procurement Contract Documents—Those items so designated in the Procurement Agreement, and which together comprise the Procurement Contract. Shop Drawings and other Seller submittals are not Procurement Contract Documents, even if accepted, reviewed, or approved by Engineer or Buyer.
26. Procurement Contract Price—The money that Buyer has agreed to pay Seller for furnishing the Goods and Special Services in accordance with the Procurement Contract Documents.
27. Procurement Contract Times—The times stated in the Procurement Agreement by which the Goods must be delivered, Special Services must be furnished, and other Milestones must be attained.

28. Procurement Drawings—That part of the Procurement Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Goods and Special Services to be furnished by Seller. Shop Drawings and other Seller submittals are not Procurement Drawings as so defined.
29. Procurement Specifications—That part of the Procurement Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the furnishing of the Goods and Special Services, and certain administrative requirements and procedural matters applicable thereto.
30. Project--The total undertaking to be accomplished for Project Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Goods and Special Services are a part.
31. Project Owner—The entity that has retained (or will retain) engineers, contractors, and others for the planning, study, design, construction, testing, commissioning, and start-up of facilities and improvements. As of the Effective Date of the Procurement Contract, the Project Owner is the Buyer.
32. Samples—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Goods and Special Services and which establish the standards by which such portion of the Goods and Special Services will be judged.
33. Schedule of Submittals—A schedule, prepared and maintained by Seller, of required Submittals and the time requirements for Engineer's review of the Submittals.
34. Seller—The individual or entity furnishing the Goods and Special Services.
35. Shop Drawings--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods and Special Services. Shop Drawings, whether approved or not, are not Procurement Drawings and are not Procurement Contract Documents.
36. Special Services—Services to be performed by Seller (or its agents or subcontractors) in association with the Goods to be furnished by Seller, as required by the Procurement Contract Documents.
37. Submittal—A written or graphic document, prepared by or for Seller, which the Procurement Contract Documents require Seller to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or site quality-control testing and inspections; warranties and certifications; suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; record documents; and other such documents required by the Procurement Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Procurement Contract Documents. Change proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
38. Successful Bidder—The Bidder whose Bid the Buyer accepts, and to which Buyer makes an award of the Procurement Contract.
39. Supplementary Conditions--The part of the Procurement Documents that amends or supplements these General Conditions.

40. Unit Price Goods and Special Services—Goods and Special Services to be paid for on the basis of unit prices (if any).

1.02 Terminology

A. The words and terms are not defined but have the indicated meanings when used in the Bidding Requirements or Procurement Contract Documents.

B. Intent of Certain Terms or Adjectives
   1. The Procurement 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 Goods and Special Services. It is intended that such exercise of professional judgment, action, or determination will be commercially reasonable and will be solely to evaluate, in general, the Goods and Special Services for compliance with the requirements of and information in the Procurement Contract Documents and conformance with the design concept of the completed Project as a functioning whole, as shown or indicated in the Procurement Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective will not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing of Goods or Special Services or any duty or authority to undertake responsibility contrary to any other provision of the Procurement Contract Documents.
   2. The word “non-conforming” when modifying the words “Goods and Special Services,” “Goods,” or “Special Services,” refers to Goods and Special Services that are unsatisfactory, faulty, or deficient in that they:
      a. do not conform to or comply with the requirements of the Procurement Contract Documents;
      b. do not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Procurement Contract Documents; or
      c. in the case of Special Services, have not been completed.
   3. The word “receipt” when referring to the Goods, means the physical taking and possession by the Buyer.
   4. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
   5. The word "furnish," when used in connection with the Goods and Special Services means to supply and deliver said Goods to the Point of Destination (or some other specified location) and to perform said Special Services fully, all in accordance with the Procurement Contract Documents.

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

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

ARTICLE 2 - PRELIMINARY MATTERS

2.01 Delivery of Bonds & Insurance Certificates

A. When Seller delivers the executed counterparts of the Procurement Agreement to Buyer, the Seller also shall deliver to Buyer the performance bond and payment bond (if the Procurement Contract requires Seller to furnish such bonds).

B. Evidence of Seller's Insurance: When Seller delivers the signed counterparts of the Procurement Agreement to Buyer, the Seller also shall deliver to Buyer, with copies to each additional insured (as identified in the Procurement Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Seller in accordance with bonds and insurance. Evidence of insurance to be obtained at a later date, such as insurance relating to transit or storage of the Goods, will be provided to Buyer at the time of such insurance is obtained.

C. Evidence of Buyer's Insurance: After receipt of the signed counterparts of the Procurement Agreement and all required bonds and insurance documentation, Buyer shall promptly deliver to Seller, with copies to each additional insured (as identified in the Procurement Contract), certificates and other evidence of insurance (if any) required to be provided by Buyer.

2.02 Copies of Documents

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

2.03 Electronic Transmittals

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

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

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

2.04 Safety

A. Buyer and Seller shall comply with all applicable Laws and Regulations relating to the safety of persons or property, and to the protection of persons or property from damage, injury, or loss.

B. When Seller's personnel, or the personnel of any subcontractor to Seller, are present at the Point of Destination or any work area or site controlled by Buyer, the Seller shall be responsible for the compliance by such personnel with any applicable requirements of Buyer's safety programs that are made known to Seller.

C. If Buyer or its representatives visit the Seller's manufacturing or storage facilities, for testing, inspection, or other purposes, Seller shall inform Buyer in advance of any safety preparations, standards, or programs with which Buyer and its representatives must comply.

ARTICLE 3 - PROCUREMENT CONTRACT DOCUMENTS

3.01 Intent

A. The Procurement Documents are complementary; what is called for by one is as binding as if called for by all.

B. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Procurement Contract Documents or from prevailing custom or trade usage as being required to produce or furnish the indicated Goods and Special Services will be provided, whether or not specifically called for, at no additional cost to Buyer.

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

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

E. Engineer will issue clarifications and interpretations of the Procurement Contract Documents.

F. Any provision or part of the Procurement Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Buyer and Seller.

3.02 Reference Standards

A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws and Regulations, whether such reference be specific or by implication, means the standard, specification, manual, code, or Laws and Regulations in effect at the time of opening of Bids (or on the Effective Date of

the Procurement Agreement if there were no Bids), except as may be otherwise specifically stated in the Procurement Contract Documents.

B. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a supplier, will be effective to change the duties or responsibilities of Buyer, Seller, or Engineer from those set forth in the part of the Procurement Contract Documents prepared by or for Engineer. No such provision or instruction will be effective to assign to Buyer or Engineer any duty or authority to supervise or direct the performance of Seller's obligations, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Procurement Contract Documents prepared by or for Engineer.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies
   1. Seller's Review of Procurement Contract Documents: If, before or during the performance of Seller's obligations, Seller discovers any conflict, error, ambiguity, or discrepancy within the Procurement Contract Documents, or between the Procurement 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 to Seller, then Seller shall promptly report it to Engineer (or if the Procurement Contract is assigned, then directly to Contractor/Assignee) in writing. Seller shall not proceed with the Goods and Special Services affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer (or if the Procurement Contract is assigned, then by Contractor/Assignee) or by an amendment or supplement to the Procurement Contract Documents issued pursuant to Article 11.
   2. Seller shall not be liable to Buyer or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Procurement Contract Documents unless Seller had actual knowledge thereof.

B. Resolving Discrepancies: Except as may be otherwise specifically stated in the Procurement Contract Documents, the provisions of the Procurement Contract Documents will take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Procurement Contract Documents and:
   1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Procurement Contract Documents); or
   2. the provisions of any Laws or Regulations applicable to the furnishing of the Goods and Special Services (unless such an interpretation of the provisions of the Procurement Contract Documents would result in violation of such Law or Regulation).

3.04 Requirements of the Procurement Drawings and Procurement Specifications

A. During the performance of Seller's obligations and until final payment, Seller and Buyer shall submit to the Engineer all matters in question concerning the requirements of the Procurement Drawings and Procurement Specifications (sometimes referred to as requests for information or interpretation—RFIs) or relating to the acceptability of the Goods and Special Services, as soon as possible after

such matters arise. Engineer will be the initial interpreter of the requirements of the Procurement Drawings and Procurement Specifications, and judge of the acceptability of the Goods and Special Services thereunder.

1. After assignment (if any) Seller shall submit such matters directly to Contractor/Assignee for response or administration, and the Procurement Contract provisions in Paragraphs 3.04.B and C will not apply.

B. Engineer will issue with reasonable promptness a written clarification, interpretation, or decision on the issue submitted, and if necessary, initiate an amendment or supplement to the Procurement Drawings or Procurement Specifications. Engineer's written clarification, interpretation, or decision will be consistent with the overall intent of the Procurement Contract Documents and will be final and binding on Seller and Buyer. If either Buyer or Seller believes that a written clarification or interpretation justifies an adjustment in the Procurement Contract Price or Procurement Contract Times, either may make a Claim for such adjustment.

C. If a submitted matter in question concerns terms and conditions of the Procurement Contract Documents that do not involve (1) the performance or acceptability of the Goods and Services, (2) the design (as set forth in the Procurement Drawings, Procurement Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Buyer and Seller that Engineer is unable to provide a decision or interpretation.

3.05 Reuse of Documents

A. Seller and its subcontractors and suppliers shall not:
   1. have or acquire any title to or ownership rights in any of the Procurement Drawings, Procurement 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 Procurement Drawings, Procurement Specifications, other documents, or copies thereof, on extensions of the Project or any other project, without written consent of Buyer and Engineer and specific written verification or adaptation by Engineer; or
   2. have or acquire any title or ownership rights in any other Procurement Contract Documents, reuse any such Procurement Contract Documents for any purpose without Buyer's express written consent, or violate any copyrights pertaining to such Procurement Contract Documents.

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

ARTICLE 4 - COMMENCEMENT AND SCHEDULE

4.01 Commencement of Procurement Contract Times

A. The Procurement Contract Times will commence to run on the Effective Date of the Procurement Contract.

4.02 Continuing Performance

A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.04.A., as duly adjusted, and the Goods will be delivered, and the Special Services furnished within the Procurement Contract Times.

B. Seller shall carry on furnishing of the Goods and Special Services and adhere to the progress schedule during all disputes or disagreements with Buyer. No furnishing of Goods and Special Services will be delayed or postponed pending resolution of any disputes or disagreements, except as expressly permitted herein, or as Buyer and Seller may otherwise agree in writing.

4.03 Adjustments to Progress Schedule

A. The progress schedule may be adjusted from time to time as provided below.
   1. Seller shall submit to Buyer for acceptance proposed adjustments in the progress schedule that will not result in changing the Procurement Contract Times. Such adjustments will comply with any applicable provisions of the Procurement Specifications.
   2. Proposed adjustments in the progress schedule that will change the Procurement Contract Times must be submitted in accordance with the requirements of Article 11. Adjustments in Procurement Contract Times may only be made by a Change Order.

4.04 Delays

A. If Buyer, Engineer, or anyone for whom Buyer is responsible, delays, disrupts, or interferes with Seller's performance or progress, then Seller shall be entitled to an equitable adjustment in Procurement Contract Price or Procurement Contract Times.

B. Seller shall not be entitled to an adjustment in Procurement Contract Price or Procurement Contract Times for delay, disruption, or interference caused by or within the control of Seller or anyone for whom Seller is responsible.

C. If Seller's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Buyer, Seller, and those for which they are responsible, then Seller shall be entitled to an equitable adjustment in Procurement Contract Times. Such an adjustment will be Seller'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 Procurement 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. inspection delays by governmental authorities, and custom delays;
   4. international shipping delays;
   5. acts or failures to act of third-party entities; and
   6. acts of war or terrorism.

D. Adjustments of Procurement Contract Times or Procurement Contract Price—General Provisions: Seller's entitlement to an adjustment of Procurement Contract Times or Procurement Contract Price is limited as follows:
   1. Seller's entitlement to an adjustment of the Procurement Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of Seller's obligations, as of the time of the delay, disruption, or interference.
   2. Seller shall not be entitled to an adjustment in Procurement Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Seller. Such a concurrent delay by Seller does not preclude an adjustment of Procurement Contract Times to which Seller is otherwise entitled.
   3. Adjustments of Procurement Contract Times or Procurement Contract Price are subject to the provisions of Articles 11 and 12.

E. Each Seller request seeking a delay-related increase in Procurement Contract Times or Procurement Contract Price must be supplemented by supporting data that sets forth in detail the following: (1) the circumstances that form the basis for the requested adjustment; (2) the date upon which each cause of delay, disruption, or interference began to affect Seller's progress; (3) the date upon which each cause of delay, disruption, or interference ceased to affect Seller's progress; (4) the number of days' increase in Procurement Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and (5) the impact on Procurement Contract Price. Seller shall also furnish such additional supporting documentation as Buyer or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion.

ARTICLE 5 - BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

A. Seller shall furnish a performance bond and a payment bond, each in an amount at least equal to the Procurement Contract Price, as security for the faithful performance and payment of Seller's obligations under the Procurement Contract. These bonds must remain in effect until 1 year after the date when final payment becomes due or until completion of the correction period, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Procurement Contract.

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

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Buyer prior to execution of the Procurement Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the

Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

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

E. If the surety on a bond furnished by Seller is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Seller shall promptly notify Buyer 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 of this Procurement Contract.

F. If Seller has failed to obtain a required bond, Buyer may exercise Buyer's termination rights.

G. Upon request to Buyer from any subcontractor, supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of Seller's obligations, Buyer shall provide a copy of the payment bond to such person or entity.

H. Upon request to Seller from any subcontractor, supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of Seller's obligations, Seller shall provide a copy of the payment bond to such person or entity.

5.02 Insurance

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Supplementary Conditions.

B. Failure of Buyer to demand certificates of insurance or other evidence of Seller's full compliance with these insurance requirements or failure of Buyer to identify a deficiency in compliance from the evidence provided will not be construed as a waiver of Seller's obligation to maintain such insurance.

C. Upon assignment of this Procurement Contract, Seller shall name the Contractor/Assignee as an additional insured and comply with the written request of Contractor/Assignee to provide evidence of insurance.

D. Buyer does not represent that insurance coverage and limits established in this Procurement Contract necessarily will be adequate to protect Seller.

E. The insurance and insurance limits required herein will not be deemed as a limitation on Seller's liability under the indemnities and other rights granted to Buyer in the Procurement Contract.

5.03 Surety or Insurance Companies

A. All bonds and insurance required by the Procurement Contract Documents to be purchased and maintained by Buyer or Seller shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies must also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

ARTICLE 6 - LICENSES AND FEES

6.01 Intellectual Property and License Fees

A. Except to the extent stated elsewhere in the Procurement Contract Documents, Seller is not transferring any patent rights, copyrights, or other intellectual property rights for the Goods delivered.

B. To the extent Seller is manufacturing to Buyer's design, Buyer retains all patent rights, copyrights, and other intellectual property rights in such design.

C. If an invention, design, process, product, or device is specified in the Procurement Contract Documents for incorporation in the Goods or for the performance of Special Services, and if, to the actual knowledge of Buyer or Engineer, its use is subject to patent rights, copyrights, or other intellectual property rights calling for the payment of a license fee or royalty to others, then the existence of such rights and payment obligations will be disclosed to Seller in the Procurement Contract Documents.

D. Seller shall pay all license fees and royalties and assume all costs incident to the use or the furnishing of the Goods, unless specified otherwise by the Procurement Contract Documents.

6.02 Seller's Infringement

A. Subject to Paragraph 6.01, to the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, members, partners, employees, agents, consultants, contractors, and subcontractors, from and against all claims, costs, losses, damages, and judgments (including but not limited to all reasonable 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 or alleged infringement of any patent, copyright, or other intellectual property right by any of the Goods as delivered or Special Services as performed.

B. Buyer will promptly notify Seller in writing of any claim, suit, or threat of suit by a third party for any infringement or alleged infringement of any patent, copyright, or other intellectual property right with respect to the Goods as delivered or Special Services as performed.

C. Seller shall promptly defend or settle the claim or suit. Seller shall have control over such claim or suit, bear all expenses, and satisfy any adverse judgment.
   1. If Seller fails to defend such suit or claim after written notice by Buyer, Seller will be bound, in any subsequent suit or claim against Seller by Buyer, by any factual determination in the prior suit or claim.
   2. If Buyer fails to provide Seller the opportunity to defend such suit or claim, Buyer shall be barred from any remedy against Seller for such suit or claim.

D. If a determination is made that Seller has infringed upon the intellectual property rights of another, Seller may, at Seller's own expense, obtain the necessary licenses for Buyer's benefit, or replace the Goods and provide related design and construction, consistent with the requirements of the Procurement Contract Documents, to avoid the infringement.

6.03 Buyer's Infringement

A. Subject to Paragraph 6.01, and to the fullest extent permitted by Laws and Regulations, Buyer shall be responsible to Seller for any infringement or alleged infringement of any patent, copyright, or other intellectual property right caused by Seller's compliance with the Procurement Drawings or Procurement Specifications, and will reimburse Seller for any license fee or royalties paid by Seller to others if such payment resulted from any invention, design, process, product, or device specified to be furnished or performed in the Procurement Drawings or Procurement Specifications, but not identified as being subject to payment of such license fee or royalty.

B. Seller will promptly notify Buyer in writing of any claim, suit, or threat of suit by a third party for intellectual property infringement arising from Seller's compliance with the Procurement Drawings or Procurement Specifications.

C. Buyer shall defend or settle the claim or suit. Buyer shall have control over such claim or suit, bear all expenses, and satisfy any adverse judgment.
   1. If Buyer fails to defend such suit or claim after written notice by Seller, Buyer will be bound, in any subsequent suit or claim against Buyer by Seller, by any factual determination in the prior suit or claim.
   2. If Seller fails to provide Buyer the opportunity to defend such suit or claim, Seller shall be barred from any remedy against Buyer for such suit or claim.

ARTICLE 7 - SELLER'S RESPONSIBILITIES

7.01 Performance of Obligations

A. Seller shall be solely responsible for the means, methods, techniques, sequences, and procedures necessary to perform its obligations in accordance with the Procurement Contract Documents.

B. Seller shall supervise, inspect, and direct the furnishing of the Goods and Special Services competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform its obligations in accordance with the Procurement Contract Documents.

C. Seller shall coordinate the provision of Special Services to avoid or limit interference or disruption of other activities at the location where the Special Services are to occur, including but not limited to ongoing facility operations and construction activities.

7.02 Labor, Materials and Equipment

A. Seller shall provide competent, qualified and trained personnel in all aspects of its performance of the Procurement Contract.

B. All Goods, and all equipment and material incorporated into the Goods, must be as specified, and unless specified otherwise in the Procurement Contract Documents, must be:
   1. new, and of good quality;
   2. protected, assembled, connected, cleaned, and conditioned in accordance with the original manufacturer's instructions; and
   3. shop-assembled to the greatest extent practicable.

7.03 Laws and Regulations

A. Seller shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of its obligations in accordance with the Procurement Contract Documents. Except where otherwise expressly required by such Laws and Regulations, neither Buyer nor Engineer shall be responsible for monitoring Seller's compliance with any Laws or Regulations.

B. If Seller furnishes Goods and Special Services knowing or having reason to know that such furnishing is contrary to Laws or Regulations, Seller shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such performance. It will not be Seller's responsibility to make certain that the Procurement Specifications and Procurement Drawings are in accordance with Laws and Regulations, but this provision will not relieve Seller of Seller's obligations.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Procurement Contract if there were no Bids) that have a direct effect on the cost or time of Seller's performance will be the subject of an adjustment in Procurement Contract Price or Procurement Contract Times. If Buyer and Seller are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made.

7.04 "Or Equals"

A. Whenever an item of material or equipment to be incorporated into the Goods is specified or described in the Procurement Contract Documents by using the names of one or more proprietary items or specific suppliers or manufacturers, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, other items of

material or equipment or material or equipment of other suppliers or manufacturers may be submitted to Buyer for Engineer's review.

1. If in Engineer's sole discretion, such an item of material or equipment proposed by Seller is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by Engineer as an "or equal" item.
2. For the purposes of this paragraph, a proposed item of material or equipment may be considered functionally equal to an item so named only if in the exercise of reasonable judgment, Engineer determines that: 1) it is at least equal in quality, durability, appearance, strength, and design characteristics; 2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; 3) it has an acceptable record of performance and availability of responsive service; and (4) Seller certifies that if approved: a) there will be no increase in any cost, including capital, installation or operating costs, to Buyer; and b) the proposed item will conform substantially to the detailed requirements of the item named in the Procurement Contract Documents.

B. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or Submittal made pursuant to Paragraph 7.04.A. Engineer will be the sole judge of whether to accept or reject such a proposal or Submittal. No "or equal" will be ordered, manufactured or utilized until Engineer's review is complete, which will be evidenced by an approved Shop Drawing. Engineer will advise Buyer and Seller in writing of any negative determination. Notwithstanding Engineer's approval of an "or-equal" item, Seller shall remain obligated to comply with the requirements of the Procurement Contract Documents.

C. Special Guarantee: Buyer may require Seller to furnish at Seller's expense a special performance guarantee or other surety with respect to any such proposed "or-equal."

D. Data: Seller shall provide all data in support of any such proposed "or equal" at Seller's expense.

7.05 Taxes

A. All taxes and duties are not included in the Procurement Contract Price.

7.06 Submittals

A. Shop Drawing and Sample Requirements
   1. Before submitting a Shop Drawing or Sample, Seller shall:
      a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Procurement Contract Documents;
      b. determine and verify:
         1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal; and
         2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of Seller's obligations.

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

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Seller has satisfied its obligations under the Procurement Contract Documents with respect to Seller's review of that Submittal, and that Seller approves the Submittal.
3. With each Shop Drawing or Sample, Seller shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Procurement Contract Documents. This notice will be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. Submittal Procedures for Shop Drawings and Samples: Seller shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
   1. Shop Drawings
      a. Seller shall submit the number of copies required in the Procurement Specifications.
      b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Seller proposes to provide, and to enable Engineer to review the information for the limited purposes required.
   2. Samples
      a. Seller shall submit the number of Samples required in the Procurement Specifications.
      b. Seller 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.
   3. Where a Shop Drawing or Sample is required by the Procurement Contract Documents or the Schedule of Submittals, any related work performed by Seller prior to Engineer's review and approval of the pertinent Submittal will be at the sole expense and responsibility of Seller.

C. Engineer's Review of Shop Drawings and Samples
   1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Goods, comply with the requirements of the Procurement Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Procurement Contract Documents.
   2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, manufacturing, fabrication, installation, or shipping, or to safety precautions or programs incident thereto.
   3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Seller from responsibility for any variation from the requirements of the Procurement Contract Documents unless Seller has complied with the requirements of Paragraph 7.06.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 Procurement Contract Documents in a Field Order or other appropriate Procurement Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Seller from responsibility for complying with the requirements.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Procurement Contract Documents, will not, under any circumstances, change the Procurement Contract Times or Procurement Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing or Sample will result in such item becoming a Procurement Contract Document.
8. Seller shall furnish Goods that comply with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.06.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples
   1. Seller 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. Seller shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

      1. Seller shall furnish required Shop Drawing and Sample Submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Seller shall be responsible for Engineer's charges to Buyer for such time. Buyer may impose a set-off against payments due Seller to secure reimbursement for such charges.

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

E. Submittals Other than Shop Drawings and Samples
   1. The following provisions apply to all Submittals other than Shop Drawings and Samples:
      a. Seller shall submit all such Submittals to the Engineer in accordance with the schedule of Submittals and pursuant to the applicable terms of the Procurement Contract Documents.
      b. Engineer will provide timely review of all such Submittals in accordance with the schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the schedule of Submittals will be deemed accepted.

c. Engineer’s review will be only to determine if the Submittal is acceptable under the requirements of the Procurement Contract Documents as to general form and content of the Submittal.
d. If any such Submittal is not accepted, Seller shall confer with Engineer regarding the reason for the non-acceptance and resubmit an acceptable document.

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

7.07 Indemnification

A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, Project Owner, and any assignee of Buyer, including Contractor/Assignee, and their officers, directors, members, partners, employees, agents, consultants, contractors, 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 the performance of Seller's obligations under the Procurement Contract, 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 Goods themselves), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Seller, or any individual or entity directly or indirectly employed by Seller or anyone for whose acts Seller may be liable.

B. In any and all claims against Buyer, Engineer, Project Owner, or any assignee of Buyer, including Contractor/Assignee, or their officers, directors, members, partners, employees, agents, consultants, contractors, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Seller, any subcontractor, any supplier, or any individual or entity directly or indirectly employed by any of them to furnish any of the Goods and Special Services, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.07.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Seller or any such subcontractor, supplier, or other individual or entity under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

7.08 Concerning Subcontractors and Suppliers

A. Seller may retain subcontractors and suppliers for the performance of parts of the furnishing of the Goods and Special Services. The Seller’s retention of a subcontractor or supplier will not relieve Seller’s obligation to Buyer to perform and complete the furnishing the Goods and Special Services in accordance with the Procurement Contract Documents.

ARTICLE 8 - SHIPPING AND DELIVERY

8.01 Shipping

A. Seller shall select the carrier and bear all costs of packaging, transportation, insurance, special handling, and all other costs associated with shipment and delivery.

8.02 Delivery

A. Seller shall deliver the Goods free on board (FOB) to the Point of Destination, freight prepaid, in accordance with the Procurement Contract Times set forth in the Procurement Agreement, or other date agreed to by Buyer and Seller.

B. At least 10 days before shipment, Seller shall provide written notice to Buyer of the manner of shipment and the anticipated delivery date. The notice must also include any instructions concerning special equipment or services required at the Point of Destination to unload and care for the Goods. Seller shall also require the carrier to give Buyer at least 24 hours' notice by telephone prior to the anticipated time of delivery.

C. Buyer will be responsible and bear all costs for unloading the Goods from carrier.

D. Buyer will assure that adequate facilities are available to receive delivery of the Goods at the time established for delivery, or on another date agreed to by Buyer and Seller.

E. No partial deliveries will be allowed, unless permitted or required by the Procurement Contract Documents or agreed to in writing by Buyer.

F. Provisions governing inspection on delivery are set forth in Paragraph 9.02.

8.03 Risk of Loss

A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer's receipt of the Goods.

B. Notwithstanding the provisions of Paragraph 8.03.A, if Buyer rejects the Goods as non-conforming, the risk of loss on such Goods will remain with Seller until Seller corrects the non-conformity or Buyer accepts the Goods. If rejected Goods remain at the Point of Destination pending modification and acceptance, then Seller shall be responsible for arranging adequate protection and maintenance of the Goods at Seller's expense.

ARTICLE 9 - BUYER'S RIGHTS

9.01 Seller's Warranties and Guarantees

A. Seller warrants and guarantees to Buyer that the title to the Goods conveyed will be proper, its transfer rightful, and free from any security interest, lien, or other

encumbrance. Seller shall defend, indemnify, and hold Buyer harmless against any liens, claims, or demands contesting or affecting title of the Goods conveyed.

B. Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Procurement Contract Documents, and with the standards established by any Samples approved by Engineer. Engineer shall be entitled to rely on Seller's warranty and guarantee. If the Procurement Contract Documents do not otherwise specify the characteristics or the quality of the Goods, the Goods must comply with the requirements of Paragraph 7.02.B.

C. Seller's warranty and guarantee hereunder excludes defects or damage caused by:
   1. abuse, improper modification, improper maintenance, or improper operation by persons other than Seller;
   2. excessive corrosion or chemical attack, unless corrosive or chemically damaging conditions were disclosed by Buyer in the Procurement Contract Documents and the Procurement Contract Documents required the Goods to withstand such conditions;
   3. use in a manner contrary to Seller's written instructions for installation, operation, and maintenance; or
   4. normal wear and tear under normal usage.

D. Seller's obligation to furnish the Goods and Special Services in accordance with the Procurement Contract Documents will be absolute. None of the following will constitute an acceptance of Goods and Special Services that are non-conforming, or a release of Seller's obligation to furnish the Goods and Special Services in accordance with the Procurement Contract Documents:
   1. observations by Buyer, Engineer, or Project Owner;
   2. recommendation by Engineer or payment by Buyer of any progress or final payment;
   3. use of the Goods by Buyer or Project Owner;
   4. any acceptance by Buyer, Engineer, or Project Owner, or any failure to do so;
   5. the end of the correction period established in Paragraph 9.04;
   6. the issuance of a notice of acceptance;
   7. any inspection, test or approval by others; or
   8. any correction of non-conforming Goods and Special Services by Buyer or Project Owner.

E. Buyer shall promptly notify Seller of any breach of Seller's warranties or guarantees.

9.02 Inspections and Testing

A. General Provisions
   1. The Procurement Contract Documents specify required inspections and tests. Buyer shall have the right to perform, or cause to be performed, reasonable inspections and require reasonable tests of the Goods at Seller's facility, and at the Point of Destination. Seller shall allow Buyer a reasonable time to perform such inspections or tests.
   2. Seller shall reimburse Buyer for all expenses, except for travel, lodging, and subsistence expenses of Buyer's and Engineer's representatives, for inspections and tests specified in the Procurement Contract Documents. If as the result of any such specified testing the Goods are determined to be non-conforming, then

Seller shall also bear the travel, lodging, and subsistence expenses of Buyer's and Engineer's representatives, and all expenses of re-inspection or retesting.

3. Buyer shall bear all expenses of inspections and tests that are not specified in the Procurement Contract Documents (other than any re-inspection or retesting resulting from a determination of non-conformity, as set forth in Paragraph 9.03); provided, however, that if as the result of any such non-specified inspections or testing the Goods are determined to be non-conforming, then Seller shall bear all expenses of such inspections and testing, and of any necessary re-inspection and retesting.
4. Seller shall provide Buyer timely written notice of the readiness of the Goods for all inspections, tests, or approvals which the Procurement Contract Documents specify are to be observed by Buyer prior to shipment.
5. Buyer will give Seller timely notice of all specified tests, inspections, and approvals of the Goods which are to be conducted at the Point of Destination, and a representative of Seller will attend such tests, inspections, and approvals.
6. If, on the basis of inspections or testing, the Goods appear to be conforming, Buyer will give Seller prompt notice thereof. If on the basis of inspections or testing, the Goods appear to be non-conforming, Buyer will give Seller prompt notice thereof and will advise Seller of the remedy Buyer elects under the provisions of Paragraph 9.03.
7. Neither payments made by Buyer to Seller prior to any tests or inspections, nor any tests or inspections, will constitute acceptance of non-conforming Goods, or prejudice Buyer's rights under the Procurement Contract.

B. Visual Inspection on Delivery
   1. Buyer will visually inspect the Goods upon delivery solely for purposes of identifying the Goods, general verification of quantities, and observation of apparent condition. Such visual inspection will not be construed as final or as receipt of any Goods and Special Services that, as a result of subsequent inspections and tests, are determined to be non-conforming.
   2. If, on the basis of the visual inspection specified in this Document, the Goods appear to comply with the requirements of the Procurement Contract Documents as to quantities and condition, then within 10 days of delivery Buyer shall issue to Seller Buyer's acknowledgment of the receipt of Goods.

C. Final Inspection
   1. After all of the Goods have been incorporated into the Project, tested in accordance with such testing requirements as are specified, and are functioning as required, and Seller has performed and completed all Special Services, Buyer will make a final inspection.
   2. If, on the basis of the final inspection, Buyer determines that the Goods and Special Services are conforming, Buyer's notice thereof will constitute Buyer's acceptance of the Goods and Special Services, subject to any limitations stated in the notice.
   3. If, on the basis of the final inspection, the Goods and Special Services are non-conforming, Buyer will identify the non-conformity in writing.

9.03 Non-Conforming Goods and Special Services

A. If, on the basis of inspections and testing prior to delivery, the Goods and Special Services are found to be non-conforming, or if at any time after Buyer has

acknowledged receipt of delivery and before the expiration of the correction period described in this Document, Buyer determines that the Goods and Special Services are non-conforming, then Seller shall promptly, without cost to Buyer and in response to written instructions from Buyer, either correct such non-conforming Goods and Special Services, or, if Goods are rejected by Buyer, remove and replace the non-conforming Goods with conforming Goods, including all work required for reinstallation.

B. Buyer's Rejection of Non-Conforming Goods
   1. If Buyer elects to reject the Goods in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Goods. If Goods have been delivered to Buyer, Seller shall promptly, and within the Procurement Contract Times, remove and replace the rejected Goods.
   2. Seller shall bear all costs, losses and damages attributable to the removal, replacement, reinspection, and retesting of the non-conforming Goods.
   3. Upon rejection of the Goods, Buyer retains a security interest in the Goods to the extent of any payments made and expenses incurred in their testing and inspection.

C. Buyer's Rejection of Non-Conforming Special Services
   1. If at any time Buyer elects to reject the Special Services in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Special Services.
   2. Seller shall promptly provide conforming Special Services acceptable to Buyer.
   3. If Seller fails to provide conforming Special Services, Buyer may remove the Special Services from the scope of the Procurement Contract, and equitably reduce the Procurement Contract Price.

D. Remedying Non-Conforming Goods: If Buyer elects to permit the Seller to modify the Goods to correct the non-conformance, then Seller shall promptly provide a schedule for such modifications and shall make the Goods conforming within a reasonable time.

E. Buyer's Acceptance of Non-Conforming Goods: Instead of requiring correction or removal and replacement of non-conforming Goods discovered either before or after final payment, Buyer may accept the non-conforming Goods. Seller shall bear all reasonable costs, losses, and damages attributable to Buyer's evaluation of and determination to accept such non-conforming Goods.

F. Seller Obligations: Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, retesting and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods and Special Services. Seller's obligations will include the costs of the correction or removal and replacement of the non-conforming Goods and the replacement of property of Buyer and others destroyed by the correction or removal and replacement of the non-conforming Goods and obtaining conforming Special Services from others.

G. Buyer's Rejection of Conforming Goods: If Buyer asserts that Goods and Special Services are non-conforming and such Goods and Special Services are determined

to be conforming, or if Buyer rejects as non-conforming Goods and Special Services that are later determined to be conforming, then Seller shall be entitled to reimbursement from Buyer of costs incurred by Seller in inspecting, testing, correcting, removing, or replacing the conforming Goods and Special Services, including but not limited to fees and charges of engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs associated with the incorrect assertion of non-conformance or rejection of conforming Goods and Special Services.

9.04 Correction Period

A. Seller's responsibility for correcting all non-conformities in the Goods and Special Services will extend for a period of 1 year after the acceptance of the Goods and Special Services.

B. Where non-conforming Goods and Services (and damage to other work resulting therefrom) have been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Goods and Services will be extended for an additional period of 1 year after such correction or removal and replacement has been satisfactorily completed.

C. Seller's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph may not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 10 - ENGINEER'S STATUS

10.01 Engineer's Role Defined

A. Engineer will be Buyer's representative until assignment (if any) of the Procurement Contract.

B. The duties and responsibilities and the limitations of authority of Engineer prior to assignment, if any, of the Procurement Contract, are set forth in the Procurement Contract Documents.

C. Engineer's responsibilities, if any, after an assignment (if any) of the Procurement Contract, are set forth in the Procurement Agreement.

10.02 Duties and Responsibilities; Authority; Limitations

A. Engineer will be the initial interpreter of the Procurement Contract Documents and judge of the acceptability of the Goods and Special Services, and will issue clarifications, interpretations, and decisions regarding such issues.

B. Acting on behalf of Buyer under the provisions of Article 9, Engineer has the authority to disapprove or reject Goods and Special Services that Engineer believes to be non-conforming. Engineer also has the authority to require special inspection or testing of the Goods or Special Services, whether or not the Goods are fabricated or installed, or the Special Services are completed.

C. Engineer may authorize minor deviations or variations in the Procurement Contract Documents by: 1) written approval of specific variations set forth in Shop Drawings when Seller has duly noted such variations, or 2) a Field Order.

D. Engineer will review Claims and render decisions on Claims.

E. In rendering any interpretations, clarifications, reviews, decisions, disapprovals, acceptances, rejections, authorizations, and judgments, Engineer will not show partiality to Buyer or Seller. Engineer will not be liable to Buyer, Seller, or others in connection with any interpretations, clarifications, reviews, decisions, disapprovals, acceptances, rejections, authorizations, or judgments conducted or rendered by Engineer in good faith.

F. Engineer will not supervise, direct, control, or have authority over or be responsible for the means, methods, techniques, sequences, or procedures used by Seller to perform its obligations under this Procurement Contract, or the safety precautions and programs incident thereto, or for any failure of Seller to comply with Laws and Regulations applicable to the performance of its obligations. Engineer will not be responsible for Seller's failure to furnish the Goods and Special Services in accordance with the Procurement Contract Documents.

ARTICLE 11 - CHANGES

11.01 Amending and Supplementing the Procurement Contract

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

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

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

11.02 Change Orders

A. Buyer and Seller shall execute appropriate Change Orders covering:
   1. Changes in Procurement Contract Price or Procurement Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Goods and Special Services furnished in accordance with a Change Directive;
   2. Changes in Procurement Contract Price resulting from a Buyer set-off, unless Seller has duly contested such set-off;
   3. Changes in the Goods and Special Services which are: (a) ordered by Buyer pursuant to Paragraph 11.05, (b) required because of Buyer's acceptance of non-conforming Goods and Services or (c) agreed to by the parties, subject to

the need for Engineer's recommendation if the change in the Goods and Special Services involves the design (as set forth in the Procurement Drawings, Procurement Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Change Directive; Article 12, Claims; and similar provisions.

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

11.03 Change Directives

A. A Change Directive will not change the Procurement Contract Price or the Procurement Contract Times but is evidence that the parties expect that the modification ordered or documented by a Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Change Directive's effect, if any, on the Procurement Contract Price and Procurement Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Procurement Contract Documents governing adjustments, expressly including Paragraph 11.08 regarding change of Procurement Contract Price.

B. If Buyer has issued a Change Directive and Buyer or Seller believes that an adjustment in Procurement Contract Times or Procurement Contract Price is necessary, then such party shall submit a Claim seeking such an adjustment no later than 30 days after the completion of the Goods and Services set out in the Change Directive.

11.04 Field Orders

A. Engineer may authorize minor changes in the Goods and Services if the changes do not involve an adjustment in the Procurement Contract Price or the Procurement Contract Times and are compatible with the design concept as indicated by the Procurement Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Buyer and also on Seller, which shall perform the Goods and Special Services involved promptly.

B. If Seller believes that a Field Order justifies an adjustment in the Procurement Contract Price or Procurement Contract Times, then before proceeding with the Goods and Special Services at issue, Seller shall submit a Claim as provided in this Document.

11.05 Buyer-Authorized Changes in the Goods and Special Services

A. Without invalidating the Procurement Contract and without notice to any surety, Buyer may, at any time or from time to time, order additions, deletions, or revisions in the Goods and Special Services. Changes involving the design (as set forth in the Procurement Drawings, Procurement Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

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

11.06 Buyer's Contingency Allowance

A. The Buyer's Contingency Allowance, if any such is set forth in the Procurement Agreement, is for the sole use of Buyer to cover unanticipated costs.

B. If Buyer exercises its unilateral right to use all or a portion of the Buyer's Contingency Allowance, Buyer will issue a written directive that documents the costs to which the allowance is applied, Seller's entitlement to compensation, and the consequent reduction in such allowance.

C. Prior to final payment, the Total Price, as set forth in the Procurement Agreement, will be duly adjusted to account for any unused portion of the Buyer's Contingency Allowance.

D. The Procurement Agreement addresses the impact on Buyer's Contingency Allowance of an assignment of the Procurement Contract.

11.07 Unauthorized Changes in the Goods and Special Services

A. Seller shall not be entitled to an increase in the Procurement Contract Price or an extension of the Procurement Contract Times with respect to any work performed that is not required by the Procurement Contract Documents, as amended, modified, or supplemented.

11.08 Change of Procurement Contract Price

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

B. An adjustment in the Procurement Contract Price will be determined as follows:
   1. For changes in Unit Price Goods and Special Services, by application of the unit prices to the quantities of the items involved;
   2. To the extent the cost of the change is not covered by unit prices, then by a mutually agreed lump sum; or
   3. To the extent the cost of the change is not covered by unit prices and the parties do not reach mutual agreement to a lump sum, then on the basis of documented costs plus a Seller's fee for overhead and profit of 15 percent.

11.09 Change of Procurement Contract Times

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

11.10 Notification to Surety

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

ARTICLE 12 - CLAIMS, DISPUTES, AND DISPUTE RESOLUTION

12.01 Claims

A. The parties agree to endeavor to avoid or resolve Claims through direct, good faith discussions and negotiations whenever practicable. Such discussions and negotiations should at the outset address whether the parties mutually agree to suspend the Claims process, including the time periods established in this Document; if so, a written record of such mutual agreement should be made and jointly executed.

B. Claimant shall deliver to Engineer and the other party to the Procurement Contract written notice of each Claim within 15 days after the occurrence of the event giving rise to the Claim.

C. Claimant shall deliver written supporting data to Engineer and the other party within 45 days after such occurrence unless Engineer allows an additional period of time.

D. Engineer will review each such Claim and render a decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

E. If Engineer does not render a formal written decision on a Claim within the time stated in this Document., Engineer shall be deemed to have issued a decision denying the Claim in its entirety 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

F. The rendering of a decision by Engineer pursuant to this Paragraph 12.01 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Buyer or Seller of such rights or remedies as either may otherwise have under the Procurement Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter. If the exercise of such rights or remedies will imminently be time-barred, a party may take actions necessary to

preserve such rights and remedies notwithstanding the lack of the condition precedent referred to in this paragraph.

G. If a submitted matter in question concerns terms and conditions of the Procurement Contract Documents that do not involve (1) the performance or acceptability of Goods and Special Services under the Procurement Contract Documents, (2) the design (as set forth in the Procurement Drawings, Procurement Specifications, Addenda, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Buyer and Seller that Engineer is unable to provide a decision or interpretation. If Buyer and Seller are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in this Document.

H. Engineer's written decision on such Claim or a decision denying the Claim in its entirety that is deemed to have been issued pursuant to Paragraph 12.01, will be final and binding upon Buyer and Seller 30 days after it is issued unless within 30 days of issuance Buyer or Seller appeals Engineer's decision by initiating the mediation of such Claim in accordance with the dispute resolution procedures set forth in this Document.

I. If Article 12 has been amended to delete the mediation requirement, then Buyer or Seller may appeal Engineer's decision within 30 days of issuance by following the alternative dispute resolution process set forth in in this Document, as amended; or if no such alternative dispute resolution process has been set forth, Buyer or Seller may appeal Engineer's decision by 1) delivering to the other party within 30 days of the date of such decision a written notice of intent to submit the Claim to a court of competent jurisdiction, and 2) within 60 days after the date of such decision instituting a formal proceeding in a court of competent jurisdiction.

J. No Claim for an adjustment in Procurement Contract Price or Procurement Contract Times will be valid if not submitted in accordance with Article 12.

K. The effect on Claims of an assignment of the Procurement Contract by Buyer to a Contractor/Assignee is addressed in the Procurement Agreement.

12.02 Dispute Resolution Method

A. Either Buyer or Seller may initiate the mediation of (1) any Claim decided in writing by Engineer under Paragraph 12.01 before such decision becomes final and binding, or (2) any other dispute between the parties, including but not limited to any dispute arising after final inspection of the Goods and Services. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Procurement Contract. The request for mediation must be submitted in writing to the American Arbitration Association and the other party to the Procurement Contract. Timely submission of the request will stay Engineer's decision from becoming final and binding.

B. Mediation is a condition precedent to seeking final dispute resolution. Buyer and Seller shall participate in the mediation process in good faith. The process must be concluded within 60 days of filing of the request. The date of termination of the mediation will be determined by application of the mediation rules referenced above.

C. If the mediation process does not result in resolution of the dispute, then Engineer's written Claim decision under Paragraph 12.01.D or a Claim denial pursuant to Paragraph 12.01.E becomes final and binding, or if applicable such other dispute is deemed resolved in favor of respondent, unless, within 30 days after termination of the mediation, Buyer or Seller:
   1. elects in writing to invoke any final dispute resolution process provided for in the Supplementary Conditions, or
   2. agrees with the other party to submit the Claim or dispute to another final dispute resolution process, or
   3. if no final dispute resolution process has been provided for in the Supplementary Conditions, delivers to the other party written notice of the intent to submit the Claim or dispute to a court of competent jurisdiction, and within 60 days of the termination of the mediation institutes such formal proceeding.

ARTICLE 13 - PAYMENT

13.01 Applications for Progress Payments

A. Seller shall submit to Buyer for Engineer's review Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Procurement Contract Documents and also as Buyer or Engineer may reasonably require.

B. The timing and amounts of progress payments will be as stipulated in the Procurement Agreement.

C. Any Application for Payment that is based in whole or in part on the delivery of Goods must be accompanied by a bill of sale, invoice, or other documentation reasonably satisfactory to Buyer warranting that Buyer has rightfully received good title to the Goods from Seller and that, upon payment, the Goods will be free and clear of all liens. Such documentation will include releases and waivers from all parties with viable lien rights.

D. Buyer shall notify Seller promptly of any deficiency in the required documentation.

13.02 Review of Applications for Progress Payments

A. 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 Buyer, or return the Application to Seller indicating in writing Engineer's reasons for refusing to recommend payment.
   2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Buyer, based on Engineer's observations of Seller's progress, 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 Goods and Special Services or other obligations of Seller have progressed to the point indicated;

b. the quality of the Goods and Special Services or other obligations of Seller are generally in accordance with the Procurement Contract Documents; and
c. the conditions precedent to Seller being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Seller's progress.

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 Goods and Special Services or other obligations of Seller have been exhaustive, extended to every aspect of the Goods and Special Services or other obligations of Seller in progress, or involved detailed inspections of the Goods and Special Services or other obligations of Seller beyond the responsibilities specifically assigned to Engineer in the Procurement Contract; or
   b. there may not be other matters or issues between the parties that might entitle Seller to be paid additionally by Buyer or entitle Buyer to withhold payment to Seller.
4. Neither Engineer's review of Seller's progress 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 Seller's performance or furnishing of Goods and Special Services or other obligations of Seller; or
   b. for the means, methods, techniques, sequences, or procedures of construction, manufacturing, fabrication, installation, or shipping, or the safety precautions and programs incident thereto; or
   c. for Seller's failure to comply with Laws and Regulations applicable to Seller's performance under the Procurement Contract; or
   d. to make any examination to ascertain how or for what purposes Seller has used the money paid for the Procurement Contract Price; or
   e. to determine that title to any of the Goods or component parts have passed to Buyer 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 Buyer stated in Paragraph 13.02.A.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Buyer from loss because:
   a. the Goods and Services are non-conforming, requiring correction or replacement;
   b. the Procurement Contract Price has been reduced by Change Orders;
   c. Buyer has been required to correct non-conforming Goods and Special Services in accordance with Paragraph 9.03.C, or has accepted nonconforming Goods and Special Services pursuant to Paragraph 9.03.E; or
   d. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Seller and therefore justify termination for cause under the Procurement Contract Documents.

13.03 Basis and Amount of Progress Payments

A. The basis and amounts of the progress payments will be as provided in the Procurement Agreement, subject to the provisions of this Article 13 regarding reductions in payment.

13.04 Suspension of or Reduction in Payment

A. Buyer may temporarily cease making progress payments, or reduce the amount of a progress payment, even though recommended for payment by Engineer, under the following circumstances:
   1. Buyer has reasonable grounds to conclude that Seller will not furnish the Goods or the Special Services in accordance with the Procurement Contract Documents, and
   2. Buyer has requested in writing assurances from Seller that the Goods and Special Services will be delivered or furnished in accordance with the Procurement Contract Documents, and Seller has failed to provide adequate assurances within ten days of Buyer's written request.
   3. In addition to any reductions in payment (set-offs) recommended by Engineer, Buyer is entitled to impose a set-off against payment based on any of the following:
      a. claims have been made against Buyer based on Seller's conduct in the performance or furnishing of the Goods and Special Services, or has incurred costs, losses, or damages resulting from Seller's conduct in the performance or furnishing of the Goods and Special Services, 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. Seller has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Point of Destination or the worksite;
      c. Seller has failed to provide and maintain required bonds or insurance;
      d. Buyer 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;
      e. the Goods and Special Services are non-conforming, requiring correction or replacement;
      f. Buyer has been required to correct non-conforming Goods and Special Services, in accordance with Paragraph 9.03.C, or has accepted non-conforming Goods and Special Services pursuant to Paragraph 9.03.E;
      g. the Procurement Contract Price has been reduced by Change Orders;
      h. an event that would constitute a default by Seller and therefore justify a termination for cause has occurred;
      i. liquidated or other damages have accrued as a result of Seller's failure to achieve Milestones, Substantial Completion, or final completion of the Goods and Special Services; or
      j. liens have been filed in connection with the Procurement Contract, except where Seller has delivered a specific bond satisfactory to Buyer to secure the satisfaction and discharge of such liens.

B. If Buyer refuses to make payment of the full amount recommended by Engineer, Buyer will provide Seller and Engineer immediate written notice stating the reason for such action and promptly pay Seller any amount remaining after deduction of the amount withheld. Buyer shall promptly pay Seller the amount withheld when Seller corrects the reason for such action to Buyer's satisfaction.

13.05 Final Payment

A. After Seller has corrected all non-conformities to the reasonable satisfaction of Buyer and Engineer and furnished all Special Services, Seller may submit its final Application for Payment following the procedures for progress payments.

B. The final Application for Payment will be accompanied by all documentation called for in the Procurement Contract Documents (including but not limited to all final operations and maintenance manuals, and any special warranties), a list of all unsettled Claims, and the written consent of surety to the making of final payment.

C. If, on the basis of final inspection and the review of the final Application for Payment and accompanying documentation, Engineer is reasonably satisfied that Seller has furnished the Goods and Special Services in accordance with the Procurement Contract Documents, and that Seller has fulfilled all other obligations under the Procurement Contract Documents, then Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment subject to the provisions of Paragraph 13.02, and present the final Application for Payment to Buyer. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Buyer from loss for the reasons stated in Paragraph 13.02.

D. If Engineer does not recommend final payment, Engineer will return the final Application for Payment to Seller, indicating the reasons for refusing to recommend final payment, in which case Seller shall make the necessary corrections and resubmit the final Application for Payment.

E. In support of its recommendation of final payment Engineer will also give written notice to Buyer and Seller that the Goods and Special Services are acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 13.06.

F. If the final Application for Payment and accompanying documentation are appropriate as to form and substance, Buyer shall, within 30 days after receipt thereof, pay Seller the amount recommended by Engineer, less any sum Buyer is entitled to set off against Engineer's recommendation, pursuant to the provisions of Paragraph 13.04.

G. Buyer will not make final payment or return or release included retainage (if any) at any time, unless Seller submits written consent of the surety to such payment, return, or release.

13.06 Waiver of Claims

A. By making final payment, Buyer waives its claim or right to liquidated damages or other damages for late completion by Seller, except as set forth in an outstanding Claim, appeal, set-off, or express reservation of rights by Buyer. Buyer reserves all other claims or rights after final payment.

B. The acceptance of final payment by Seller will constitute a waiver by Seller of all claims and rights against Buyer other than those pending matters that have been duly submitted or appealed under the provisions of Article 12.

ARTICLE 14 - CANCELLATION, SUSPENSION, AND TERMINATION

14.01 Cancellation

A. Buyer has the right to cancel the Procurement Contract, without cause, at any time prior to delivery of the Goods by written notice. Cancellation pursuant to the terms of this paragraph will not constitute a breach of contract by Buyer. Upon cancellation:
   1. Buyer shall pay Seller for the direct costs incurred in producing any Goods that Seller has specially manufactured for the Project, plus a fair and reasonable amount for overhead and profit.
   2. For Goods that are not specially manufactured for the Project, Seller shall be entitled to a restocking charge of 10 percent of the unpaid Procurement Contract Price of such Goods.

14.02 Suspension of Performance by Buyer

A. Buyer has the right to suspend performance of the Procurement Contract for up to 90 days, without cause, by written notice. Upon suspension under this paragraph, Seller shall be entitled to an increase in the Procurement Contract Times and Procurement Contract Price caused by the suspension, provided that performance would not have been suspended or delayed for causes attributable to Seller.

14.03 Suspension of Performance by Seller

A. Seller may suspend the furnishing of the Goods and Special Services only under the following circumstance:
   1. Seller has reasonable grounds to conclude that Buyer will not perform its future payment obligations under the Procurement Contract; and
   2. Seller has requested in writing assurances from Buyer that future payments will be made in accordance with the Procurement Contract, and Buyer has failed to provide such assurances within ten days of Seller's written request.

14.04 Breach and Termination

A. Buyer's Breach
   1. Seller shall have the right to terminate the Procurement Contract for cause by declaring a breach if Buyer fails to comply with any material provision of the Procurement Contract. Upon termination, Seller shall be entitled to all remedies provided by Laws and Regulations.
   2. If Seller believes Buyer is in breach of its obligations under the Procurement Contract, Seller shall provide Buyer with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Buyer shall have 7 days from receipt of the written notice declaring the breach (or such longer period of time as Seller may grant in writing) within which to cure or to proceed diligently to cure such alleged breach.

B. Seller's Breach
   1. Buyer may terminate Seller's right to perform the Procurement Contract for cause by declaring a breach should Seller fail to comply with any material provision of the Procurement Contract Documents. Upon termination, Buyer shall be entitled to all remedies provided by Laws and Regulations.

2. In the event Buyer believes Seller is in breach of its obligations under the Procurement Contract, Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Seller shall have 7 days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure or to proceed diligently to cure such alleged breach.
3. If and to the extent that Seller has provided a performance bond under the provisions of Paragraph 5.01, the notice and cure procedures of that bond, if any, will supersede the notice and cure procedures of Paragraph 14.04.B.2.

ARTICLE 15 - MISCELLANEOUS

15.01 Giving Notice

A. Whenever any provision of the Procurement Documents requires the giving of written notice to Buyer, Seller, or Engineer, it will be deemed to have been validly given if delivered:
   1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
   2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
   3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

15.02 Controlling Law

A. This Procurement Contract is to be governed by the law of the state in which the Goods are to be installed.

B. In the case of any conflict between the express terms of this Procurement Contract and the Uniform Commercial Code, as adopted in the state whose law governs, it is the intent of the parties that the express terms of this Procurement Contract will apply.

15.03 Computation of Time

A. When any period of time is referred to in the Procurement Documents by number of 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. When any period of time is referred to in the Procurement Documents by number of 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

15.04 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 Procurement Contract, and the provisions of this paragraph will be as effective as if repeated specifically in the Procurement Contract in connection with each particular duty, obligation, right, and remedy to which they apply.

15.05 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Procurement Contract, as well as all continuing obligations indicated in the Procurement Contract, will survive final payment, completion, and acceptance of the Goods and Special Services or termination or completion of the Procurement Contract or of the services of Seller.

15.06 Entire Agreement

A. Buyer and Seller agree that this Procurement Contract is the complete and final agreement between them, and supersedes all prior negotiations, representations, or agreements, either written or oral. This Procurement Contract may not be altered, modified, or amended except in writing signed by an authorized representative of both parties.

15.07 No Waiver

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Procurement Contract.

15.08 Headings

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

15.09 Successors and Assigns

A. Buyer and Seller each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Procurement Contract.

END OF DOCUMENT

DOCUMENT 00801

SUPPLEMENTARY CONDITIONS - PROCUREMENT

Scope: These Supplementary Conditions amend or supplement Document 00701 - General Conditions - Procurement and other provisions of the Procurement Documents as indicated in this Document. All provisions that are not so amended or supplemented remain in full force and effect.

ARTICLE 1 — DEFINITIONS

5.02 Defined Terms

SC-1.01 Defined Terms: Add the following definitions immediately after 1.01.40:

41. "Or Equal" — Alternate product that does not affect Contract Time, Contract Price, or Contract Scope.
42. Submittals — Shop Drawings, catalog cuts, samples, operating and maintenance instructions, progress payments, requests, and other documents and items specified to be delivered to Owner or Owner's representative.
43. Substitution - Alternate product that requires a Change Order to adjust the Contract Time, Contract Price, or Contract Scope.

ARTICLE 2 — PRELIMINARY MATTERS (NOT USED)

ARTICLE 3 — PROCUREMENT CONTRACT DOCUMENTS (NOT USED)

ARTICLE 4 — COMMENCEMENT AND SCHEDULE (NOT USED)

ARTICLE 5 — BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

SC-5.01 Add the following paragraphs immediately after Paragraph 5.01.A:

1. Required Performance Bond Form: The performance bond that Seller furnishes will be in the form of Document 00614 - Performance Bond - Procurement.

5.02 Insurance

SC-5.02 Add the following new paragraphs immediately after Paragraph 5.02.E:

F. Seller shall purchase and maintain such liability and other insurance as is appropriate for the furnishing of Goods and Special Services and as will provide protection from claims set forth below which may arise out of or result from Seller's furnishing of the Goods or Special Services and Seller's other obligations under the Procurement Contract Documents, whether the furnishing of Goods and Special Services or other obligations are to be performed by Seller, any subcontractor or supplier, or by anyone directly or indirectly employed by any of them to furnish the Goods and Special Services, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Seller's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Seller's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (a) by any person as a result of an offense directly or indirectly related to the employment of such person by Seller, or (b) by any other person for any other reason;

5. claims for damages, other than to the Goods, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

G. The policies of insurance so required by this Paragraph 5.02 to be purchased and maintained must:

1. with respect to insurance required by Paragraphs SC-5.02.F.3 through SC-5.02.F.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) Buyer, Engineer, and their consultants, all of whom must be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds must provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided below or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Seller's indemnity obligations under Paragraph 7.07;

5. contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder will provide a copy of the notice to the other party, each other insured, and Engineer;

6. remain in effect at least until final payment and at all times thereafter when Seller may be correcting, removing, or replacing non-conforming Goods in accordance with Paragraph 9.03 and 9.04; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and Seller shall furnish Buyer and each other additional insured identified in these Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Buyer and any such additional insured of continuation of such insurance at final payment and one year thereafter).

H. The limits of liability for the insurance required by Paragraph SC-5.02.F must 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 SC-5.02.F.1 and F.2:

Workers' Compensation and Related Policies	Policy limits of not less than
Workers' Compensation	
State	Statutory
Applicable Federal	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Each accident	$ 1,000,000
Each employee	$ 1,000,000
Policy limit	$ 2,000,000

2. Seller's General Liability under Paragraphs SC-5.02.F.3 through F.6 which must include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Seller:

Commercial General Liability	Policy limits of not less than
General Aggregate	$ 2,000,000
Products—Completed Operations Aggregate	$ 1,000,000
Personal and Advertising Injury	$ 1,000,000
Bodily Injury and Property Damage—Each Occurrence	$ 1,000,000

3. Automobile Liability under Paragraph SC-5.02.F.6:

6. Transportation Insurance: Transportation insurance shall be of the "all risks" type and shall protect Supplier and Owner from all insurable risks of physical loss or damage to equipment and materials in transit to the designated location. The coverage amount shall be not less than the full value of items exposed to risk in transit at any one time.

   a. Transportation insurance shall provide for losses to be payable to Supplier and Owner as their interests may appear and shall contain a waiver of subrogation rights against the insured parties. For insurance purposes, the risk of loss to equipment and materials shall remain with Supplier until the equipment and materials are accepted by the assignee general construction contractor at the designated location.

   b. Supplier shall submit a copy of the transportation insurance policy to Owner at least 30 days before the scheduled shipping date. The policy

shall quote the insuring agreement, shall list all exclusions, and shall state that 30 days' written notice will be given Owner before the policy is changed or canceled.

I. Seller shall deliver to Buyer, with copies to each additional insured identified in these Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Buyer or any other additional insured) which Seller is required to purchase and maintain.

ARTICLE 6 — LICENSES AND FEES (NOT USED)

ARTICLE 7 — SELLER'S RESPONSIBILITIES (NOT USED)

ARTICLE 8 — SHIPPING AND DELIVERY (NOT USED)

ARTICLE 9 — BUYER'S RIGHTS

9.05 Limitation of Seller's Liability

SC-9.05 Add the following new paragraph after Paragraph 9.04:

9.05 Limitation of Seller's Liability

A. Buyer and Seller agree that the total liability of Seller to Buyer for claims, costs, losses, and damages arising from this Procurement Contract will be limited to the amount established in the Procurement Agreement as the Procurement Contract Price.

B. Upon assignment the terms of this Paragraph 9.05 will be binding upon both the assignor and assignee with respect to Seller's liability, The terms of this limitation do not apply to or limit any claim by Buyer against Seller based on any of the following: (a) contribution or indemnification with respect to third-party claims, losses, and damages; (b) costs, losses, or damages attributable to personal or bodily injury, sickness, disease, or death, or to injury to or destruction of the tangible property of others, (c) intentional or reckless wrongful conduct, or (d) rights conferred by any bond provided by Seller under this Contract.

ARTICLE 10 — ENGINEER'S STATUS (NOT USED)

ARTICLE 11 — CHANGES

11.02 Change Orders

SC-11.02 Insert the following new subparagraphs immediately following Paragraph 11.02.A.4:

5. In signing a Change Order, the Owner and Contractor acknowledge and agree that:
   a. the stipulated compensation (Contract Price or Contract Times, or both) set forth in the Change Order includes not only all direct costs of Contractor such as labor, material, job overhead, and profit markup, but also includes any costs for modifications or changes in sequence of work to be performed, delays, rescheduling, disruptions, extended direct overhead or general overhead, acceleration, material or other escalation which includes wages and other impact costs. This Document will become a supplement to the Contract and all Contract provisions will apply hereto. It is understood that this Change Order shall be effective on the date approved by the Owner's Representative;

b. the Change Order constitutes full mutual accord and satisfaction for the change to the Work;
c. no reservation of rights to pursue subsequent claims on the Change Order will be made by either party; and
d. no subsequent claim or amendment of the Contract Documents will arise out of or as a result of the Change Order.

ARTICLE 12 — CLAIMS, DISPUTES, AND DISPUTE RESOLUTION (NOT USED)

ARTICLE 13 — PAYMENT (NOT USED)

ARTICLE 14 — CANCELLATION, SUSPENSION, AND TERMINATION (NOT USED)

ARTICLE 15 — MISCELLANEOUS (NOT USED)

END OF DOCUMENT

SECTION 01782

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Preparation and submittal of manual with requirements to operate and maintain the equipment.

1.02 PREPARATION

A. General requirements:
   1. Provide dimensions in English units.
   2. Assemble material, where possible, in the same order within each volume.
   3. Reduce drawings and diagrams to 8 1/2 by 11-inch size, if possible unless otherwise specified.
   4. Complete forms on computer, handwriting not acceptable.
   5. Delete items or options not provided in the supplied equipment or system.
   6. Provide package control system annotated ladder logic for PLC, if applicable.

B. Hard copy requirements:
   1. Binders: 3-ring with rigid covers.
      a. Break into separate binders as needed to accommodate large size.
   2. Utilize numbered tab sheets to organize information.
   3. Provide original and clear text on reproducible non-colored paper, 8 1/2 by 11-inch size, 24 pound paper.
   4. Drawings larger than 8 1/2 by 11 inch:
      a. Fold drawings separately and place in envelope bound into the manual.
      b. Label each drawing envelope on the outside regarding contents.

C. Electronic requirements:
   1. File format:
      a. Entire manual in PDF format.
         1) Include text and drawing information.
         2) Provide a single PDF file even if the hard copy version is broken into separate binders due to being large.
         3) Create PDF from the native format of the document (Microsoft Word, graphics programs, drawing programs, etc.).
            a) If material is not available in native format and only available in paper format, remove smudges, fingerprints, and other extraneous marks before scanning to PDF format.
            b) Hard copy record drawing requirements:
               (1) Provide a single multipage PDF file of each set of the scanned drawings.
               (2) Page 1 shall be the cover of the drawing set.

c) At file opening, display the entire cover.
(1) Scan drawings at 200 to 300 dots per inch (DPI), black and white, Group IV Compression, unless otherwise specified.
(2) Scan drawings with photos in the background at 400 dots per inch (DPI), black and white, Group IV Compression.
4) Pagination and appearance to match hard copy.
5) Searchable.
6) Scanned images are not acceptable.
7) Bookmarks:
a) Bookmarks shall match the table of contents.
b) Bookmark each section (tab) and heading.
c) Drawings: Bookmark at a minimum, each discipline, area designation, or appropriate division.
d) At file opening, display all levels of bookmarks as expanded.
8) Thumbnails optimized for fast web viewing.
b. Drawing requirements:
1) Provide additional copy of drawings in most current version of AutoCAD format.
2) Drawings shall have a white background.
3) Drawing shapes shall not degrade when closely zoomed.
4) Screening effects intended to de-emphasize detail in a drawing must be preserved.
5) Delete items or options not provided in the supplied equipment or system.
2. Media:
a. USB flash drive.
b. Secure File Transfer Protocol (SFTP).
3. Label media with the following information:
a. Operation and Maintenance Manual.
b. Equipment name.
c. Specification Section Number
d. Equipment tag number.
e. Owner's name.
f. Project number and name.
g. Date.
4. If multiple submittals are made together, each submittal must have its own subdirectory that is named and numbered based on the submittal number.

1.03 CONTENTS

A. Table of Contents: General description of information provided within each tab section.

B. Complete Attachment A - Equipment Summary Form.

C. Description of system and components.

D. Description of equipment function, normal operating characteristics, and limiting conditions.

E. On-line resources.

F. Telephone resources.

G. Approved submittals.
   1. Markup with any field changes.
   2. Final programming.

H. Start-up procedures: Recommendations for installation, adjustment, calibration, and troubleshooting.

I. Operating procedures:
   1. Step-by-step instructions including but not limited to the following:
      a. Safety precautions and applicable Safety Data Sheets.
      b. Guidelines.
      c. Other information as needed for safe system operation and maintenance.

J. Preventative maintenance procedures:
   1. Recommended steps and schedules for maintaining equipment.
   2. Troubleshooting.

K. Lubrication information: Required lubricants and lubrication schedules.

L. Overhaul instructions: Directions for disassembly, inspection, repair and reassembly of the equipment; safety precautions; and recommended tolerances, critical bolt torques, and special tools that are required.

M. Manufacturer's technical reference manuals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

ATTACHMENT A - EQUIPMENT SUMMARY FORM

EQUIPMENT SUMMARY FORM

1. EQUIPMENT ITEM _____

2. MANUFACTURER _____

3. EQUIPMENT TAG NUMBER(S) _____

4. LOCATION OF EQUIPMENT _____

5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

_____

_____

_____

6. NAMEPLATE DATA -
   - Horsepower _____
   - Amperage _____
   - Voltage _____
   - Service Factor (S.F.) _____
   - Speed _____
   - ENC Type _____
   - Capacity _____
   - Other _____

7. MANUFACTURER'S LOCAL REPRESENTATIVE

   Name _____

   Address _____

   Telephone Number _____

8. MAINTENANCE REQUIREMENTS:

Maintenance Operation	Frequency	Lubricant (if applicable)	Comments
(List each operation required. Refer to specific information in Manufacturer's Manual, if applicable)	(List required frequency of each maintenance operation)	(Refer by symbol to lubricant list as required)	

9. LUBRICANT LIST:

Reference Symbol	Conoco Phillips	Exxon/Mobil	BP/Amoco	Other (List)
(Symbols used in Item 7 above)	(List equivalent lubricants, as distributed by each manufacturer for the specific use recommended)			

10. SPARE PARTS (recommendations)_____

_____

11. COMMENTS_____

12. GENERAL INFORMATION:

Date Accepted*: _____

Expected Life*: _____

Project Name & Number: _____

Design Engineer: _____

13. WARRANTY:

Start Date: _____

Expiration Date: _____

Prorated: _____

SECTION 11359A

ROTARY FAN AND SCREW PRESS DEWATERING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fabrication, delivery, start-up assistance, and performance testing of rotary fan or screw press dewatering system for the dewatering of biosolids at the East Canyon Water Reclamation Facility.

1.02 REFERENCES

A. American Bearing Manufacturers Association (ABMA).

B. American Gear Manufacturers Association (AGMA).

C. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME).

D. Institute of Electrical and Electronics Engineers (IEEE).

E. Instrumentation, Systems, and Automation Society (ISA).

1.03 SYSTEM DESCRIPTION

A. The Snyderville Basin Water Reclamation District will pre-purchase dewatering equipment for the East Canyon Water Reclamation Facility. The equipment Supplier will be determined by evaluation of information required in this specification including equipment cost, ease of operation and maintenance, local support, reference installations, and experience with similar sludge characteristics.

B. Rotary fan press dewatering equipment shall be capable of dewatering waste activated sludge with the characteristics and to the performance requirements described below.
   1. Design criteria:
      a. Number of units: two 6-channel units.
      b. Solids Loading Rate: 600 lbs/hour per unit.
   2. Sludge characteristics:
      a. Feed solids consist of waste activated sludge from a biological nutrient removal oxidation ditch with tertiary alum addition.
      b. Feed solids concentration of waste activated sludge (percent solids by weight): 1 to 2 percent.
      c. Percent volatile suspended solids (USS): 75 to 85.
      d. The equipment shall be capable of operating continuously 24 hours per day, 7 days per week.
   3. Performance requirements:
      a. Cake dryness: minimum 15 percent solids.

b. Polymer dose: as indicated by manufacture.
c. Solids capture: minimum of 90 percent.

4. Washwater requirements:
   a. Should dewatering equipment require larger washwater pressures than 80 psi, provide wash water booster pumps as part of Supplier's bid.
5. Air requirements:
   a. Should dewatering equipment require external air, provide air compressors with dryer as part of Supplier's bid.

C. Supplier shall provide a control system for the dewatering equipment in accordance with Section 17055 - Packaged Control System. Control panel for the equipment should be sized as follows:
   1. Provide a single control panel sized for 2 dewatering units.
   2. Provide control of all dewatering equipment including existing equipment provided by others such as the dewatering feed pumps and polymer feed equipment for a completely automated system capable of unattended operation.
   3. Provide a separate power supply panel that houses the variable frequency drives (VFD) needed for the dewatering equipment.

D. Supplier shall provide a removable stand to elevate the rotary fan presses 43-1/4 inches above the floor, for temporary discharge into an existing horizontal screw conveyor.

1.04 PROCUREMENT SUBMITTAL

A. Owner/Engineer will use information provided by the manufacturer for determination of preferred dewatering equipment Supplier.

B. Supplier must submit the information listed in Document 00200 - Instructions to Bidders, Article 10 in order to be found responsive to this request for proposals.

1.05 CONTRACT SUBMITTALS

A. The following submittals items will be required of the successful Supplier as per the schedule outlined in these procurement documents.

B. Submittals required in accordance with Sections 01330 - Submittal Requirements.

C. Product Data:
   1. For each item of equipment:
      a. Design features.
      b. Load capacities.
      c. Efficiency ratings.
      d. Material designations by UNS alloy number or ASTM Specification and Grade.
      e. Data needed to verify compliance with the specifications.
      f. Nameplate data.
      g. Clearly mark submittal information to show specific items, materials, and accessories or options being furnished.

2. For gear reduction units submit the following:
    a. Engineering information per applicable AGMA standards.
    b. Gear mesh frequencies.
3. Submit data completely describing product including plan and section views and listings of all components.
4. Submit surface preparation and finishes to be applied to all equipment.

D. Shop Drawings:
1. Generate all drawings developed for this project utilizing AutoCAD or MicroStation:
    a. Delivered in PDF format.
2. Drawings for Equipment:
    a. Drawings that include weight, loading information, cut-away drawings, parts lists, material specification lists, and other information required to substantiate that proposed equipment complies with specified requirements.
    b. Outline drawings showing equipment, driver, driven equipment, pumps, seal, motor(s) or other specified drivers, variable frequency drive, shafting, U-joints, couplings, drive arrangement, gears, baseplate or support dimensions, anchor bolt sizes and locations, bearings, and other furnished components.
    c. Include details on interconnecting piping, supports, and control panel.
    d. Installation and checkout instructions including leveling and alignment tolerances, grouting, lubrication requirements, and initial start-up procedures.
    e. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer based controls.
        1) Clearly show every wire, circuit, and terminal provided under this contract on one or more submitted wiring diagrams.
        2) Show all interfaces between any of the following: instruments, vendor control panels, motor control centers, motor starters, variable speed drives, control valves, flow meters, chemical feeders and other equipment related to the instrumentation system.
        3) Show location of conduit entrances and access plates.
    f. Recommended or normal operating parameters such as temperatures and pressures.
    g. Alarm and shutdown set points for all controls furnished.

E. Design calculations:
1. As specified in Section 01850 - Design Criteria, including the strength requirements for equipment support, enclosure support, and anchor bolts signed and stamped by a structural engineer registered in the state of Utah.
2. Provide bearing L_{10} life calculations in accordance with ABMA calculation method for gears, motors, and other driveline components signed and stamped by a professional engineer as required by Section 15050 - Common Work Results for Mechanical Equipment.

F. Quality control submittals:
   1. Special shipping storage, protection, and handling instructions.
   2. Provide factory test results from Level 1 General Equipment Performance Test as described in Section 15958 - Mechanical Equipment Testing prior to shipping equipment.

G. Motor and VFD data:
   1. Submittals as required by Sections 16222 - Low Voltage Motors up to 500 Horsepower and 16262 - Variable Frequency Drives 0.50 to 50 Horsepower.

H. Instrumentation and Control Data:
   1. Submittals as required by Section 17055 - Packaged Control System.

I. Operation and Maintenance Manuals:
      a. Supplier shall furnish equipment operation and maintenance (O&M) manuals to the Owner for the Owner's use in accordance with Section 01782 - Operation and Maintenance Manuals.

1.06 QUALITY ASSURANCE

A. Experience:
   1. Furnish services of authorized representative specially trained in installation of equipment as stated below:
      a. Visit project site and perform tasks necessary to certify installation.
      b. Provide operations and maintenance training to Owner on mechanical, electrical, and instrumentation equipment.
      c. Conduct Performance Testing.

1.07 DELIVERY, SHIPPING, AND HANDLING

A. Packing and Shipping:
   1. Equipment shall be packed in boxes, crates, or otherwise protect from damage and moisture, dust, or dirt during shipment, handling, and storage.
      a. Bearings: Separately pack or otherwise suitably protect during transport.
      b. Spare Parts: Deliver in boxes labeled with contents, equipment to which spare parts belong, and name of Contractor.
   2. Before delivery, Supplier will supply detailed packing lists, shipping weights, and shipping container arrangement drawings. Each individual package, crate, or skid shall be tagged.
   3. Supplier shall ship as much of the equipment and material as possible shop assembled, in order to keep field assembly and erection work to a minimum.

1.08 WARRANTY

A. Warranty period shall extend for a minimum of 12 months following successful demonstration of performance testing and acceptance by Owner.

B. Warranty shall include all parts, labor, and coatings for repairing or replacing equipment that fails during the warranty period. Defects or corrosion occurring

within the warranty period shall be repaired or replaced by the Supplier at no cost to the Owner.

1.09 MAINTENANCE

A. Provide tools required for assembling and disassembling the screw press or rotary fan press and flocculation tank.

B. Provide a list of recommended spare parts with price information.

1.10 SITE CONDITIONS

A. Equipment is to be suitable for performance in a wastewater treatment plant environment, indoors and under the following conditions:
   1. Room Temperatures: 40 to 100 degrees Fahrenheit.
   2. Relative Humidity: 10 to 100 percent.
   3. Site Elevations:
      a. Approximately 6,300 feet above mean sea level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. One of the following or equal:
   1. Rotary fan press:
      a. Fournier Industries, Inc.
      b. PSI.

2.02 DEWATERING SYSTEM DESCRIPTIONS

A. The equipment to be provided in general includes dewatering units, flocculation tanks and mixers, and associated instrumentation and controls. Two vendor control panels will be provided. One panel will contain PLC, controls, and human machine interface (HMI). The second panel will contain VFDs for each press and flocculator. Each control panel shall be sized for 2 dewatering units. Future expansion of the control panel will not be required. Start-up services shall be provided once for each dewatering unit. In general, the following equipment will be provided by others:
   1. Solids feed pumps.
   2. Polymer feeders.
   3. Solids flow meters.
   4. Sludge grinder.

B. Fournier Industries, Inc.
   1. Rotary fan press includes a base, dewatering channels, cake outlet chutes and drive system.
   2. Inside each dewatering channel are filtration elements, filtration wheel, scrapers, deflector gate and wash water system.
   3. Flocculator and feed manifold are provided to condition and distribute sludge to the dewatering channels.

C. PSI:
   1. Rotary fan press includes slotted filter screens, discharge chute, an integrated mixing element and VFD press drive.
   2. Equipment utilizes the combination of controlled sludge feed along with chemical/polymer conditioning of the sludge with drainage of free water within the channel of the rotary fan press.
   3. Each channel has an inner and outer filtration element and filter element support made of 304 stainless steel. Channels have pneumatically adjusted radial seal to maintain the seal for the filter support wheels.

2.03 IDENTIFICATION

A. Identify each piece of equipment with a stainless steel nameplate, securely affixed in a conspicuous place. Nameplate information shall include equipment model number, serial number, manufacturer's name, and location.

2.04 MATERIALS

A. General:
   1. All wetted parts shall be constructed of 304 stainless steel.
   2. The frame and structural base may be constructed of carbon steel with epoxy corrosion resistant coating.
   3. Mechanical elements such as shaft couplings, seals, bearings, and gear reduction units shall be supplied in accordance with Section 15050 - Common Work Results for Mechanical Equipment.
   4. All sprockets, chains, couplings, and other rotating parts shall be provided with OSHA approved guards as per Section 15050 - Common Work Results for Mechanical Equipment.
   5. All piping connections shall be ANSI, Class 150, standard raised face flanges.
   6. Motors: 480 V, 60 Hz, 3 phase inverter duty electric motor with temperature switches suitable to provide full load capacity and also to withstand the full starting torque of the system in accordance with Section 16222 - Low Voltage Motors up to 500 Horsepower.
   7. VFDs in accordance with Section 16262 - Variable Frequency Drives 0.50 to 50 Horsepower.
   8. Anchor bolts shall be Type 304 stainless steel sized by Supplier and supplied by the Contractor.

2.05 ENCLOSURES

A. Provide enclosures for all electrical, instrumentation, and controls equipment that meet the requirements outlined in NEMA Standard 250 for the following enclosure type:
   1. NEMA 4X enclosure: Made from 316 Stainless Steel for PLC enclosure.
   2. NEMA 4 enclosure for VFD enclosure.

2.06 CONTROLS

A. Control Strategy:
   1. Screw press manual control: The screw press shall be controlled manually at the Supplier-supplied vendor control panel (VCP).

2. Screw press automatic control: The programmable logic controller (PLC) in the VCP shall accept a remote run/stop command from the plant PLC-based control system via Ethernet cable. Upon sending a run command, the PLC will simultaneously command the corresponding sludge feed pump and polymer feed pump to start with required time delays. Upon sending a stop command, the PLC will simultaneously command the corresponding sludge feed pump and polymer feed pump to stop with required time delays.

B. Vendor Control Panel:
   1. The Supplier shall provide a control panel with programmable logic controller (PLC) and human interface (HMI).
      a. PLC system shall be GE Rx3i, Allen Bradley, or approved equal.
         1) PLC hardware manufacturer shall manufacture PLC programming software system.
      b. Human machine interface (HMI) shall be a color touch screen.
         1) Provide the HMI graphic software system manufactured by the HMI hardware manufacturer.
   2. Provide uninterruptible power supply (UPS) to power PLC, HMI, and field instruments.
      a. The VA rating of the UPS shall be greater than 1.5 times the connected load or 700 VA, whichever is greater.
      b. The UPS shall provide backup power in the event of a power failure for a minimum of 30 minutes.
   3. PLC shall be capable of networking with the existing plant SCADA system, which utilizes GE Rx3i PLCs.

C. Field Instruments:
   1. The Supplier shall provide field instruments required for fully operational dewatering equipment.

2.07 SOURCE QUALITY CONTROL

A. Perform a Level 1 General Equipment Performance Test in accordance with Section 15958 - Mechanical Equipment Testing. This test does not need to be witnessed by Engineer or Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Contractor shall install equipment in accordance with Supplier’s instructions, and provide all hardware required for installation.

3.02 EQUIPMENT START-UP AND TESTING

A. Supplier shall inspect the system before initial start-up and certify that the system has been correctly installed and prepared for start-up. Provide certificate of proper installation as specified in Section 01756 - Commissioning.

B. Contractor shall perform start-up and functional testing as specified in Section 01756 - Commissioning for entire dewatering system, with all units operating in AUTO mode.
   1. Operational testing as per Section 15958 - Mechanical Equipment Testing as follows:
      a. General Performance Test: Level 2.
      b. Vibration Test: Level 1.
      c. Noise Test: None required.

C. Operational test:
   1. After successful completion of the functional testing, the dewatering equipment will be operated continuously for 7 days at the design conditions to demonstrate consistent performance.

D. Performance Testing:
   1. At the conclusion of the 7-day operational test, Supplier's field representative shall conduct the performance testing.
   2. Test runs shall consist of two 24-hour steady-state runs performed on 2 consecutive days.
   3. Samples of feed, filtrate, and cake shall be collected by Engineer's appointed representative or by the Owner and shall be evaluated by a certified testing laboratory and/or by the Owner.
      a. Sample testing and analysis costs shall be the responsibility of the Owner.
   4. Polymer shall be as selected by the Supplier and shall be supplied by the Owner for testing.
   5. Performance test runs:
      a. Data collected during each test run shall include at a minimum:
         1) Run number.
         2) Date and time.
         3) Feed sludge percent total solids, %TS (daily composite).
         4) Feed sludge percent volatile solids, %VS (daily composite).
         5) Sludge feed rate, gpm.
         6) Polymer name.
         7) Polymer percent active, %.
         8) Polymer density, lb/gal.
         9) Polymer feed rate (neat), gph.
         10) Screw press screw speed, rpm.
         11) Amperage drawn by the screw press drive, amps.
         12) Screw press filtrate percent total suspended solids, %TSS.
         13) Cake percent total solids, %TS.
      b. Provide calculated values for the following:
         1) Solids throughput, lbs TS/hr.
         2) Polymer dosage, active lb/dry ton TS.
         3) Solids recovery (capture), %, calculated as follows:
            a) Capture % = Cake %TS * (Feed %TS - Filtrate %TS) / (Feed %TS * (Cake %TS - Filtrate %TSS))*100.
            b) Begin sampling after 30 minutes of steady state run time.
      c. Solids concentrations will be determined using Standard Methods for the Examination of Water and Wastewater.

d. All test data and values as previously described and as required to demonstrate performance shall be recorded at the start of each run and every hour thereafter.
e. The units shall be operated in AUTO mode at all times during the Performance Test Runs.
f. Supplier shall prepare and submit a written report documenting the test data listed above.
g. Provide a computer spreadsheet compatible with Microsoft Excel with the test data listed above.

E. Witnessing: The Engineer shall witness all field-testing. Provide advance notice of field-testing as specified in Section 01756 - Commissioning and Section 15958 - Mechanical Equipment Testing.

3.03 SUPPLIER'S FIELD SERVICES

A. A representative of the Supplier shall be provided for the following:
1. Inspection, Functional Testing, and Operator Training: 1 trip with 3 days of service.
a. Inspect the system before initial start-up and certify that the system has been correctly installed with Certificate of Proper Installation.
b. Assist with functional testing.
c. Training of Owner's Personnel:
1) Operations and inspection training.
2) Safety instruction.
3) Preventative maintenance instruction.
4) Calibration and other pertinent services.
5) Control strategy and procedure instruction.
2. Conduct Performance Testing: 1 trip with 2 days of service.
a. Provide field adjustments to ensure proper equipment operation at the completion of the operational test.
3. Additional trips resulting from a failed performance test shall be the sole responsibility of the Supplier.
4. Additional trips resulting from improper installation, or project delays shall be the responsibility of the Contractor.

END OF SECTION

SECTION 15050

COMMON WORK RESULTS FOR MECHANICAL EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Basic design and performance requirements for building mechanical equipment and process mechanical equipment.

1.02 REFERENCES

A. American Gear Manufacturer's Association (AGMA) Standards:
   1. 6001-E08 - Design and Selection of Components for Enclosed Gear Drives.

B. American Bearing Manufactures Association (ABMA) Standards:
   1. 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. American Petroleum Institute (API):
   1. 682 - Shaft Sealing Systems for Centrifugal and Rotary Pumps.

D. ASTM International (ASTM):
   1. A36 - Standard Specification for Carbon Structural Steel.
   2. A48 - Standard Specification for Gray Iron Castings.
   3. A125 - Standard Specification for Steel Springs, Helical, Heat-Treated.
   4. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
   5. A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   6. A320 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.
   7. A536 - Standard Specification for Ductile Iron Castings.
   8. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   9. B61 - Standard Specification for Steam or Valve Bronze Castings.
   10. B62 - Standard specification for Composition Bronze or Ounce Metal Castings.
   11. B505 - Standard Specification for Copper Alloy Continuous Castings.
   12. B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
   13. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   14. F594 - Standard Specification for Stainless Steel Nuts.

E. Hydraulic Institute (HI).

F. Occupational Safety and Health Administration (OSHA).

G. Unified Numbering System (UNS).

1.03 DEFINITIONS

A. Resonant frequency: That frequency at which a small driving force produces an ever-larger vibration if no dampening exists.

B. Rotational frequency: The revolutions per unit of time usually expressed as revolutions per minute.

C. Critical frequency: Same as resonant frequency for the rotating elements or the installed machine and base.

D. Peak vibration velocity: The root mean square average of the peak velocity of the vibrational movement times the square root of 2 in inches per second.

E. Rotational speed: Same as rotational frequency.

F. Maximum excitation frequency: The excitation frequency with the highest vibration velocity of several excitation frequencies that are a function of the design of a particular machine.

G. Critical speed: Same as critical frequency.

H. Free field noise level: Noise measured without any reflective surfaces (an idealized situation); sound pressure levels at 3 feet from the source unless specified otherwise.

I. Operating weight: The weight of unit plus weight of fluids or solids normally contained in unit during operation.

1.04 DESIGN REQUIREMENTS

A. General:
   1. Product requirements as specified in Section 01600 - Product Requirements.
   2. Project conditions as specified in Section 01850 - Design Criteria.
   3. Provisions specified under each technical equipment specification prevail over and supersede conflicting provisions specified in this Section.
   4. Equipment manufacturer's responsibility extends to selection and mounting of gear drive units, motors or other prime movers, accessories, and auxiliaries required for proper operation.
   5. Vibration considerations:
      a. Resonant frequency:
         1) For single-speed equipment, ensure there are no natural resonant frequencies within 25 percent above or below the operating rotational frequencies or multiples of the operating rotational frequencies that may be excited by the equipment design.
         2) For variable-speed equipment, ensure there are no natural resonant frequencies within 25 percent above or below the range of operating frequencies.

b. Design, balance, and align equipment to meet the vibration criteria specified in Section 15958 - Mechanical Equipment Testing.

6. Equipment units weighing 50 pounds or more: Provide with lifting lugs or eyes to allow removal with hoist or other lifting device.

B. Power transmission systems:
   1. V-belts, sheaves, shaft couplings, chains, sprockets, mechanical variable-speed drives, variable frequency drives, gear reducers, open and enclosed gearing, clutches, brakes, intermediate shafting, intermediate bearings, and U-joints are to be rated for 24 hour-a-day continuous service or frequent stops-and-starts intermittent service, whichever is most severe, and sized with a service factor of 1.5 or greater in accordance with manufacturer recommendations:
      a. Apply service factor to nameplate horsepower and torque of prime source of power and not to actual equipment loading.
      b. Apply service factors in accordance with AGMA 6001-E08, other applicable AGMA standards, or other applicable referenced standards.

C. Equipment mounting and anchoring:
   1. Mount equipment on cast-iron or welded-steel bases with structural steel support frames.
      a. Utilize continuous welds to seal seams and contact edges between steel members.
      b. Grind welds smooth.
   2. Provide bases and supports with machined support pads, dowels for alignment of mating of adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits.
   3. Provide jacking screws in bases and supports for equipment weighing over 1,000 pounds.
   4. Design equipment anchorage, supports, and connections for dead load, running loads, loads during start-up, seismic load specified in Section 01850 - Design Criteria, and other loads as required for proper operation of equipment.
      a. For equipment with an operating weight of 400 pounds or greater and all equipment that is supported higher than 4 feet above the floor, provide calculations for:
         1) The operating weight and location of the centroid of mass for the equipment.
         2) Forces and overturning moments.
         3) Shear and tension forces in equipment anchorages, supports, and connections.
         4) The design of equipment anchorage, supports, and connections based on calculated shear and tension forces.
   5. Anchorage of equipment to concrete or masonry:
      a. Perform calculations and determine number, size, type, strength, and location of anchor bolts or other connections.
      b. Unless otherwise indicated on the Drawings, select and provide anchors from the types specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.
      c. Provide bolt sleeves around cast-in anchor bolts for 400 pounds or greater equipment.
         1) Adjust bolts to final location and secure the sleeve.

6. Anchorage of equipment to metal supports:
    a. Perform calculations and determine number, size, type, strength, and location of bolts used to connect equipment to metal supports.
7. Unless otherwise indicated on the Drawings, install equipment supported on concrete over non-shrink grout pads as specified in this Section.

1.05 SUBMITTALS

A. As specified in Section 01600 - Product Requirements.

B. Product data:
1. For each item of equipment:
    a. Design features.
    b. Load capacities.
    c. Efficiency ratings.
    d. Material designations by UNS alloy number or ASTM Specification and Grade.
    e. Data needed to verify compliance with the Specifications.
    f. Catalog data.
    g. Nameplate data.
    h. Clearly mark submittal information to show specific items, materials, and accessories or options being furnished.
2. Gear reduction units:
    a. Engineering information in accordance with applicable AGMA standards.
    b. Gear mesh frequencies.

C. Shop drawings:
1. Drawings for equipment:
    a. Drawings that include cut-away drawings, parts lists, material specification lists, and other information required to substantiate that proposed equipment complies with specified requirements.
2. Outline drawings showing equipment, driver, driven equipment, pumps, seal, motor(s) or other specified drivers, variable frequency drive, shafting, U-joints, couplings, drive arrangement, gears, base plate or support dimensions, anchor bolt sizes and locations, bearings, and other furnished components.
3. Installation instructions including leveling and alignment tolerances, grouting, lubrication requirements, and initial Installation Testing procedures.
4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer-based controls.
5. Recommended or normal operating parameters such as temperatures and pressures.
6. Alarm and shutdown setpoints for all controls furnished.

D. Calculations:
1. Structural:
    a. Substantiate equipment base plates, supports, bolts, anchor bolts, and other connections meet minimum design requirements specified and seismic design criteria as specified in Section 01850 - Design Criteria.

2. Mechanical:
    a. ABMA 9 or ABMA 11 L10 life for bearings calculation methods for drivers, pumps, gears, shafts, motors, and other driveline components with bearings.
    b. Substantiate that operating rotational frequencies meet the requirements of this Section.
    c. Torsional analysis of power transmission systems: When torsional analysis specified in the equipment sections, provide:
        1) Sketch of system components identifying physical characteristics including mass, diameter, thickness, and stiffness.
        2) Results of analysis including first and second critical frequencies of system components and complete system.
    d. Calculations shall be signed and stamped by a licensed engineer.
3. Drinking water:
    a. If applicable, conform to the requirements of Section 01600 - Product Requirements for materials in contact with drinking water.

E. Operation and maintenance manuals:
1. As specified in Section 01782 - Operating and Maintenance Data.
2. Equipment with bearings:
    a. Include manufacturer and model number of every bearing.
    b. Include calculated ball pass frequencies of the installed equipment for both the inner and outer raceways.

F. Commissioning submittals: As specified in Section 01756 - Commissioning.

G. Project closeout documents: As specified in Section 01770 - Closeout Procedures.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials as specified in Section 01600 - Product Requirements including special requirements for materials in contact with drinking water.

B. Ferrous materials:
1. Steel for members used in fabrication of assemblies: ASTM A36.
2. Iron castings: ASTM A48, tough, close-grained gray iron, free from blowholes, flaws, and other imperfections.
3. Ductile iron castings: ASTM A536, Grade 65-45-12, free from flaws and imperfections.
4. Galvanized steel sheet: ASTM A653, minimum 0.0635 inch (16 gauge).
5. Expanded metal: ASTM A36, 13 gauge, 1/2-inch flat pattern expanded metal.
6. Stainless steel:
    a. As specified in Section 05120 - Structural Steel Framing.
    b. In contact or within 36 inches of water: Type 316 or 316L.
    c. In sea air environment: Type 316 or 316L.
    d. Other locations: Type 304 or 304L.
    e. Source cleaning and passivation as specified in Section 05120 - Structural Steel Framing.

C. Non-ferrous materials:
   1. Stainless steel: Type 304 or 316 as specified. Provide L grade where welding is required.
   2. Bronze in contact with wastewater: Composition of not more than 2 percent aluminum nor more than 6 percent zinc; UNS Alloy C83600, C89833, C89520, C92200, or C93700 in accordance with ASTM B 61, B 62, B 505, or B 584, when not specified otherwise.

D. Dielectric materials for separation of dissimilar metals:
   1. Neoprene, bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other materials as specified.

E. Non-shrink grout and epoxy non-shrink grout: As specified in Section 03600 - Grouting.

2.02 ANCHORS AND FASTENERS

A. Mechanical anchoring to concrete and masonry:
   1. As specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry:
      a. Type 316 stainless steel.
   2. Design as specified in Section 01612.

B. High-strength fasteners:
   1. As specified in Section 05120 - Structural Steel Framing.

C. Flange bolts:
   1. As specified in Section 15052 - Common Work Results for General Piping.

D. Mechanical assembly fasteners:
   1. Stainless steel:
      a. High-temperature service or high-pressure service:
         1) Bolts: ASTM A193, Grade B8 (Type 304) or Grade B8M (Type 316), Class 1, heavy hex.
         2) Nuts: ASTM A194, Grade 8, heavy hex.
         3) Washers: Alloy group matching bolts and nuts.
      b. Low-temperature service:
         1) Bolts: ASTM A320, Grade B8 (Type 304) or Grade B8M (Type 316), Class 1, heavy hex.
         2) Nuts: ASTM A194, Grade 8 (Type 304) or Grade B8M (Type 316), heavy hex.
         3) Washers: Alloy group matching bolts and nuts.
      c. General service:
         1) Bolts: ASTM F593, Alloy Group 1 (Type 304) or Alloy Group 2 (Type 316).
         2) Nuts: ASTM F594, Alloy Group 1 (Type 304) or Alloy Group 2 (Type 316).
         3) Washers: Alloy group matching bolts and nuts.

2.03 SHAFT COUPLINGS

A. General:
   1. Type and ratings: Provide non-lubricated type, designed for not less than 50,000 hours of operating life.
   2. Sizes: Provide as recommended by manufacturer for specific application, considering horsepower, speed of rotation, and type of service.

B. Shaft couplings for close-coupled electric-motor-driven equipment:
   1. Use for:
      a. Equipment 1/2 horsepower or larger.
      b. Reversing equipment.
      c. Equipment subject to sudden torque reversals or shock loading:
      d. Examples:
         1) Reciprocating pumps, blowers, and compressors.
         2) Conveyor belts.
   2. Manufacturers: One of the following or equal:
      a. Lovejoy.
      b. T.B. Woods.
   3. Provide flexible couplings designed to accommodate angular misalignment, parallel misalignment, and end float.
   4. Manufacture flexible component of coupling from synthetic rubber or urethane.
   5. Provide service factor of 2.5 for electric motor drives and 3.5 for engine drives.
   6. Do not allow metal-to-metal contact between driver and driven equipment.

C. Shaft couplings for direct-connected electric-motor-driven equipment:
   1. Use for 1/2 horsepower or larger and subject to normal torque, non-reversing applications.
   2. Manufacturers: One of the following or equal:
      a. Rexnord.
      b. T.B. Woods.
   3. Provide flexible couplings designed to accommodate shock loading, vibration, and shaft misalignment or offset.
   4. Provide flexible connecting element of rubber and reinforcement fibers.
   5. Provide service factor of 2.0.
   6. Connect stub shafts through collars or round flanges, firmly keyed to their shafts with neoprene cylinders held to individual flanges by through pins.

D. Spacer couplings: Where cartridge-type mechanical seals or non-split seals are specified, provide a spacer-type coupling of sufficient length to remove the seal without disturbing the driver or driven equipment unless noted otherwise in the individual equipment specifications.

E. Specialized couplings: Where requirements of equipment dictate specialized features, supply coupling recommended for service by manufacturer:
   1. Includes any engine-driven equipment.

2.04 STUFFING BOX, SEAL CHAMBER, AND SHAFT SEALS

A. General:
   1. Unless otherwise noted in the equipment section, provide cartridge-type, double mechanical shaft seals for pumps.
   2. Provide a stuffing box large enough for a double mechanical seal.
   3. Where packing is specified, provide stuffing box large enough to receive a double mechanical seal.
   4. Provide seal or packing flush connections, 3/4-inch size.
   5. Provide and route leakage drain line to nearest equipment floor drain
   6. For pumps with packing, design packing gland to allow adjustment and repacking without dismantling pump except to open up packing box.
   7. Seal or packing flush requirements shall be in accordance with API Standard 682 requirements. Unless otherwise indicated, specified or required by the equipment and seal manufacturers, the following API flushing Plan arrangements shall be utilized as appropriate for the application:
      a. Single seal, clean water applications: Plan 11 (Discharge bypass to seal).
      b. Single seal, vertical pump applications: Plan 13 (Seal bypass to suction).
      c. Single seal, clean hot water (greater than 180 degrees Fahrenheit) applications: Plan 23 (Seal cooler and pumping ring).
      d. Single seal, solids, or contaminants containing water applications: Plan 32 (External seal water).
      e. Double seal applications: Plan 54 (External seal water).

B. Packing: When specified in the equipment section of the specifications, provide the following type of packing:
   1. Wastewater, water, and sludge applications:
      a. Asbestos free.
      b. PTFE (Teflon) free.
      c. Braided graphite.
      d. Manufacturers: One of the following or equal:
         1) Chesterton, 1400.
         2) John Crane, equivalent product.
   2. Drinking water service:
      a. Asbestos free.
      b. Material: Braided PTFE (Teflon).
      c. Manufacturers: One of the following or equal:
         1) Chesterton, 1725.
         2) John Crane, equivalent product.

C. Mechanical seals: Provide seal types specified in the equipment sections and as specified.
   1. Provide seal types meeting the following requirements:
      a. Balanced hydraulically.
      b. Spring: Stationary, out of pumping fluid, Hastelloy C; Type Elgiloy or 17-7 PH stainless steel for split seals.
      c. O-ring: Viton 747.
      d. Gland: Type 316L stainless steel.
      e. Set screws: Type 316L stainless steel.
      f. Faces: Reaction bonded, silicon carbide.

g. Seal designed to withstand 300 pounds per square inch gauge minimum differential pressures in either direction; no requirement for seal buffer pressure to be maintained when pump is not operational even though process suction head may be present in pump.

2. Cartridge-type single mechanical: Manufacturers: One of the following or equal:
   a. Chesterton, S10.
   b. John Crane, 5610 Series.
3. Cartridge-type double mechanical: Manufacturers: One of the following or equal:
   a. Chesterton, S20.
   b. John Crane, 5620 Series.
4. Split-face single mechanical: Manufacturers: One of the following or equal:
   a. Chesterton, 442.
   b. John Crane, 3740.
5. Cartridge-type flushless mechanical: Manufacturers: One of the following or equal:
   a. Chesterton, 156.
   b. John Crane, 5870.

2.05 GEAR REDUCTION UNITS

A. Type: Helical or herringbone, unless otherwise specified.

B. Design:
   1. Made of alloys treated for hardness and for severe service.
   2. AGMA Class II service:
      a. Use more severe service condition when such is recommended by unit's manufacturer.
   3. Cast-iron housing with gears running in oil.
   4. Anti-friction bearings.
   5. Thermal horsepower rating based on maximum horsepower rating of prime mover, not actual load.
   6. Manufactured in accordance with applicable AGMA standards.

C. Planetary gear units are not to be used.

2.06 BELT DRIVES

A. Sheaves:
   1. Separately mounted on bushings by means of at least 3 pull-up bolts or cap tightening screws.
   2. When 2 sheave sizes are specified, provide separate belts sized for each set of sheaves.
   3. Statically balanced for all; dynamically balanced for sheaves that operate at a peripheral speed of more than 5,500 feet per minute.
   4. Key bushings to drive shaft.

B. Belts: Anti-static type when explosion-proof equipment or environment is specified.
   1. When spare belts are specified, furnish 1 spare belt for every different type and size of belt-driven unit:
      a. Where 2 or more belts are involved, furnish matched sets.
      b. Identify as to equipment, design, horsepower, speed, length, sheave size, and use.
      c. Package in boxes labeled with identification of contents.

C. Manufacturers: One of the following or equal:
   1. Dodge, Dyna-V belts with matching Dyna-V sheaves and Taper-Lock bushings.
   2. T.B. Woods, Ultra-V belts with matching Sure-Grip sheaves and Sure-Grip bushings.

2.07 BEARINGS

A. Type: Oil or grease lubricated, ball or roller antifriction type, of standard manufacture.

B. Oil-lubricated bearings: Provide either pressure lubricating system or separate oil reservoir splash-type system:
   1. Size oil-lubrication systems to safely absorb heat energy generated in bearings when equipment is operating under normal conditions and with the temperature 15 degrees Fahrenheit above the maximum design temperature as specified in Section 01850 - Design Criteria.
   2. Provide an external oil cooler when required to satisfy the specified operating conditions:
      a. Provide air cooled system if a water-cooling source is not available.
      b. Equip oil cooler with a filler pipe and external level gauge.

C. Grease lubricated bearings, except those specified to be factory sealed: Fit with easily accessible grease supply, flush, drain, and relief fittings.
   1. Lubrication lines and fittings:
      a. Lines: Minimum 1/4-inch diameter stainless steel tubing.
      b. Multiple fitting assemblies: Mount fittings together in easily accessible location.
      c. Use standard hydraulic-type grease supply fittings:
         1) Manufacturers: One of the following or equal:
            a) Alenite.
            b) Zerk.

D. Ratings: Rated in accordance with ABMA 9 or ABMA 11 L10 life for bearings rating life of not less than 50,000 hours.

2.08 MOTORS

A. As specified in Section 16222 - Low Voltage Motors Up to 500 Horsepower.

2.09 GEAR MOTORS

A. Motors as specified in Section 16222 - Low Voltage Motors Up to 500 Horsepower.

B. Helical gearing for parallel shaft drives and worm gearing for right-angle drives.

C. One of the following or equal:
   1. Baldor Electric Company.
   2. Bodine Electric Company.

2.10 VENDOR CONTROL PANELS

A. As specified in Section 17055 - Packaged Control System.

2.11 EQUIPMENT SUPPORT FRAMES

A. Bolt holes shall not exceed bolt diameter by more than 25 percent, up to a limiting maximum diameter oversize of 1/4 inch.

2.12 PIPING AND VALVES

A. Piping as specified in Section 15052 - Common Work Results for General Piping.

B. Valves as specified in Section 15110 - Common Work Results for Valves.

2.13 SAFETY EQUIPMENT

A. Safety guards:
   1. Provide guards that protect personnel from rotating shafts or components within 7.5 feet of floors or operating platforms.
   2. Requirements:
      a. Allow visual inspection of moving parts without removal.
      b. Allow access to lubrication fittings.
      c. Prevent entrance of rain or dripping water for outdoor locations.
      d. Size belt and sheave guards to allow for installation of sheaves 15 percent larger and addition of 1 belt.
   3. Materials:
      a. Sheet metal: Carbon steel, 12-gauge minimum thickness, hot-dip galvanized after fabrication.
      b. Fasteners: Type 304 stainless steel.

B. Insulation:
   1. Insulate all surfaces with normal operating temperatures above 120 degrees Fahrenheit when surface is within 7.5 feet height from any operating floor or level.
   2. Insulation thickness such that temperature is below 120 degrees Fahrenheit.
   3. Insulation Type 3 and cover Type 5 as specified in Section 15082 - Piping Insulation.

C. Warning signs:
   1. Provide warning signs in accordance with OSHA requirements for equipment that starts automatically or remotely.
   2. Material, sign size, and text: As specified in Section 10400 - Signage.
   3. Mount warning signs with stainless steel fasteners at equipment.

2.14 SPRING VIBRATION ISOLATORS

A. Design requirements:
   1. Telescopic top and bottom housing with vertical stabilizers to resist lateral and vertical forces.
   2. Use steel coil springs.
   3. Design vibration isolators in accordance with seismic design criteria as specified in Section 01850 - Design Criteria.

A. Performance requirements: Minimum spring deflection of 1 inch under static load and capable of limiting transmissibility to 10 percent maximum at design operating load.

B. Manufacturers: One of the following or equal:
   1. California Dynamics Corporation, Type RJSD.
   2. Mason Industries, equivalent product.

C. Materials:
   1. Fabricate isolators using welded-steel or shatterproof ductile iron in accordance with ASTM A536 Grade CS-45-12.
   2. Spring steel: ASTM A125.

2.15 NAMEPLATES

A. Fastened to equipment at factory in an accessible and visible location.

B. Stainless steel sheet engraved or stamped with text, holes drilled or punched for fasteners.

C. Fasteners: Number 4 or larger oval head stainless steel screws or drive pins.

D. Text:
   1. Manufacturer’s name, equipment model number and serial number, motor horsepower when appropriate, and identification tag number.
   2. Indicate the following additional information as applicable:
      a. Maximum and normal rotating speed.
      b. Service class per applicable standards.
   3. Include for pumps:
      a. Rated total dynamic head in feet of fluid.
      b. Rated flow in gallons per minute.
      c. Impeller, gear, screw, diaphragm, or piston size.
   4. Include for gear reduction units:
      a. AGMA class of service.
      b. Service factor.
      c. Input and output speeds.

2.16 SHOP FINISHES

A. Provide appropriate factory coatings as specified in Section 09960 - High-Performance Coatings.
   1. Motors and gear reducers: Shop finish paint with manufacturer's standard coating, unless otherwise specified in the individual equipment specification.

2.17 SPECIAL TOOLS

A. Supply one set of special tools as specified in Section 01600 - Product Requirements.

2.18 SOURCE TESTING

A. Testing requirements unless specified otherwise in the individual equipment specifications:
   1. Mechanical equipment: Level 1 General Equipment Performance Test as specified in Section 15958 - Mechanical Equipment Testing.
   2. Motors: As specified in Section 16222 - Low Voltage Motors Up to 500 Horsepower.
   3. Vendor control panels: As specified in Section 17950 - Commissioning for Instrumentation and Controls.

2.19 SHIPPING

A. As specified in Section 01600 - Product Requirements.

B. Prior to shipment of equipment:
   1. Bearings (and similar items):
      a. Pack separately or provide other protection during transport.
      b. Greased and lubricated.
   2. Gear boxes:
      a. Oil filled or sprayed with rust preventive protective coating.
   3. Fasteners:
      a. Inspect for proper torques and tightness.

PART 3 EXECUTION

3.01 DELIVERY, HANDLING, STORAGE, AND PROTECTION

A. As specified in Section 01600 - Product Requirements.

B. Inspect fasteners for proper torques and tightness.

C. Storage:
   1. Bearings:
      a. Rotate units at least once per month or more often as recommended by the manufacturer to protect rotating elements and bearings.
   2. Gear boxes:
      a. Inspect to verify integrity of protection from rust.

D. Protection:
    1. Equipment Log shall include description of rotation performed as part of maintenance activities.

3.02 INSTALLATION

A. Field measurements:
    1. Prior to shop drawings preparation, take measurements and verify dimensions indicated on the Drawings.
    2. Ensure equipment and ancillary appurtenances fit within available space.

B. Sequencing and scheduling:
    1. Equipment anchoring: Obtain anchoring material and templates or setting drawings from equipment manufacturers in adequate time for anchors to be cast-in-place.
    2. Coordinate details of equipment with other related parts of the Work, including verification that structures, piping, wiring, and equipment components are compatible.

C. Metal work embedded in concrete:
    1. Accurately place and hold in correct position while concrete is being placed.
    2. Clean surface of metal in contact with concrete immediately before concrete is placed.

D. Concrete surfaces designated to receive non-shrink grout:
    1. Heavy sandblast concrete surface in contact with non-shrink grout.
    2. Clean concrete surfaces of sandblasting sand, grease, oil, dirt, and other foreign material that may reduce bond to non-shrink grout.
    3. Saturate concrete with water. Concrete shall be saturated surface damp at time non-shrink grout is placed.

E. Install equipment in accordance with manufacturer's installation instructions and recommendations.

F. Lubrication lines and fittings:
    1. Support and protect lines from source to point of use.
    2. Fittings:
        a. Bring fittings to outside of equipment in manner such that they are readily accessible from outside without necessity of removing covers, plates, housings, or guards.
        b. Mount fittings together wherever possible using factory-mounted multiple fitting assemblies securely mounted, parallel with equipment lines, and protected from damage.
        c. Fittings for underwater bearings: Bring fittings above water surface and mount on edge of structure above.

G. Alignment of drivers and equipment:
    1. Where drive motors or other drivers are connected to driven equipment by flexible coupling, disconnect coupling halves and align driver and equipment after complete unit has been leveled on its foundation.

2. Comply with procedures of appropriate HI, AGMA Standards, alignment tolerances of equipment manufacturers and the following requirements to bring components into angular and parallel alignment:
    a. Maximum total coupling offset (not the per-plane offset): Not to exceed 0.5 mils per inch of coupling length for spacer couplings based on coupling length (not dial separation).
    b. Utilize jacking screws, wedges, or shims as recommended by the equipment manufacturer and as specified in the equipment sections.
3. Use reverse-indicator arrangement dial-type or laser-type alignment indicators: Mount indicators on the driver/coupling flange and equipment/coupling flange. Alignment instrumentation accuracy shall be sufficient to read angular and radial misalignment at 10 percent or less of the manufacturer's recommended acceptable misalignment.
4. Alignment and calculations shall include measurement and allowance for thermal growth, spacer coupling length, indicator separation, and axial spacing tolerances of the coupling.
5. When alignment satisfies most stringent tolerance of system components, grout between base and foundation.
    a. Allow minimum 48 hours for grout to harden.
    b. After grout hardens, remove jacking screws, tighten anchor bolts and other connections, and recheck alignment.
    c. Correct alignment as required.
6. After functional testing is complete, dowel motor or drivers and driven equipment:
    a. Comply with manufacturer's instructions.

H. Grouting under equipment bases, baseplates, soleplates, and skids:
1. Comply with equipment manufacturer's installation instructions for grouting spaces, and tolerances for level and vertical and horizontal alignment, unless otherwise indicated on the Drawings. Grout with non-shrink grout as specified in Section 03600 - Grouting.
    a. Non-shrink epoxy grout required only when indicated on the Drawings.
2. Install grout only after:
    a. Equipment is leveled and in proper alignment.
    b. Piping connections are complete and in alignment with no strain transmitted to equipment.
3. Do not use leveling nuts on equipment anchors for supporting and leveling equipment bases, baseplates, soleplates, and skids for grouting.
4. Use jack screws for supporting and leveling equipment bases, baseplates, soleplates, and skids for grouting following the procedure defined below:
    a. Drill and tap equipment base plates, sole plates, and skids for jack screws.
    b. Use suitable number and size of jack screws.
    c. End of jack screws shall bear on circular steel plates epoxy bonded to equipment foundation.
    d. Jack screw threads that will be in contact with grout: Wrap with multiple layers of tape or other material, acceptable to Engineer, to prevent grout from bonding to threads.
    e. Place and cure grout as specified in Section 03600 - Grouting.

f. After grout is cured, remove jack screws and material used to prevent bonding to grout.
    1) Provide jack screws to Owner for future use.
g. Tighten equipment anchors in accordance with equipment manufacturer requirements.
h. Fill holes where jack screws have been removed with grout.
i. Cure as specified in Section 03600 - Grouting.

5. For equipment bases, baseplates, soleplates, and skids where it is not practical to use jack screws, use steel wedges and shims.
    a. Wrap wedges and shims that contact grout with multiple layers of tape or other material, acceptable to Engineer, to prevent grout from bonding.
    b. Place and cure grout as specified in Section 03600 - Grouting.
    c. Remove wedges or shims.
    d. Tighten equipment anchors to in accordance with equipment manufacturer requirements.
    e. Fill voids where wedges and shims have been removed with grout.
    f. Cure as specified in Section 03600 - Grouting.
7. Preparation of equipment bases, baseplates, soleplates, and skids for grouting:
    a. Metal in contact with grout: Grit blast to white metal finish.
    b. Clean surfaces of equipment bases, baseplates, soleplates, and skids in contact with grout of dirt, dust, oil, grease, paint, and other material that will reduce bond.
8. Preparation of concrete equipment foundation for grouting:
    a. Rough concrete surfaces in contact with grout.
    b. Concrete contact surface shall be free of dirt, dust, laitance, particles, loose concrete, or other material or coatings that will reduce bond.
    c. Saturate concrete contact surface area with water for minimum of 24 hours prior to grouting.
    d. Remove standing water just prior to grout placement, using clean rags or oil-free compressed air.

9. Forms and header boxes:
    a. Build forms for grouting of material with adequate strength to withstand placement of grouts.
    b. Use forms that are rigid and liquid tight. Caulk cracks and joints with an elastomeric sealant.
    c. Line forms with polyethylene film for easy grout release. Forms carefully waxed with 2 coats of heavy-duty paste wax will also be acceptable.
10. Grout placement requirements:
    a. Minimum ambient and substrate temperature: 45 degrees Fahrenheit and rising:
        1) Conform to grout manufacturer’s temperature requirements.
    b. Pour grout using header box.
    c. Keep level of grout in header box above bottom of equipment bases, baseplates, soleplates, and skids at all times to prevent air entrapment.
    d. Grout shall flow continuously from header box to other side of forms without trapping air or forming voids.
    e. Vibrate, rod, or chain grout to facilitate grout flow, consolidate grout, and remove entrapped air.

f. After grout sets, remove forms and trim grout at 45-degree angle from bottom edge of equipment bases, baseplates, soleplates, and skids.
g. Cure as specified in Section 03600 - Grouting.

I. Field welding:
1. Use welding procedures, welders, and welding operators qualified and certified in accordance with AWS D1.1.
2. Shielded arc welding.

J. Field finishes.
1. Protect motors.
2. Clean equipment.
3. Apply primer and coating systems as specified in Section 09960 - High-Performance Coatings requirements.

K. Special techniques:
1. Use applicable special tools and equipment, including precision machinist levels, dial indicators, and gauges as required in equipment installations.

L. Tolerances:
1. Completed equipment installations: Comply with requirements for intended use and specified vibration and noise tolerances.

M. Warning signs:
1. Mount securely with stainless fasteners at equipment that can be started automatically or from remote locations.

3.03 COMMISSIONING

A. As specified in Section 01756 - Commissioning.

B. Functional testing requirements unless specified otherwise in the individual equipment specifications:
1. Mechanical equipment: Level 1 tests as specified in Section 15958 - Mechanical Equipment Testing.
2. Motors: As specified in Sections 16222 - Low Voltage Motors Up to 500 Horsepower and 16950 - Field Electrical Acceptance Tests.
3. Vendor control panels: As specified in Section 17950 - Commissioning for Instrumentation and Controls.

END OF SECTION

SECTION 15958

MECHANICAL EQUIPMENT TESTING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Testing of mechanical equipment and systems.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. S1.4 Specification for Sound Level Meters.

B. Hydraulic Institute (HI).

C. National Institute of Standards and Technology (NIST).

1.03 SUBMITTALS

A. Project closeout documents:
   1. Provide vendor operation and maintenance manual as specified in Section 01782 - Operation and Maintenance Manuals.
      a. Include motor rotor bar pass frequencies for motors larger than 500 horsepower.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Commissioning of equipment as specified in:
   1. This Section.
   2. Section 01756 - Commissioning
   3. Equipment sections:
      a. If testing requirements are not specified, provide Level 1 Tests.

B. Test and prepare piping as specified in Section 15956 - Piping Systems Testing.

C. Provide necessary test instrumentation that has been calibrated within 1 year from date of test to recognized test standards traceable to the NIST or approved source.
   1. Properly calibrated field instrumentation permanently installed as a part of the Work may be utilized for tests.
   2. Prior to testing, provide signed and dated certificates of calibration for test instrumentation and equipment.

D. Test measurement and result accuracy:
   1. Use test instruments with accuracies as recommended in the appropriate referenced standards. When no accuracy is recommended in the referenced standard, use 1 percent or better accuracy test instruments.
      a. Improved (lower error tolerance) accuracies specified elsewhere prevail over this general requirement.
   2. Do not adjust results of tests for instrumentation accuracy.
      a. Measured values and values directly calculated from measured values shall be the basis for comparing actual equipment performance to specified requirements.

3.02 VARIABLE SPEED EQUIPMENT TESTS

A. Establish performance over the entire speed range and at the average operating condition.

B. Establish performance curves for the following speeds:
   1. The speed corresponding to the rated maximum capacity.
   2. The speed corresponding to the minimum capacity.
   3. The speed corresponding to the average operating conditions.

3.03 PUMP TESTS, ALL LEVELS OF TESTING

A. Test in accordance with the following:
   1. Applicable HI Standards.
   2. This Section.
   3. Equipment sections.

B. Test tolerances: In accordance with appropriate HI Standards, except the following modified tolerances apply:
   1. From 0 to plus 5 percent of head at the specified flows
   2. From 0 to plus 5 percent of flow at the rated design point head.
   3. No negative tolerance for the efficiency at the specified
   4. No positive tolerance for vibration limits. Vibration limits and test methods in HI Standards do not apply, use limits and methods specified in this or other Sections of the Specifications.

3.04 DRIVERS TESTS

A. Test motors as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower.

B. Test other drivers as specified in the equipment section.

3.05 NOISE REQUIREMENTS AND CONTROL

A. Perform noise tests in conjunction with vibration test analysis.

B. Make measurements in relation to reference pressure of 0.0002 microbar.

C. Make measurements of emitted noise levels on sound level meter meeting or exceeding ANSI S1.4, Type II.

D. Set sound level meter to slow response.

E. Unless otherwise specified, maximum free field noise level not to exceed 85 dBA measured as sound pressure level at 3 feet from the equipment.

3.06 PRESSURE TESTING

A. Hydrostatically pressure test pressure containing parts at the appropriate standard or code required level above the equipment component specified design pressure or operating pressure, whichever is higher.

3.07 INSPECTION AND BALANCING

A. Statically and dynamically balance each of the individual rotating parts as required to achieve the required field vibration limits.

B. Statically and dynamically balance the completed equipment rotating assembly and drive shaft components.

C. Furnish copies of material and component inspection reports including balancing reports for equipment system components and for the completed rotating assembly.

D. Critical speed of rotating equipment:
   1. Satisfy the following:
      a. The first lateral and torsional critical speed of all constant, variable, and 2-speed driven equipment that is considered rigid such as horizontal pumps, all non-clog pumps, blowers, air compressors, and engines shall be at least 25 percent above the equipment's maximum operating speed.
      b. The first lateral and torsional critical speed of all constant, variable, and 2-speed driven equipment that is considered flexible or flexibly mounted such as vertical pumps (vertical in-line and vertical non-clog pumps excluded) and fans shall at least 25 percent below the equipment's lowest operating speed.
      c. The second lateral and torsional critical speed of all constant, variable, and 2-speed equipment that is considered flexible or flexibly mounted shall be at least 25 percent above the maximum operating speed.

E. Vibration tests:
   1. Definitions:
      a. Root mean square: for pumps operating at speeds greater than 600 rpm, the vibration measurement shall be measured as the overall velocity in inches per second root mean square (RMS).
      b. Peak-to-peak displacement: The root means squared average of the peak-to-peak displacement multiplied by the square root of 2.
      c. Peak velocity: The root mean squared average of the peak velocity multiplied by the square root of 2.
      d. Peak acceleration: The root mean squared average of the peak acceleration multiplied by the square root of 2.

e. High frequency enveloping: A process to extract very low amplitude time domain signals associated with impact or impulse events such as bearing or gear tooth defects and display them in a frequency spectrum of acceleration versus frequency.
    1) Manufacturers: One of the following or equal:
        a) Rockwell Automation, Entek Group, "Spike Energy" analysis.
        b) CSI, "PeakVue."
f. Low speed equipment: Equipment or components of equipment rotating at less than 600 revolutions per minute.
g. High speed equipment: Equipment and equipment components operating at or above 600 revolutions per minute.
h. Preferred operating range: Manufacturer’s defined preferred operating range (POR) for the equipment.
i. Allowable operating range: Manufacturer’s defined allowable operating range (AOR) for the equipment.

2. Vibration instrumentation requirements:
    a. Analyzers: Use digital type analyzers or data collectors with anti-aliasing filter, 12 bit A/D converter, fast fourier transform circuitry, phase measurement capability, time wave form data storage, high frequency enveloping capabilities, 35 frequency ranges from 21 to 1,500,000 cycles per minute, adjustable fast fourier transform resolution from 400 to 6,400 lines, storage for up to one hundred 3,200 line frequency spectra, data output port, circuitry for integration of acceleration data to velocity or double integration to displacement.
        1) Manufacturers: One of the following or equal:
            a) Computational Systems Inc., (CSI) Division of Emerson Process Management, Model 2120A, Data Collector/analyzer with applicable analysis software.
            b) Pruftechnik, VIBXPERT II.
    b. Analyzer settings:
        1) Units: English, inches/second, mils, and gravitational forces.
        2) Fast fourier transform lines: Most equipment 1,600 minimum; for motors, enough lines as required to distinguish motor current frequencies from rotational frequencies, use 3,200 lines for motors with a nominal speed of 3,600 revolutions per minute; 3,200 lines minimum for High Frequency Enveloping; 1,600 lines minimum for low speed equipment.
        3) Sample averages: 4 minimum.
        4) Maximum frequency (Fmax): 40 times rotational frequency for rolling element bearings, 10 times rotational frequency for sleeve bearings.
        5) Amplitude range: Auto select but full scale not more than twice the acceptance criteria or the highest peak, whichever is lower.
        6) Fast fourier transform windowing: Hanning Window.
        7) High pass filter: Minus 3 dB at 120 cycles per minute for high speed equipment. Minus 3 dB at 21 cycles per minute for low speed equipment.
    c. Accelerometers:
        1) For low speed equipment: Low frequency, shear mode accelerometer, 500 millivolts per gravitational force sensitivity,

10 gravitational force range, plus/minus 5 percent frequency response from 0.5 hertz to 850 hertz, magnetic mount.

a) Manufacturers: One of the following or equal:
(1) Wilcoxon Research, Model 797L.
(2) PCB, Model 393C.

2) For high speed equipment: General purpose accelerometer, 100 millivolts per gravitational force sensitivity, 50 gravitational force range, plus/minus 3dB frequency response range from 2 hertz to 12,000 hertz when stud mounted, with magnetic mount holder.

a) Manufacturers: One of the following or equal:
(1) Wilcoxon Research, Model 793.
(2) Entek-IRD Model 943.

3. Accelerometer mounting:
   a. Use magnetic mounting or stud mounting.
   b. Mount on bearing housing in location with best available direct path to bearing and shaft vibration.
   c. Remove paint and mount transducer on flat metal surface or epoxy mount for High Frequency Enveloping measurements.
4. Vibration acceptance criteria:
   a. Testing of rotating mechanical equipment: Tests are to be performed by an experienced, factory trained, and independent authorized vibration analysis expert.
   b. Vibration displacement limits: Unless otherwise specified, equipment operating at speeds 600 revolutions per minute or less is not to exhibit unfiltered readings in excess of following:

Operating Conditions and Application Data	Overall Peak-to-Peak Displacement	
	Field, mils	Factory, mils
Operation within the POR	3.0	4.0
Operation within the AOR	4.0	5.0
Additive value when measurement location is greater than 5 feet above foundation.	2.0	2.0
Additive value for solids-handling pumps	2.0	N/A
Additive value for slurry pumps	2.0	N/A

   c. Vibration velocity limits: Unless otherwise specified, equipment operating at speeds greater than 600 revolutions per minute is not to exceed the following peak velocity limits:

HI Pump Type	Horsepower	Field Test	Factory Test
		Overall RMS	Overall RMS
Horizontal Solids Handling Centrifugal Pumps	Below 33 hp	0.25	0.28
Horizontal and Vertical In-Line Centrifugal	Between 33 and 100 hp	0.28	0.31

HI Pump Type	Horsepower	Field Test	Factory Test
		Overall RMS	Overall RMS
Pumps (other than Non-Clog type) Vertical Solids Handling Centrifugal Pumps	100 hp and above	0.31	0.34
	Below 33 hp	0.30	0.33
Vertical Turbine, Mixed Flow, and Propeller Pumps	Between 33 and 100 hp	0.32	0.35
	100 hp and above	0.34	0.35
Non-Solids Handling Centrifugal Pumps HI Types BB1, BB2, BB3, BB4, BB5, OH1, OH2, OH3, OH4, OH5, and OH7	Below 268 hp	0.15	0.19
	268 hp and above	0.19	0.22
Vertical Turbine, Mixed Flow, and Propeller Pumps HI Types VS1, VS2, VS3, VS4, VS5, VS6, VS7, and VS8	Below 268 hp	0.13	
Gear Reducers, Radial	268 hp and above	0.17	
Slurry Pumps		0.25	0.30
Motors		See Applicable Motor Specification	See Applicable Motor Specification
Gear Reducers, Radial		Not to exceed AGMA 6000-B96 limits	Not to exceed AGMA 6000-B96 limits
Other Reducers, Axial		0.1	N/A

d. Equipment operation: Measurements are to be obtained with equipment installed and operating within capacity ranges specified and without duplicate equipment running.

e. Additional criteria:

1) No narrow band spectral vibration amplitude components, whether sub-rotational, higher harmonic, or synchronous multiple of running speed, are to exceed 40 percent of synchronous vibration amplitude component without manufacturer's detailed verification of origin and ultimate effect of such excitation.

2) The presence of discernable vibration amplitude peaks in Test Level 2 or 3 vibration spectra at bearing inner or outer race frequencies shall be cause for rejection of the equipment.

3) For motors, the following shall be cause for rejection:
   a) Stator eccentricity evidenced by a spectral peak at 2 times electrical line frequency that is more than 40 percent of the peak at rotational frequency.
   b) Rotor eccentricity evidenced by a spectral peak at 2 times electrical line frequency with spectra side bands at the pole pass frequency around the 2 times line frequency peak.
   c) Other rotor problems evidenced by pole pass frequency side bands around operating speed harmonic peaks or 2 times line frequency side bands around rotor bar pass frequency or around 2 times the rotor bar pass frequency.
   d) Phasing problems evidenced by 1/3 line frequency side band spectral peaks around the 2 times electrical line frequency peak.
4) The presence of peaks in a High Frequency Enveloping spectra plot corresponding to bearing, gear or motor rotor bar frequencies or harmonics of these frequencies shall be cause for rejection of the equipment; since inadequate lubrication of some equipment may be a cause of these peaks, lubrication shall be checked, corrected as necessary and the high frequency envelope analysis repeated.

5. Vibration testing results presentation:
   a. Provide equipment drawing with location and orientation of measurement points indicated.
   b. For each vibration measurement take and include appropriate data on equipment operating conditions at the time vibration data is taken; for pumps, compressors, and blowers record suction pressure, discharge pressure, and flow.
   c. When Vibration Spectra Data required:
      1) Plot peak vibration velocity versus frequency in cycles per minute.
      2) Label plots showing actual shaft or part rotation frequency, bearing inner and outer race ball pass frequencies, gear mesh frequencies and relevant equipment excitation frequencies on the plot; label probable cause of vibration peaks whether in excess of specification limits or not.
      3) Label plots with equipment identification and operating conditions such as tag number, capacity, pressure, driver horsepower, and point of vibration measurement.
      4) Plot motor spectra on a log amplitude scale versus frequency.
   d. For low speed equipment, plot peak vibration displacement versus frequency as well as velocity versus frequency.
   e. Provide name of manufacturer and model number of the vibration instrumentation used, including analyzer and accelerometer used together with mounting type.

3.08 TESTING LEVELS

A. Level 1 Tests:
   1. Level 1 General Equipment Performance Test:
      a. For equipment, operate, rotate, or otherwise functionally test for 15 minutes minimum after components reach normal operating temperatures.
      b. Operate at rated design load conditions.

c. Confirm that equipment is properly assembled, equipment moves or rotates in the proper direction, shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.

2. Level 1 Pump Performance Test:
   a. Measure flow and head while operating at or near the rated condition; for factory testing, testing may be at reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.
   b. Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower or the applicable equipment section. Use actual driver for field tests.
   c. Record measured flow, suction pressure, discharge pressure, and make observations on bearing temperatures and noise levels.
3. Level 1 Vibration Test:
   a. Test requirement:
      1) Measure filtered vibration spectra versus frequency in 3 perpendicular planes at each normally accessible bearing housing on the driven equipment, any gears and on the driver; 1 plane of measurement to be parallel to the axis of rotation of the component.
      2) Vibration spectra versus frequency shall be in accordance with Vibration Acceptance Criteria.
   b. Equipment operating condition: Test at specified maximum speed.
4. Level 1 Noise Test:
   a. Measure unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment and at a mid-point of the equipment height.

B. Level 2 Tests:
1. Level 2 General Performance Test:
   a. For equipment, operate, rotate, or otherwise functionally test for at least 2 hours after components reach normal operating temperatures.
   b. Operate at rated design load conditions.
   c. Confirm that equipment is properly assembled, equipment moves or rotates in the proper direction, shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
2. Level 2 Pump Performance Test:
   a. Test 2 hours minimum for flow and head at the rated condition; for factory testing, testing may be at a reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.
   b. Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower. Use actual driver for field tests.
   c. Test for flow and head at 2 additional conditions; 1 at 25 percent below the rated flow and 1 at 10 percent above the rated flow.

d. Record measured flow, suction pressure, discharge pressure, and observations on bearing temperatures and noise levels at each condition.

3. Level 2 Vibration Test:
   a. Test requirement:
      1) Measure filtered vibration spectra versus frequency and measure vibration phase in 3 perpendicular planes at each normally accessible bearing housing on the driven equipment, any gears and on the driver; 1 plane of measurement to be parallel to the axis of rotation of the component; measure actual rotational speeds for each vibration spectra measured using photometric or other tachometer input connected directly to the vibration data collector.
      2) Vibration spectra versus frequency shall be in accordance with Vibration Acceptance Criteria.
   b. Equipment operating condition: Repeat test requirements at design specified maximum speed and at minimum speed for variable speed equipment.
   c. Natural frequency test of field installed equipment:
      1) Excite the installed equipment and support system in 3 perpendicular planes, use same planes as operating vibration measurement planes, and determine the as-installed natural resonant frequency of the driven equipment, the driver, gears, and supports.
      2) Perform test at each bearing housing, at each support pedestal, and for pumps on the suction and discharge piping.
      3) Perform with equipment and attached piping full of intended service or process fluid.
4. Level 2 Noise Test:
   a. Measure filtered A-weighted overall sound pressure level in dBA for each of 8 octave band mid-points beginning at 63 hertz measured at 3 feet horizontally from the surface of the equipment at mid-point height of the noise source.

C. Level 3 Tests:
   1. Level 3 General Equipment Performance Tests:
      a. For equipment, operate, rotate, or otherwise functionally test for at least 4 hours after components reach normal operating temperatures.
      b. Operate at rated design load conditions for 1/2 the specified time; operate at each of any other specified conditions for a proportionate share of the remaining test time.
      c. Confirm that equipment is properly assembled, equipment rotates in the proper direction, shafting and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual noise, vibration, or temperatures are observed.
      d. Take appropriate capacity, power or fuel consumption, torque, revolutions per minute, pressure, and temperature readings using appropriate test instrumentation to confirm equipment meets specified performance requirements at the design rated condition.
      e. Bearing temperatures: During maximum speed or capacity performance testing, measure and record the exterior surface temperature of each bearing versus time.

2. Level 3 Pump Performance Test:
    a. Test 4 hours minimum for flow and head at or near the rated condition; for factory testing, testing may be at a reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.
    b. Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower. Use actual driver for field tests.
    c. Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 15 minutes; for factory testing, test at other speeds may be omitted if test driver at reduced speeds is used for rated condition testing.
    d. Record measured shaft revolutions per minute, flow, suction pressure, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices are not required by the equipment section) and record observations on noise levels.
3. Level 3 Vibration Test:
    a. Requirements: Same as Level 2 vibration test except data taken at each operating condition tested and with additional requirements below.
    b. Perform High Frequency Enveloping Analysis for gears and bearings.
        1) Measure bearing element vibration directly on each bearing cap in a location close as possible to the bearing load zone that provides a smooth surface and direct path to the bearing to detect bearing defects.
        2) Report results in units of acceleration versus frequency in cycles per minute.
    c. Perform Time Wave Form analysis for gears, low speed equipment and reciprocating equipment; plot true peak amplitude velocity and displacement versus time and label the period between peaks with the likely cause of the periodic peaks (relate the period to a cause).
    d. Plot vibration spectra on 3 different plots; peak displacement versus frequency, peak acceleration versus frequency and peak velocity versus frequency.
4. Level 3 Noise Test: Measure filtered, un-weighted overall sound pressure level in dB at 3 feet horizontally from the surface of the equipment at mid-point height and at 4 locations approximately 90 degrees apart in plan view; report results for each of 8 octave band mid-points beginning at 63 hertz.

D. Level 4 Tests:
1. Level 4 General Equipment Performance Test:
    a. For equipment, operate, rotate, or otherwise functionally test for at least 8 hours after components reach normal operating temperatures.
    b. Operate at rated design load conditions for 1/2 the specified time; operate at each of any other specified conditions for a proportionate share of the remaining test time.
    c. Confirm that equipment is properly assembled, equipment rotates in the proper direction, shafting and bearings are installed and lubricated in

accordance with proper tolerances, and that no unusual noise, vibration, or temperatures are observed.

d. Take appropriate capacity, power or fuel consumption, torque, revolutions per minute, pressure and temperature readings, using appropriate test instrumentation to confirm equipment meets specified performance requirements at the design rated condition.

e. Bearing temperatures: During maximum speed or capacity testing, measure and record the exterior surface temperature of each bearing versus time.

2. Level 4 Pump Performance Test:
   a. Test 8 hours minimum for flow and head; begin tests at or near the rated condition; for factory and field-testing, test with furnished motor at full speed.
   b. Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 20 minutes or longer as necessary to measure required performance, vibration, and noise data at each test condition.
   c. Record measured shaft revolutions per minute, flow, suction pressure, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices not required by the equipment section) and record observations on noise levels.
   d. Bearing temperatures: During maximum speed or capacity testing, measure and record the exterior surface temperature of each bearing versus time.
   e. Perform efficiency and/or Net Positive Suction Head Required (NPSHr) and/or priming time tests when specified in the equipment section in accordance with the appropriate HI standard and as follows:
      1) Perform NPSHr testing at maximum rated design speed, head and flow with test fluids at ambient conditions; at maximum rated speed, test at 15 percent above rated design flow, and 25 percent below rated design flow.
      2) Perform efficiency testing with test fluids at maximum rated speed.
      3) Perform priming time testing with test fluids at maximum rated speed.
3. Level 4 Vibration Test: Same as Level 3 vibration test.
4. Level 4 Noise Test: Same as Level 3 Noise Test except with data taken at each operating condition tested.

END OF SECTION

SECTION 16222

LOW VOLTAGE MOTORS UP TO 500 HORSEPOWER

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Low voltage motors up to 500 horsepower.

B. Related sections:
   1. Section 01756 - Commissioning.

1.02 REFERENCES

A. As specified in Section 16050 - Common Work Results for Electrical.

B. American Bearing Manufacturers Association (ABMA):
   1. 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. American Petroleum Institute (API):
   1. 670 - Vibration, Axial Position, and Bearing Temperature Monitoring Systems.

D. ASTM International (ASTM).
   1. B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. Institute of Electrical and Electronic Engineers (IEEE):
   1. 43 - IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery.
   2. 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators.
   3. 114 - Standard Test Procedure for Single-Phase Induction Motors.
   4. 303 - Recommended Practice for Auxiliary Devices for Rotating Electrical Machines in Class I, Division 2 and Zone 2 Locations.
   5. 841 - Standard for Petroleum and Chemical Industry-Premium-Efficiency, Severe Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors - Up to and Including 370 kW (500 hp).
   6. 1349 - Guide for Application of Electric Motors in Class I, Division 2 Hazardous (Classified) Locations.

F. National Electrical Manufacturers' Association (NEMA):
   1. MG-1 - Motors and Generators.
   2. MG-2 - Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators.

G. Underwriters Laboratories Inc. (UL):
   1. 674 - Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.

1.03 DEFINITIONS

A. As specified in Section 16050 - Common Work Results for Electrical.

1.04 SYSTEM DESCRIPTION

A. Furnish and install electric motors and accessories as specified in this Section and the Sections specifying driven equipment to provide a complete and operable installation.

1.05 SUBMITTALS

A. Furnish submittals as specified in Sections 01330 - Submittal Procedures and 16050 - Common Work Results for Electrical.

B. Submit completed motor data sheets for each motor supplied:
   1. Conform to data sheet in the appendix of this Section.
   2. Manufacturer’s or other data sheets are not acceptable.

C. Product data:
   1. Descriptive bulletins.
   2. Machine tag and loop number as indicated on the Drawings and in the specification section number of the driven machine.
   3. Complete electrical data.
   4. Torque, current, and power factor versus speed curves:
      a. At 100 percent rated voltage for all full voltage started and VFD-driven motors.
      b. For motors on reduced voltage start at 70, 80, 90, and 100 percent rated voltage.
   5. Accessories data:
      a. Power factor correction capacitors:
         1) Size in KVAR, for all motors not connected to variable frequency drives.
      b. Motor winding heaters:
         1) Voltage.
         2) Watts.
      c. Winding temperature detectors:
         1) Type.
         2) Rating.
      d. Moisture detectors.
   6. Mechanical data:
      a. Bearing design and bearing life calculations.
      b. Resonant frequencies for all VFD-driven motors 50 horsepower or greater.

D. Shop drawings:
   1. Motor weight.
   2. Frame size.
   3. Conduit box(es), size(s), and location(s).
   4. Outline drawings with dimensions.
   5. Installation details for the project seismic criteria.

E. Test reports:
   1. Factory test reports with test reference standard identified.

F. Certification:
   1. When motors are driven by variable speed drive systems, submit certification that selected motor:
      a. Is capable of satisfactory performance under the intended load.
      b. Meets the requirements of the latest edition of NEMA MG-1 Part 31.

G. Calculations:
   1. Where site conditions specified in Section 16050 - Common Work Results for Electrical exceed manufacturer's ratings, provide derating calculations for each motor.

1.06 QUALITY ASSURANCE

A. As specified in Section 16050 - Common Work Results for Electrical.

1.07 DELIVERY, STORAGE, AND HANDLING

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Motors 200 hp and larger:
   1. Rotate shaft 90 degrees once per month.

1.08 PROJECT OR SITE CONDITIONS

A. As specified in Section 16050 - Common Work Results for Electrical.

1.09 SEQUENCING (NOT USED)

1.10 SCHEDULING (NOT USED)

1.11 WARRANTY

A. As specified in Section 16050 - Common Work Results for Electrical.

1.12 SYSTEM START-UP

A. As specified in Section 16050 - Common Work Results for Electrical.

1.13 OWNER'S INSTRUCTION (NOT USED)

1.14 MAINTENANCE (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. One of the following or equal:
   1. US Motors.
   2. General Electric.
   3. Reliance.
   4. Toshiba.
   5. Baldor.

2.02 EXISTING PRODUCTS (NOT USED)

2.03 MATERIALS (NOT USED)

2.04 MANUFACTURED UNITS (NOT USED)

2.05 EQUIPMENT

A. 3-phase induction motors - general:
   1. Voltage:
      a. All motors 1/2 hp and larger shall be rated 460 V, 3-phase unless otherwise indicated on the Drawings.
      b. Dual voltage motors rated 230/460 V, 3-phase are acceptable provided all leads are brought to the conduit box.
   2. Motors driving identical machines shall be identical.
   3. All motors greater than 1 hp and up to 500 hp shall meet the "NEMA Premium Efficiency" percent listed in NEMA MG-1.
   4. Horsepower as indicated on the Drawings:
      a. Horsepower ratings indicated on the Drawings are based on vendor's estimates. Provide motors sized for the load of the actual equipment furnished without operating in the service factor.
   5. Service factor:
      a. 1.15 service factor on sine wave power.
      b. 1.0 when driven by VFD.
   6. Torque:
      a. Provide motors that develop sufficient torque for acceleration to full speed at voltage 10 percent less than motor nameplate rating.
      b. When started using reduced voltage starters:
         1) Provide motors that develop sufficient torque for acceleration to full speed.
      c. NEMA Design B except where driven load characteristics require other than normal starting torque:
         1) In no case shall starting torque or breakdown torque be less than the values specified in NEMA MG-1.
   7. Enclosures:
      a. As specified in the individual equipment Specifications or in this Section.
      b. Totally enclosed fan cooled:
         1) Cast iron conduit box.

2) Tapped drain holes with Type 316 stainless steel plugs for frames 286 and smaller, and automatic breather and drain devices for frames 324 and larger.

c. Explosion-proof:
1) Tapped drain holes with corrosion resistant plugs for frames 286 and smaller and automatic breather and drain devices for frames 324 and larger.

d. Lifting devices: All motors weighing 265 pounds (120 kilograms) or more shall have suitable lifting devices for installation and removal.

8. Manufactured with cast iron frames in accordance with NEMA MG-1 or manufacturer's standard material for the specified rating.
9. Nameplates:
a. Provide all motors with a permanent, stainless steel nameplate indelibly stamped or engraved with:
1) NEMA standard motor data.
a) Indicate compliance with NEMA MG-1 Part 31 for inverter duty motors.
2) AFBMA bearing numbers and lubrication instructions.
10. Hardware:
a. Type 316 stainless steel.
11. Conduit boxes:
a. Cast iron or stamped steel.
b. Split from top to bottom.
c. Provide gaskets at the following interfaces:
1) Frames and conduit boxes.
2) Conduit boxes and box covers.
d. Rotatable through 360 degrees in 90-degree increments.
1) Where available based on the size of the conduit box.
e. Exceeding the dimensions defined in NEMA MG-1.
f. Provide grounding lugs inside conduit boxes for motor frame grounding.
12. Motor bearings:
a. Antifriction.
b. Regreasable and initially filled with grease for horizontal motors and vertical motors per manufacturer's standard design.
c. Bearings and lubrication suitable for ambient temperature and temperature rise.
d. Suitable for intended application and have ABMA L-10 rating life of 60,000 hours or more.
e. Fit bearings with easily accessible grease supply, flush, drain, and relief fittings using extension tubes where necessary.
f. Where specified in the equipment Specifications, provide split-sleeve type hydrodynamic radial bearings. Provide a bearing isolator to protect bearings from contaminants.
13. Insulation systems:
a. Motors installed in ambient temperatures 40 degrees Celsius or less:
1) Provide Class F insulation.
2) Design temperature rise consistent with Class B insulation.
3) Rated to operate at an ambient temperature of 40 degrees Celsius at the altitude where the motor will be installed.

b. Motors installed in ambient temperatures between 40 degrees Celsius and 50 degrees Celsius:
    1) Provide Class F insulation.
    2) Design temperature rise consistent with Class B insulation.
    3) Rated to operate at an ambient temperature of 50 degrees Celsius at the altitude where the motor will be installed.
c. Motors installed in ambient temperatures between 50 degrees Celsius and 65 degrees Celsius:
    1) Provide Class H insulation.
    2) Design temperature rise consistent with Class F insulation.
    3) Rated to operate at an ambient temperature of 65 degrees Celsius at the altitude where the motors will be installed.

14. Motor leads:
    a. Insulated leads with non-wicking, non-hydroscopic material. Class F insulation.
15. Noise:
    a. Maximum operating noise level in accordance with NEMA MG-1.

B. Submersible motors:
1. Enclosures:
    a. Totally enclosed non-ventilated (TENV) watertight casing.
    b. Inner and outer shaft seals separated by an oil chamber.
2. Cooling:
    a. Suitable for continuous operation in totally, partially, or nonsubmerged condition without overheating.
    b. Convection cooling by the surrounding environment or pump cooling by circulating a portion of the pumped media through a cooling water jacket as recommended by the manufacturer based on horsepower and application.
3. Electrical cables:
    a. Wire unit without splices. Coordinate with Contractor to ensure cables of adequate length.
    b. Epoxy encapsulated cable entry into terminal box.
4. Insulation:
    a. Sealed moisture resistant windings.
    b. Class H.
5. Motor protection:
    a. Provide temperature detection in motor windings.
    b. Provide moisture detection in motor housing.
    c. Other detection and protection functions specified in the in the driven equipment Section.

C. Vertical motors:
1. Enclosures:
    a. Totally enclosed fan cooled (TEFC) for motors 200 horsepower and less installed outdoors.
    b. Weather protected Type II (WPII) for motors greater than 200 horsepower installed outdoors.
    c. Weather protected Type I (WPI) where installed indoors.
2. Thrust bearings:
    a. Selected for combined rotor and driven equipment loads.

b. Coordinate with driven equipment supplier for maximum vertical thrust of driven equipment.

3. Anti-reverse ratchet.

D. Motors driven by variable frequency drives:
1. Compatible with the variable frequency drives specified.
2. Inverter duty rated and labeled.
3. Meet the requirements of NEMA MG-1 Part 31.
4. Winding insulation meets the requirements of NEMA MG-1 Part 31.4.4.2.
5. Capable of running continuously at 1/10th of full speed, with no harmful effects or overheating.
6. Shaft grounding ring:
   a. Provide a shaft grounding ring for each VFD-driven motor.
   b. Aluminum frame and internal components.
   c. Conductive microfiber brushes.
   d. Maintenance free design.
   e. Aegis Bearing Protection ring as manufactured by Electro Static Technology or equal.
7. On motors over 100 HP, provide insulated bearings on bearings on both ends of the motor or on the end opposite of the shaft ground ring as recommended by the motor manufacturer.

E. Motors installed in hazardous locations:
1. Class I, Division 1 or Class II, Division 1 areas:
   a. Enclosures:
      1) Explosion proof for 3-phase motors.
      2) UL listed in conformance with UL-674.
      3) UL approval with nameplate and serial number.
2. Other hazardous areas:
   a. Enclosures:
      1) TEFC for motors in Class I, Division 2 areas.
      2) Vertical motors as specified in this Section.
      3) Hazardous area and temperature code approval stamped on nameplate.
3. Single-phase motors: Explosion proof motor enclosure.

F. Motors installed in corrosive environments:
1. Nameplate indicating conformance to IEEE 841.
2. Stator double dipped in varnish and baked.
3. Stator and rotor coated with corrosion resistant epoxy.
4. Frame, brackets, fan guard and conduit box coated with minimum of 2 coats of epoxy paint.
5. Withstand salt spray tests in accordance with ASTM B117.

G. Single-phase motors:
1. Capacitor start type rated for operation at 115 volts, 60 hertz, unless otherwise specified or as indicated on the Drawings.
2. Totally enclosed fan cooled (TEFC) motors manufactured in accordance with NEMA MG 1.
3. Ball bearings: Sealed.

4. 1/2 horsepower or less fan motors:
    a. Split-phase or shaded pole type when standard for the equipment.
    b. Open type when suitably protected from moisture, dripping water, and lint accumulation.
5. Wound rotor or commutator type single-phase motors only when their specific characteristics are necessary for application and their use is acceptable to the Engineer.
6. Integral overload protection.

H. Immersible motors:
1. Meet all general requirements for 3-phase induction motors except as modified in this Section.
2. Inverter duty as indicated on the Drawings or in the driven equipment Specifications.
3. Enclosure:
    a. Cast iron.
    b. Designed and constructed to meet or exceed IP67.
    c. Epoxy paint finish:
        1) Withstands salt spray and corrosion tests in accordance with ASTM B117.
    d. Furnished with lifting plates or lugs.
    e. Vertical or horizontal mounting as required by the application.
4. Conduit box:
    a. Cast iron.
    b. Bolted and sealed cover.
    c. Rotatable in 90-degree increments.
    d. Watertight gland or potable hub for power cable entry.
5. Power cable:
    a. Type SOOW or W cable, non-shielded.
    b. Length as required for the installation.
6. Cooling blower:
    a. As required by the motor manufacturer.
    b. Washdown duty rated.
    c. Constant speed.
7. Humidity moisture detector.

2.06 COMPONENTS (NOT USED)

2.07 ACCESSORIES (NOT USED)

2.08 MIXES (NOT USED)

2.09 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION (NOT USED)

3.02 PREPARATION (NOT USED)

3.03 INSTALLATION

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Install motors in accordance with manufacturer's instructions.

C. Install shaft grounding ring on VFD-driven motors in accordance with the manufacturer’s instructions.

3.04 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.05 REPAIR/RESTORATION (NOT USED)

3.06 RE-INSTALLATION (NOT USED)

3.07 COMMISSIONING AND PROCESS START-UP

A. As specified in Section 01756 - Commissioning.

B. Factory testing:
   1. Motors less than 250 horsepower:
      a. Perform manufacturer’s standard production tests including but not limited to:
         1) No load current.
         2) High potential test.
         3) Winding resistance.
      b. Furnish copies of standard test reports on prototype or identical units.

3.08 FIELD QUALITY CONTROL

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Before start-up, perform insulation resistance test on each motor furnished or installed on this project:
   1. Windings energized to 1,000 volts DC for 1 minute.
   2. Resistance measured at the end of the test, recorded, and submitted to the Engineer for review.
   3. Inform the Engineer of any unusual or unacceptable test results.
   4. This test is in addition to the acceptance tests in Section 16050 - Common Work Results for Electrical.

3.09 ADJUSTING (NOT USED)

3.10 CLEANING (NOT USED)

3.11 PROTECTION

A. As specified in Section 16050 - Common Work Results for Electrical.

END OF SECTION

MOTOR DATA SHEET

MOTOR/ EQUIPMENT TAG _____ MOTOR NUMBER _____

SPECIFICATION NUMBER OF DRIVEN MACHINE _____

MOTOR NAMEPLATE DATA

MANUFACTURER _____ MODEL/SERIES _____ MODEL NO. _____

FRAME _____ ENCLOSURE _____ NEMA DESIGN _____

HP _____ SERVICE FACTOR _____ RPM _____

INSULATION CLASS _____ VOLTS _____ FULL LOAD AMPS _____

AMBIENT TEMP _____ PHASE _____ NO LOAD AMPS _____

DESIGN TEMP _____ HERTZ _____ LOCK ROTOR AMPS _____

INRUSH CODE LETTER _____

	100% LOAD	75% LOAD	50% LOAD
GUARANTEED MINIMUM EFFICIENCIES:			
GUARANTEED MINIMUM POWER FACTOR:			

MAXIMUM SIZE OF POWER FACTOR CORRECTION CAPACITOR: _____ KVAR

ACCESSORIES

MOTOR WINDING HEATER _____ VOLTS _____ WATTS

WINDING THERMAL PROTECTION

WINDING TEMP SWITCHES (YES/NO) _____

RTD:

TYPE _____ QUANTITY PER PHASE _____ # OF WIRES _____

NOMINAL RESISTANCE _____ NOMINAL TEMP _____ COEFFICIENT _____

RECOMMENDED ALARM _____ DEGREES CELSIUS RECOMMENDED TRIP _____ DEGREES CELSIUS

SPECIAL APPLICATIONS

INVERTER DUTY* (YES/NO) _____ PART WINDING (YES/NO) _____ WYE - DELTA (YES/NO) _____

2 SPEED, 1 WINDING (YES/NO) _____ 2 SPEED, 2 WINDING (YES/NO) _____

AREA CLASSIFICATION:

CLASS _____ DIVISION _____ GROUP _____ TEMP CODE _____

* Conforms to NEMA MG-1 Part 31.

SECTION 16262

VARIABLE FREQUENCY DRIVES 0.50 - 50 HORSEPOWER

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Variable frequency drives (VFD) 0.5 to 50 horsepower for control of NEMA Design B squirrel cage induction motors.

B. Related sections:
   1. Section 01756 - Commissioning.
   2. Section 16222 - Low Voltage Motors Up To 500 Horsepower.

1.02 REFERENCES

A. As specified in Section 16050 - Common Work Results for Electrical.

B. International Organization for Standardization (ISO):
   1. 9001 - Quality Management Systems - Requirements.

C. National Electrical Manufacturers Association (NEMA):
   1. MGI, Part 31 - Motors with higher peak voltage capability.

D. Underwriters' Laboratories (UL):
   1. 508A - Standard for Safety for Industrial Control Panels.
   2. 508C - Standard for Power Conversion Equipment.

1.03 DEFINITIONS

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Specific definitions:
   1. Point of common coupling: the point of common coupling for all harmonic calculation and field measurements for both voltage and current distortions is defined as the closest directly connected bus supplying power to the VFD.

1.04 SYSTEM DESCRIPTION

A. Design requirements:
   1. Each VFD system consists of all components required to meet the performance, protection, safety, testing, and certification criteria of this Section.
   2. The VFD system:
      a. Is a fully integrated package.
      b. Includes all material necessary to interconnect all VFD system elements, even if shipped separately.
   3. Coordinate bearing protection methods with the supplier of the driven equipment.

B. Any modifications to a standard product necessary to meet this Section shall be made only by the VFD manufacturer:
   1. Each VFD shall be completely factory pre-wired, assembled, and then tested as a complete system by the VFD manufacturer to ensure a properly coordinated, fully integrated drive system.
   2. The VFD shall be capable of operating standard NEMA Design B motors. It is the responsibility of the VFD manufacturer to ensure that the drive will not damage motor insulation due to high carrier frequency, reflected wave, dv/dt or other drive electrical characteristics based upon the installed conditions:
      a. Provide equipment necessary to mitigate potential damage to motor insulation.
      b. Motors as specified in Section 16222 - Low Voltage Motors Up To 500 Horsepower.

C. Performance:
   1. Operating envelope:
      a. Speed and torque requirements:
         1) Provide a variable torque or constant torque VFD as required by the driven load.
         2) The VFD shall be capable of producing a variable alternating voltage/frequency output to provide continuous operation over the 40 to 200 percent (25 to 120 hertz) speed range.
      b. Current requirements:
         1) Full rated current output on a continuous basis.
         2) Variable torque VFD:
            a) Minimum 110 percent current overload for 1 minute.
         3) Constant torque VFD:
            a) Minimum 150 percent current overload for 1 minute.
   2. Minimum VFD system efficiency:
      a. Ninety-six percent when operating at the rated kW output.
      b. VFD system efficiency shall be calculated as follows:

$$\text{Efficiency}(\%) = \frac{\text{Power (Load)}}{\text{Power (Supply)}} \times 100$$

         Power (Load) is the total power measured at the output terminals of the drive system, including VFD, output filters or transformers. Power (Supply) is the total power measured at the input terminals of the VFD including input filters, line reactors, isolation transformers, harmonic distortion attenuation equipment and auxiliary equipment (e.g., controls, fans) for complete system operation.

   3. Total power factor:
      a. Minimum of 0.96 lagging across the entire speed range.
      b. At no speed shall the VFD have a leading power factor.
   4. Frequency accuracy:
      a. Minimum of within 0.01 percent.
   5. Speed regulation:
      a. Minimum of within 0.5 percent across the entire speed range.

1.05 SUBMITTALS

A. Furnish submittals as specified in Sections 01330 - Submittal Procedures and 16050 - Common Work Results for Electrical:
   1. Custom prepared by the VFD manufacturer and specific for the equipment furnished.

B. Product data:
   1. Manufacturer of the VFD.
   2. Manufacturer of all components of the VFD.
   3. Dimensions:
      a. Height.
      b. Width.
      c. Depth.
      d. Weight.
   4. Nameplate schedule.
   5. Bill of material.
   6. Ratings:
      a. Voltage.
      b. Phase.
      c. Input current.
      d. Output current.
      e. Interrupting rating.
      f. Momentary current rating.
   7. List of recommended spare parts.
   8. Catalog cut sheets for major components.
   9. Design data:
      a. Efficiency and power factor values.
      b. Certification that the drive is sized for the full nameplate motor horsepower and current of the driven load at the installed altitude and ambient temperature.
      c. Certification that based upon VFD design, cable length to motor, and motor dielectric insulation level that the VFD will not damage motor insulation due to carrier frequency, reflected wave, dv/dt, or other VFD produced characteristics.
      d. Certification that all electronic circuits and printed circuit boards are conformally coated.
   10. For equipment installed in structures designated as seismic design category C, D, E, or F submit the following as specified in Section 16050 - Common Work Results for Electrical:
      a. Manufacturer’s statement of seismic qualification with substantiating test data.
      b. Manufacturer’s special seismic certification with substantiating test data.

C. Shop drawings:
   1. Complete plan and elevation drawings showing:
      a. All dimensions.
      b. Panel, sub-panel and component layout indexed to the bill of material.
      c. Conduit connections.
   2. Block diagram showing the basic control and protection systems specifying the protection, control, trip and alarm functions, the reference signals and commands and the auxiliary devices.

3. Complete schematic, wiring and interconnection diagrams showing connections to both internal and external devices:
    a. Include terminal number and wire numbers.
4. Complete single-line and 3-line diagrams including, but not limited to, circuit breakers, motor circuit protectors, contactors, instrument transformers, meters, relays, timers, control devices, and other equipment comprising the complete system:
    a. Clearly indicate device electrical ratings on the drawings.

D. Installation instructions:
1. Detail the complete installation of the equipment including rigging, moving, and setting into place.
2. For equipment installed in structures designated as seismic design category A or B:
    a. Provide manufacturer's installation instructions and anchoring details for connecting equipment to supports and structures.
3. For equipment installed in structures designated as seismic design category C, D, E, or F:
    a. Provide project-specific installation instructions and anchoring details based on support conditions and requirements to resist seismic and wind loads as specified in Section 16050 - Common Work Results for Electrical.
    b. Submit anchoring drawings with supporting calculations.
    c. Drawings and calculations shall be stamped by a professional engineer registered in the state where the Project is being constructed.

E. Operation and maintenance manuals:
1. Spare parts list with supplier names and part numbers.
2. Startup and commissioning instructions and data.
3. Operating manuals:
    a. Submit operating instructions and a maintenance manual presenting full details for care and maintenance of each model of VFD provided under this Contract.
4. Operating instructions:
    a. Written descriptions detailing the operational functions of all controls on the front panel.
5. Maintenance manual:
    a. Furnish maintenance manuals with instructions covering all details pertaining to care and maintenance of all equipment as well as identifying all parts.
    b. Manuals shall include, but are not limited to the following:
        1) Adjustment and test instructions covering the steps involved in the initial test, adjustment and start-up procedures.
        2) Detailed control instructions which outline the purpose and operation of every control device used in normal operation.
        3) All schematic wiring and external diagrams:
            a) Furnish drawings in a reduced 11-inch by 17-inch format that are fully legible at that size.

F. Test forms and reports.
1. Submit complete factory acceptance test procedures and all forms used during the test.

G. Manufacturer's Certificate of Installation and Functionality Compliance.

H. Manufacturer's field reports:
   1. Report listing the setting of all VFD adjustable parameters and their values after start-up.

I. Record Documents:
   1. Certified Record Documents of equipment with information listed above.

1.06 QUALITY ASSURANCE

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Qualifications:
   1. Any third party certification, safety or protection requirements shall be applied to the VFD system as a whole. Certification or protection of system elements or individual components by themselves is not acceptable.
   2. VFDs shall be UL 508C listed and labeled:
      a. UL 508C for individual units.
      b. UL 508A for VFD systems in control panels.
   3. Variable frequency drives shall be manufactured by the VFD manufacturer at its own facility which shall have a quality assurance program that is certified in conformance with ISO 9001.

1.07 DELIVERY, STORAGE, AND HANDLING

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Ship the VFDs and associated equipment to the job site on a dedicated air ride vehicle that will allow the Contractor to utilize on site offloading equipment:
   1. VFDs shall be delivered to the site preassembled and wired.

C. Furnish temporary equipment heaters within the VFD to prevent condensation from forming.

1.08 PROJECT OR SITE CONDITIONS

A. As specified in Section 16050 - Common Work Results for Electrical.

1.09 SEQUENCING

A. Conduct factory acceptance test and submit certified test results for Engineer's review.

B. Ship equipment to project site after successful completion of factory acceptance test.

C. Assemble equipment in the field.

D. Conduct field acceptance test and submit results for Engineer's review.

E. Submit Manufacturer's Certificate of Installation and Functionality Compliance.

F. Conduct Owner's training sessions.

G. Commissioning and process start-up as specified in Section 01756.

1.10 SCHEDULING

A. As specified in Section 16050 - Common Work Results for Electrical.

1.11 WARRANTY

A. As specified in Section 16050 - Common Work Results for Electrical.

1.12 SYSTEM START-UP

A. As specified in Section 16050 - Common Work Results for Electrical.

B. The VFD manufacturer shall be responsible for startup of the VFDs in the presence of the equipment suppliers, Contractor, Engineer and Owner.

1.13 OWNERS INSTRUCTIONS (NOT USED)

1.14 MAINTENANCE

A. Spare parts:
   1. The following spare parts shall be furnished:
      a. One complete VFD of each size furnished.
      b. One set of all power and control fuses for each VFD.
      c. One complete main control key pad for each type and rated size of VFD.
      d. One spare fan for each VFD unit.
      e. Two sets of ventilation filters for each VFD unit (if applicable in VFD cabinet louvers).
      f. One set of thyristors or power electronics for each type and rated size of VFD.
      g. Any special dedicated tools for emergency service and troubleshooting.
      h. All hardware and software required for configuration, maintenance, troubleshooting and inquiry of all drive parameters.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. One of the following or equal:
   1. Eaton/Cutler-Hammer.
   2. Allen-Bradley.
   3. Siemens-Robicon.
   4. Schneider Electric/Square D.
   5. General Electric.
   6. ABB.

2.02 EXISTING PRODUCTS (NOT USED)

2.03 MATERIALS (NOT USED)

2.04 MANUFACTURED UNITS (NOT USED)

2.05 EQUIPMENT

A. General:
   1. Sinusoidal pulse width modulated (PWM) type drive.
      a. Six-pulse insulated gate bipolar transistor (IGBT) power section.
      b. Microprocessor based controls.
      c. Line and load reactors.

B. Ratings:
   1. Voltage:
      a. Input voltage as indicated on the Drawings.

C. Operational features:
   1. Protective features:
      a. Provide the following minimum protective features:
         1) Motor overload protection.
         2) Instantaneous overcurrent.
         3) Instantaneous overvoltage.
         4) Undervoltage.
         5) Power unit overtemperature.
         6) Phase loss.
         7) VFD output short circuit.
   2. Control mode:
      a. Operation in either a constant volts/hertz or sensorless vector mode:
         1) The control mode selectable using the programming keypad.
   3. Frequency control:
      a. Minimum of 3 selectable skip frequencies with adjustable bandwidths.
      b. Programmable minimum frequency.
      c. Programmable maximum frequency.
   4. Acceleration/deceleration:
      a. Separately adjustable acceleration and deceleration rates:
         1) Each rate adjustable from 0.01 to 1,800 seconds.
   5. Spinning load:
      a. The VFD shall be capable of determining the speed and direction of a spinning load, “catch” the load and accelerate or decelerate it without damage to the load.
   6. Programmable loss of signal:
      a. Upon loss of speed reference the VFD shall be programmable to either:
         1) Stop.
         2) Maintain current speed.
         3) Default to pre-selected speed.
   7. Power interrupt ride-through:
      a. The VFD shall be capable of continuous operation in the event of a power loss of 5 cycles or less.
   8. Inputs/Outputs:
      a. Manufacturer’s standard number the following:
         1) Analog inputs:
            a) Configurable as either 0 to 10 volts or 4 to 20 milliamperes.
         2) Analog outputs:
            a) Programmable 4 to 20 milliamperes isolated.

3) Discrete inputs:
a) Programmable.
4) Discrete outputs:
a) Programmable.
b) Form C relay contacts.
5) Potentiometer 3-wire input.
b. Provide additional inputs/outputs as required to meet the control functions indicated on the Drawings.
9. Diagnostics:
a. Store a minimum of 4 fault conditions in non-volatile memory on a first in-first out basis.
b. Operational parameters stored at the time of a the fault:
1) Operating frequency.
2) Drive status.
3) Power mode.
c. Fault memory accessible via RS-232, RS-422 or RS-485.
10. Automatic restart:
a. User selectable automatic restart feature allowing the VFD to restart following a momentary power failure or other VFD fault:
1) Programmable for up to 9 restart attempts.
2) Adjustable time delay between restart attempts.

2.06 COMPONENTS

A. Enclosure:
1. NEMA 4X enclosure.
2. Provide cooling devices required to maintain the VFD within the manufacturer's specified temperature limits for the Project conditions:
a. Provide cooling device failure alarm.

B. Power disconnect:
1. Flange mounted motor circuit protector, MCP or thermal magnetic circuit breaker.
2. Lockable in the OFF position.

C. Reactors:
1. Line reactors: 3 percent input and 3 percent output.

D. Keypad:
1. Provide each VFD with a keypad for programming and control.
2. Keypad requirements:
a. Password security to protect drive parameters.
b. Mounted on the door of the enclosure housing the VFD (MCC, Vendor Control Panel) or as indicated on the Drawings.
c. Back-lit LCD:
1) Minimum of 2 lines with a minimum of 16 characters per line.
d. Programming and display features language: English.
e. Capable of displaying the following parameters:
1) Speed (percent).
2) Output current (amperes).
3) Output frequency (hertz).
4) Input voltage.

5) Output voltage.
6) Total 3-phase kilowatt.
7) Kilowatt-hour meter.
8) Elapsed run time meter.
9) Revolutions per minute.
10) Direct current bus voltage.

3. In addition to all keys required for programming, provide the following controls on the keypad:
   a. Auto/manual selector.
   b. Start pushbutton.
   c. Stop pushbutton.
   d. Jog pushbutton.
   e. Speed increment.
   f. Speed decrement.
   g. Forward/reverse selector.
   h. Run LED indicator.
   i. Program LED indicator.
   j. Fault LED indicator.
4. Provide the VFD with the hardwired controls as indicated on the Drawings.

E. Control power transformer:
1. Furnish a control power transformer mounted and wired inside the VFD enclosure.
2. With primary and secondary fusing.
3. Sized to power all VFD controls and options as well as any external devices indicated on the Drawings including the motor winding heater.

2.07 ACCESSORIES

A. Metal oxide varistors:
1. Provide protection for the VFD against:
   a. Line transients: 5,000 volt peak minimum.
   b. Line to ground transients: 7,000 peak minimum.

B. Conformal coating:
1. Provide conformal coating material applied to electronic circuitry and printed circuit boards to act as a protection against moisture, dust, temperature extremes, and chemicals such as H_2S and chlorine.

2.08 MIXES (NOT USED)

2.09 FABRICATION (NOT USED)

2.10 FINISHES

A. Enclosure finish shall be manufacturer's standard gray.

2.11 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION (NOT USED)

3.02 PREPARATION (NOT USED)

3.03 INSTALLATION

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Install the equipment in accordance with the accepted installation instructions and anchorage details to meet the seismic and wind load requirements at the Project site.

C. General:
   1. Furnish all cables, conduit, lugs, bolts, expansion anchors, sealants, and other accessories needed to complete the installation of the VFD (free-standing or within motor control center).
   2. Assemble and install the VFD in the locations and with the layouts indicated on the Drawings.
   3. Perform work in accordance with manufacturer's instructions and shop drawings.
   4. Furnish components and equipment as required to complete the installation.
   5. Replace any hardware lost or damaged during the installation or handling to provide a complete installation.
   6. Install free-standing enclosures on 3-1/2 inch raised concrete housekeeping pad:
      a. Provide structural leveling channels in accordance with the manufacturer's recommendations to provide proper alignment of the units.
      b. Weld and/or bolt the VFD frame to the leveling channels.
   7. Provide openings in top or bottom of the VFD (free-standing or within motor control center) enclosure for conduit only, no additional openings will be allowed:
      a. Improperly cut holes will require that the entire panel be replaced:
         1) No hole closers or patches will be allowed.
   8. Bundle circuits together and terminate in each unit:
      a. Tie with nylon wire ties.
      b. Label all wires at each end with wire numbers shown on the approved control drawings.
      c. All connections to and from the VFD (free-standing or within motor control center) enclosure must be made via terminal blocks.

3.04 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.05 REPAIR/RESTORATION (NOT USED)

3.06 RE-INSTALLATION (NOT USED)

3.07 COMMISSIONING

A. As specified in Section 01756 - Commissioning.

B. Source testing (Factory Acceptance Tests):
   1. Owner and Engineer will witness the Factory Acceptance Test as specified in Section 16050 - Common Work Results for Electrical.
   2. General:
      a. Incoming inspection of components and raw materials based on strategic supplier base and experience.
      b. All VFDs furnished under this Section shall be tested and inspected as specified below. Testing of VFDs based on sampling plans is not allowed.
      c. The testing procedures specified are the minimum acceptable requirements. The manufacturer may perform additional tests at its discretion.
   3. Failure of any component during testing requires repair of the faulted component and complete retest.
   4. Tests:
      a. Perform manufacturer's standard factory acceptance tests.

C. Provide Manufacturer’s Certificate of Installation and Functionality Compliance as specified in Section 01756 - Commissioning.

D. Owner training:
   1. As specified in Sections 01756 - Commissioning and 16050 - Common Work Results for Electrical.

3.08 FIELD QUALITY CONTROL

A. As specified in Section 16050 - Common Work Results for Electrical.

B. Provide the services of a VFD manufacturer representative for startup assistance and training:
   1. Inspection and field adjustment:
      a. Supervise the following and submit written certification that the equipment and controls have been properly installed, aligned, adjusted, and readied for operation.
   2. Startup field testing:
      a. Provide technical direction for testing, checkout, and startup of the VFD equipment in the field.
      b. Under no circumstances are any portions of the drive system to be energized without authorization from the manufacturer's representative.

3.09 ADJUSTING

A. Make all adjustments as necessary and recommended by the manufacturer, Engineer, or testing firm.

B. Provide the services of a VFD manufacturer factory technician to make all drive parameters and protective device settings:
   1. Protective device settings provided by the VFD manufacturer in accordance with the manufacturer of the driven equipment requirements.
   2. Provide documentation of VFD settings included but not limited to:
      a. Minimum speed.
      b. Maximum speed.
      c. Skip speeds.
      d. Current limit.

e. Acceleration time.
f. Deceleration time.

3.10 CLEANING

A. As specified in Section 16050 - Common Work Results for Electrical.

3.11 PROTECTION

A. As specified in Section 16050 - Common Work Results for Electrical.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION 17055

PACKAGED CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. General requirements for a Master Control Panel (MCP) designed to monitor and control all skids and ancillary equipment furnished for each skid, local control panels at each skid, local control panels for other furnished equipment, and field instruments required for a complete package control system.

1.02 REFERENCES

A. Code compliance:
   1. As specified in Section 01410 - Regulatory Requirements:
      a. The publications are referred to in the text by basic designation only. The latest edition accepted by the Authority Having Jurisdiction of referenced publications in effect at the time of Bid governs.
   2. The following codes and standards are hereby incorporated into these Specifications:
      a. Institute of Electrical and Electronics Engineers:
         1) C62.41.1 - IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.
      b. International Society of Automation (ISA):
         1) 5.4 - Instrument Loop Diagrams.
         2) 20 - Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.
      c. National Electrical Manufacturer's Association (NEMA):
         1) 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum).
      d. National Fire Protection Association (NFPA).
      e. Underwriters Laboratories Inc. (UL):
         1) 508C - Power Conversion Equipment.
         2) 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
         3) 913 - Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations.
         4) 1283 - Standard for Electromagnetic Interference Filters.
         5) 1449 - Transient Voltage Surge Suppressors.

1.03 DEFINITIONS

A. Definitions of terms and other electrical and instrumentation considerations as set forth in the:
   1. Factory Mutual or FM Global (FM).
   2. Institute of Electrical and Electronic Engineers (IEEE).

3. InterNational Electrical Testing Association (NETA).
4. International Electrotechnical Commission (IEC).
5. International Organization for Standardization (ISO).
6. International Society of Automation (ISA).
7. National Electrical Code (NEC).
8. National Fire Protection Association (NFPA).
9. National Institute of Standards and Technology (NIST).
10. Underwriter Laboratories (UL).

B. NEMA:
1. Type 1 enclosure in accordance with NEMA 250.
2. Type 3R enclosure in accordance with NEMA 250.
3. Type 4 enclosure in accordance with NEMA 250.
4. Type 4X enclosure in accordance with NEMA 250.
5. Type 6 enclosure in accordance with NEMA 250.
6. Type 6P enclosure in accordance with NEMA 250.
7. Type 12 enclosure in accordance with NEMA 250.

C. Specific definitions:
1. Control circuit: Any circuit operating at 120 volts alternating current (AC) or direct current (DC) or less, whose principal purpose is the conveyance of information (including performing logic) and not the conveyance of energy for the operation of an electrically powered device.
2. Panel: An instrument support system that may be either a flat surface, a partial enclosure, or a complete enclosure for instruments and other devices used in process control systems. Unless otherwise specified or clearly indicated by the context, the term “panel” in these Contract Documents is interpreted as a general term, which includes flat surfaces, enclosures, cabinets, and consoles.
3. Power circuit: Any circuit operating at 90 volts (AC or DC) or more, whose principal purpose is the conveyance of energy for the operation of an electrically powered device.
4. Signal circuit: Any circuit operating at less than 50 volts AC or DC, which conveys analog information or digital communications information.
5. Digital Bus: A communication network, such as Profibus, Foundation Fieldbus, or DeviceNet, allowing instruments and devices to transmit data, control functions, and diagnostic information.
6. 2-Wire transmitter (loop powered): A transmitter that derives its operating power supply from the signal transmission circuit and requires no separate power supply connections. As used in this Section, 2-wire transmitter refers to a transmitter that provides 4 to 20 mA current regulation of a signal in a series circuit with an external 24 VDC driving potential:
   a. Field Bus Communications signal or both.
7. Powered transmitters: A transmitter that requires a separate power source (120 VAC, 240 VAC, etc.) in order for the transmitter to develop its signal. As used in this Section, the produced signal may either be a 4 to 20 mA current signal, a Digital Bus communications signal or both.
8. Hardwired control: Control circuitry that does not utilize software to initiate functionality.
9. Hardwired interlocks: A safety or protective feature that will interrupt operation of the equipment in all operating modes with no required operator intervention.

10. Software interlocks: A safety or protective feature that will interrupt operation of the equipment when the RTU has control.
11. The term “panel” in this Section is interchangeable with the term “enclosure.”

D. Acronym definitions:
1. CCS: The PCS central computer system (CCS) consisting of computers and software. The personal computer-based hardware and software system that includes the operator interface, data storage, data retrieval, archiving, alarming, historian, reports, trending, and other higher level control system software and functions.
2. DPDT: Double-pole, double-throw.
3. ES: Enterprise system: Computer based communications or data sharing system utilized for non-process control functions such as E-mail, sharing files, creating documents, etc.
4. FAT: Factory acceptance test also known as Source Test.
5. HART: Highway addressable remote transducer.
6. HOA: Hand-Off-Auto control function that is totally PLC based. In the Hand mode, equipment is started or stopped, valves are opened or closed through operator direction under the control of the PLC software. In the Auto mode, equipment is started or stopped and valves are opened or closed through a control algorithm within the PLC software. In the Off mode, the equipment is prohibited from responding from the PLC control.
7. HMI: Human machine interface is a software application that presents information to an operator or user about the state of a process, and to accept and implement the operators control instructions. Typically information is displayed in a graphical format.
8. ICSC: Instrumentation and control system contractor: Subcontractor who specializes in the design, construction, fabrication, software development, installation, testing, and commissioning of industrial instrumentation and control systems.
9. IJB: Instrument junction boxes: A panel designed with cord sets to easily remove, replace, or relocate instrument signals.
10. I/O: Input/Output.
11. IP: Internet protocol or ingress protection.
12. LCP: Local control panel: Operator interface panel that may contain an HMI, pilot type control devices, operator interface devices, control relays, etc. and does not contain a PLC or RIO.
13. LAN: Local area network: A control or communications network that is limited to the physical boundaries of the facility.
14. LOI: Local Operator Interface is an operator interface device consisting of an alphanumeric or graphic display with operator input functionality. The LOI is typically a flat panel type of display mounted on the front of an enclosure with either a touch screen or tactile button interface.
15. LOR: Local-Off-Remote control function. In the Remote mode, equipment is started or stopped, and valves are opened or closed through the PLC based upon the selection of the HOA. In the Local mode, equipment is started or stopped, valves are opened or closed based upon hardwired control circuits completely independent of the PLC with minimum interlocks and permissive conditions. In the Off mode, the equipment is prohibited from responding to any control commands.

16. NJB: Network junction box. An enclosure that contains multiple access points to various networks within the facility. Networks could be Ethernet, Ethernet/IP, Fieldbus, RIO etc.
17. P&ID: Process and instrumentation diagram.
18. PC: Personal computer.
19. PCIS: Process control and instrumentation system: Includes the entire instrumentation system, the entire control system, and all of the Work specified in the Instrumentation and Control Specifications and depicted on the Instrumentation Drawings.
20. PCM: Process control module: An enclosure containing any of the following devices: PLC, RTU, or RIO.
21. PCS: Process Control System: A general name for the computerized system that gathers and processes data from equipment and sensors and applies operational controls to the process equipment. It includes the PLCs and/or RIOs, LOIs, HMIs, both LCPs, VCPs and all data management systems accessible to staff.
22. PJB: Power junction box: An enclosure with terminal blocks that distribute power to multiple instruments.
23. PLC: Programmable logic controller.
24. RIO: Remote I/O device for the PLC consisting of remote I/O racks, or remote I/O blocks.
25. RTU: Remote telemetry unit: A controller typically consisting of a PLC, and a means for remote communications. The remote communications devices typically are radios, modems, etc.
26. SCADA: Supervisory control and data acquisition system: A general name for the computerized system that gathers and processes data from sensors and equipment located outside of the facility, such as wells, lift stations, metering stations etc.
27. SPDT: Single-pole, double-throw.
28. SPST: Single-pole, single-throw.
29. UPS: Uninterruptible power supply.
30. VCP: Vendor control panel: Control panels that are furnished with particular equipment by a vendor other than the ICSC. These panels may contain PLCs, RIO, LOI, HMI, etc.
31. WAN: Wide area network: A control or communications network that extends beyond the physical boundaries of the facility.

1.04 SYSTEM DESCRIPTION

A. Master control panel (MCP):
   1. PLC processor, power supply, I/O backplanes, I/O modules, and communications modules sized for connected I/O and required spares.
   2. LOI on the face of the MCP enclosure for monitoring and control of the package control system.
   3. Ethernet communication equipment to provide communications with plant PCS system GE RX3i.
   4. Uninterruptable power supply.
   5. The MCP shall exercise control over all aspects of the package control system.
   6. All PLC and LOI programming required for fully functional package control system.

B. Other control panels:
   1. Provide power supply panel with required variable frequency drives.

C. Field instruments for process and equipment monitoring.

1.05 SUBMITTALS

A. General:
   1. Submit as specified in Section 01330 - Submittal Procedures and Section 11359A - Rotary Fan Press.
   2. Furnish submittals fully bookmarked in PDF format.
   3. Sequentially number pages within the tabbed sections. Submittals and Operations and Maintenance manuals that are not fully indexed and tabbed with sequentially numbered pages, or are otherwise unacceptable, will be returned without review.
   4. Edit all submittals and operation and maintenance manuals so that the submittal specifically applies to only the equipment furnished. Neatly cross out all extraneous text, options, models, etc. that do not apply to the equipment being furnished, so that the information remaining is only applicable to the equipment being furnished.

B. Pre-bid information:
   1. To the extent practical, packaged systems shall be factory assembled and wired. Information on packing splits and other anticipated field wiring requirements shall be provided to the Contractor prior to the bid.
   2. The Contractor shall be responsible to obtain the necessary information to accurately estimate the electrical connections to the packaged system equipment.

C. Product data:
   1. General:
      a. Submitted for non-custom manufactured material specified in this and other sections and indicated on shop drawings.
      b. Furnish sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications.
      c. Include:
         1) Catalog cuts.
         2) Bulletins.
         3) Brochures.
         4) Quality photocopies of applicable pages from these documents.
         5) Identify on the data sheets the project name, applicable specification section, and paragraph.
         6) Identify model number and options for the actual equipment being furnished.
      d. Legibly cross out options that do not apply or equipment not intended to be supplied.

2. Material and equipment schedules:
    a. Furnish a complete schedule and/or matrix of all materials, equipment, apparatus, and instruments that are proposed:
        1) Include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.
3. Instrument data sheets:
    a. Furnish fully completed data sheets, both electronically in Microsoft Word or Excel and in hard copy, for each instrument and component according to ISA 20. Include the following information on the data sheet:
        1) Component functional description specified in this Section and indicated on the Drawings.
        2) Manufacturers model number or other product designation.
        3) Tag number specified in this Section and indicated on the Drawings.
        4) System or loop of which the component is a part.
        5) Location or assembly at which the component is to be installed.
        6) Input and output characteristics.
        7) Scale range with units and multiplier.
        8) Requirements for electric supply.
        9) Requirements for air supply.
        10) Power consumption.
        11) Response timing.
        12) Materials of construction and of component parts that are in contact with, or otherwise exposed to, process media, and or corrosive ambient air.
        13) Special requirements or features, such as specifications for ambient operating conditions.
        14) Features and options that are furnished.

D. Shop drawings:
1. General:
    a. Show all interfaces between any of the following: instruments, vendor control panels, motor control centers, motor starters, variable speed drives, control valves, flowmeters, chemical feeders and other equipment related to the control work provided.
2. Shop drawing requirements:
    a. Front, side, and, rear elevations, and top and bottom views, showing all dimensions.
    b. Locations of conduit entrances and access plates.
    c. Component layout and identification.
    d. Schematic and wiring diagrams with wire numbers and terminal identification.
    e. Connection diagrams, terminal diagrams, internal wiring diagrams, conductor size, etc.
    f. Anchoring method and leveling criteria, including manufacturer’s recommendations for the seismic and wind conditions specified in Section 01850 - Design Criteria.
    g. Weight.
    h. Finish.
    i. Nameplates with legends:
        1) Temperature limitations, as applicable.

3. Control panel drawings:
    a. Layout drawings:
        1) Submit panel, enclosure, console, furniture, and cabinet layout drawings for all items provided.
        2) As a minimum, include the following information:
            a) To scale front, side, and plan views.
            b) Dimensions.
            c) Interior and exterior arrangements.
            d) Mounting information, including conduit entrance location.
            e) Finish data.
            f) Tag number and functional name of items mounted in and on each panel, console, and cabinet.
            g) Nameplate legend including text, letter size, and colors.
    b. Wiring and piping diagrams:
        1) Submit panel wiring and piping diagrams for every panel that contains wiring and/or piping.
        2) Include the following information:
            a) Name of panel.
            b) Wiring and piping sizes and types.
            c) Terminal strip numbers.
            d) Wire tags and labels.
            e) Functional name and manufacturer's designation for items to which wiring and piping are connected.
            f) Electrical control schematics in accordance with ANSI standards.
    c. Calculations:
        1) Provide installation details based on calculated shear and tension forces:
            a) Calculations shall be signed and sealed by a Professional Engineer licensed in the state where the cabinets and panels will be installed.
        2) For assembled enclosures and other equipment with a weight of 200 pounds or more, provide calculations for:
            a) Weight including panel internal components.
            b) Seismic forces and overturning moments.
            c) Shear and tension forces in connections.
        3) Cooling calculations, to include but not limited to:
            a) Highest expected ambient temperature for the enclosure's location
            b) Internal heat load.
            c) Exposure to direct sunlight.
            d) Dimensions of the enclosure in inches.
            e) Maximum desired temperature inside the enclosure.
    d. Seismic panel construction:
        1) Seismic anchorage: Provide seismic design calculations and installation details for anchorage of all panels, enclosures, consoles, etc. to meet seismic requirements as specified in Section 01850 - Design Criteria:
            a) Stamped by a Professional Engineer registered in the state where the Project is being constructed.

2) For floor mounted free standing panels weighing 200 pounds or more (assembled, including contents), submit calculations, data sheets, and other information to substantiate that panel, base, and framing meet minimum design strength requirements and seismic requirements at the project site. Calculations shall be signed and sealed by a Professional Engineer.

4. Schematic diagrams:
   a. Submit schematic diagrams for all electrical equipment in ladder diagram format.
   b. Include device and field connection terminal numbers on all schematic diagrams.

E. Process control and LOI software submittal:
   1. A complete listing of the PLC system point I/O database:
      a. Include for each data point, relevant parameters such as range, contact orientation, limits, incremental limits, I/O card byte, I/O hardware address, and PLC assignment.
      b. Organize on a site-by-site basis, separate by point type.
      c. In addition to the active I/O points, list the implemented spare I/O points and the available I/O points remaining on each card, as well as other defined future points specified or shown.
   2. Preliminary LOI screens, including pop-ups, trends, and alarm screens. Provide electronic and hard copy.
   3. Final LOI screens for use by the ICSC in developing graphic screens for WTP PCS system. Provide electronic and hard copy.
   4. Provide a complete, documented listing of all PLC codes.

F. Testing:
   1. For each test specified in this Section, prepare and submit complete test plans, test procedures, test forms, test binders, and test reports, and other submittals, as specified below.
   2. Submit manufacturer's certifications and manufacturer's field reports where required.
   3. Submit Test plans, procedures, forms, and binders for approval by the Engineer before scheduling or performing tests.
   4. Additional test form and test procedure requirements are specified with individual test requirements.

1.06 QUALITY ASSURANCE

A. Furnish all equipment listed by and bearing the label of the UL or of an independent testing laboratory acceptable to the Engineer and the authority having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Shipping precautions:
   1. After completion of shop assembly and successful Source Testing, pack all equipment, cabinets, panels, and consoles in protective crates and enclose in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture.
   2. Place dehumidifiers when required, inside the polyethylene coverings.

3. Skid-mount the equipment for final transport.
4. Provide lifting rings for moving without removing protective covering.
5. Display boxed weight on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.

B. Tagging:
1. Tag each component and/or instrument to identify its location, instrument tag number, and function in the system.
2. Firmly attach a permanent tag indelibly machine marked with the instrument tag number, as given in the tabulation, on each piece of equipment provided as part of this Section.
3. Tag instruments immediately upon receipt in the field.
4. Prominently display identification on the outside of the package.

1.08 PROJECT OR SITE CONDITIONS

A. Provide instruments suitable for the installed site conditions including, but not limited to, material compatibility, site altitude, site seismic conditions, humidity, and process and ambient temperatures.

1.09 SEQUENCING

A. Install passes one at a time to keep existing dewatering equipment operational.

1.10 SYSTEM STARTUP (NOT USED)

1.11 OWNER'S INSTRUCTIONS (NOT USED)

1.12 COMMISSIONING (NOT USED)

1.13 MAINTENANCE

A. If the PLC hardware provided for the MCP and local control panels is not the same type as the WTP PLC system hardware, the supplier shall provide the following spare PLC hardware for the PLC equipment in the MCPs and LCPs.
1. One spare CPU for every type of CPU in the system.
2. One spare I/O modules for every type of I/O module in the system.
3. One spare power supply for every power supply in the system.
4. One spare network and/or communications card for every network or communications card in the system.

B. Provide 5 spare fuses of each type and rating furnished.

PART 2 PRODUCTS

2.01 GENERAL

A. Signal transmission:
   1. Analog signals:
      a. Furnish analog measurements and control signals that vary in direct linear proportion to the measured variable, unless otherwise indicated.
      b. Furnish electrical analog signals outside control panels that are 4 to 20 mA 24 VDC, except as indicated.
      c. Analog signals within enclosures may be 1 to 5 VDC.
      d. Electrically or optically isolate all analog signals from other signals.
      e. All pneumatic signals: 3 to 15 psig.
      f. Discrete input signal: 24 VDC or 120 VAC according to the supplier's discretion.
      g. Discrete output signals:
         1) Output type according to the supplier's discretion.
         2) Provide external terminal block mounted fuse with blown fuse indication for all discrete outputs.
         3) Interposing relays:
            a) Provide interposing relays as required.
      h. Furnish regulated analog signals that are not affected by changes in supply voltage or load resistance within the unit's rating.
      i. Maintain the total 4 to 20 mA loop impedance to 10 percent below the published value at the loop operating voltage.
      j. Where necessary, reduce loop impedance by providing current-to-current (I/I) isolation amplifiers for signal re-transmission.

B. Discrete circuit configuration:
   1. Configure discrete control circuits to fail safe, on loss of continuity or loss of power.
   2. Alarm contacts: Fail to the alarm condition.
   3. Control contacts fail to the inoperative condition unless otherwise indicated on the Drawings.

C. Grounding:
   1. Provide control panels with a signal ground bus, isolated from the power ground bus:
      a. Provide multiple panels in one location with a common point for signal ground bus connection to ground.
   2. Single point ground shields and measurement loops at the source panel external terminals, unless otherwise noted, by bonding to the control panel signal ground bus.
   3. Provide isolating amplifiers within control panels for field equipment possessing a grounded input or output, except when the panel circuit is galvanically isolated.

2.02 CONTROL PANEL

A. General:
   1. PLC processor, power supply, I/O backplanes, and modules sized for connected I/O and required spares.
   2. An LOI shall be provided on the face of the MCP enclosure for monitoring and control of the system.
   3. The MCP shall exercise control over all aspects of the system. Each unit shall be equipped with a control panel containing I/O modules and necessary interface with the MCP.
   4. Ethernet communication equipment to provide communications with plant PCS system.
   5. The MCP shall continuously monitor all operating parameters, and shall respond to alarms and emergency conditions by shutting down or activating system components. The MCP shall indicate alarm conditions locally at the LOI, and remotely for monitoring by the WTP PCS system.
   6. The MCP shall be integrated into the overall plant SCADA system via Ethernet.
   7. The MCP shall be capable of sending and receiving equipment status signals, analog data and alarms, and receiving both discrete and analog control signals from the WTP PCS system via Ethernet.
   8. Uninterruptible power supply.
   9. All PLC and LOI programming required for fully functional package control system.

2.03 PROGRAMMABLE LOGIC CONTROLLERS (PLC) HARDWARE

A. PLC hardware shall be:
   1. Allen-Bradley ControlLogix or CompactLogix.
   2. General Electric RX3i.

B. General:
   1. Install all communications modules in the PLC backplane.

2.04 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. General:
   1. Provide UPS at MCP.
   2. Provide UPS power at LCPs, either via UPS in the MCP, or via separate UPS mounted in each LCP.
   3. The minimum VA rating of the UPS shall be greater than or equal to 1.5 times the connected load or 700 VA, whichever is greater.
   4. The battery shall be sized to provide minimum 15 minutes runtime at full load.
   5. Provide calculations showing run time and VA loading of the UPS.

B. UPS shall be one of the following:
   1. Free-standing UPS, 700-3,000 VA:
      a. Emerson Network Power - Liebert GXT 2U (700 - 3000 VA).
      b. Eaton Corporation - Powerware 9120 (700 - 3000 VA).
   2. Free-Standing UPS, above 3 kVA:
      a. Emerson Network Power - Liebert GXT2-6000RT208 (6 kVA).

b. Emerson Network Power - Liebert GXT2-10000RT208 (10 kVA).
c. Eaton Corporation - Powerware 9125 (5.0 and 6.0 kVA).
d. Eaton Corporation - Powerware 9155 (8 and 10 kVA).

C. Provide manual maintenance bypass switch:
1. 700 to 3,000 VA units: One of the following or equal:
a. Liebert Micropod 2U.
b. Powerware Powerpass 9125.
2. Above 3,000 VA units: By manufacturer of UPS, with connections matched for operation with UPS.

2.05 HUMAN MACHINE INTERFACE (LOI) HARDWARE

A. General:
1. NEMA Type 4X rated.
2. LOI shall communicate directly with PLC processor via dedicated communication cable.
3. Provide color touch-screen type display.

B. LOI shall be one of the following:
1. Allen-Bradley: PanelView Plus.
2. Telemecanique: Magelis.
3. General Electric: QuickPanel.

PART 3 EXECUTION

3.01 EXAMINATION (NOT USED)

3.02 PREPARATION (NOT USED)

3.03 INSTALLATION

A. Field instruments installation:
1. Install field instruments as specified in the Contract Documents and in accordance with API 550 and 551 and the manufacturer's instructions.
2. Mount field instruments so that they can be easily read, readily approached, and easily serviced, and so they do not restrict access to mechanical equipment:
a. Mount field instruments on a pipe stand or local panel, if they are not directly mounted.
3. Make connections from rigid conduit systems to field instruments with PVC coated flexible conduit:
a. Type of flexible conduit required for the area classification.
b. Maximum length of 18 inches.
4. Connect field instruments with cable as specified in the Electrical Specifications, except when the manufacturer requires the use of special cable, or otherwise specified in this Section:
a. Special cable applications shall be in accordance with the NEC.
5. Verify the correctness of each installation:
a. Polarity of electric power and signal connections.

b. Ensure all process connections are free of leaks.

B. Process sensing lines and air tubing:
   1. Install individual tubes parallel and/or perpendicular to and near the surfaces from which they are supported.
   2. Provide supports for rigid tubing at intervals of not more than 3 feet.
   3. Slope horizontal runs of instrument tubing at a minimum of 1/16th-inch per foot to allow for draining of any condensate.
   4. Bends:
      a. Use proper tool.
      b. Make bends for parallel lines symmetrical.
      c. Make bends without deforming or thinning the walls of the tubing.
   5. Square-cut and clean all ends of tubing before being inserted in the fittings.
   6. Provide bulkhead fittings at all panels requiring pipe and/or tubing entries.
   7. Use stainless steel tubing for all piping hard piped from the air header, unless otherwise indicated on the Drawings or not compatible with the fluids or atmosphere in the area:
      a. Use flexible connections only on moving equipment and under the constraint that the length shall be less than 1.5 times maximum travel of the equipment.

C. Equipment tie-downs:
   1. Anchor all instruments, control panels, and equipment by methods that comply with seismic and wind bracing requirements, which apply to the site.
   2. All control panels, VCPs, LCPs, RTUs, PCMs, etc., shall be permanently mounted and tied down to structures.

D. Instrument tagging:
   1. Provide all field-mounted instruments with nameplates:
      a. Nameplates engraved with the instrument's full tag number as indicated on the Drawings:
         1) Affix tags with stainless steel wire fasteners.
   2. Provide all back of panel instruments with nameplates:
      a. Engraved with the instrument's full tag number.
   3. Provide all front of panel instruments with a nameplate:
      a. Engraving to include the following:
         1) Instrument's full tag number.
         2) Service description.
      b. Nameplates:
         1) Secure nameplates to the panel with stainless steel screws.
         2) Use an approved adhesive if screws would violate the NEMA or other ratings of the enclosure.

E. Cable and conductor termination:
   1. Terminate all cables and conductors on terminal blocks.
   2. Terminal block enclosures:
      a. Suitable for the area classification.

F. Surge protection:
   1. Provide outdoor field instrument loops with voltage surge protection units installed on the instruments.

2. Individually fuse each 4-20 mA DC loop with a 1/16 ampere fuse between power supplies and receiver surge protectors.
3. Provide voltage surge protection for 4-wire transmitters and analyzers:
    a. Protect both power source and signal loop.

G. Control panel installation:
1. Install enclosures so that their surfaces are plumb and level within 1/8 inch over the entire surface of the panel; anchor securely to wall and structural supports at each corner, minimum. Direct attachment to drywall is not permitted.
2. Provide floor stand kits for wall-mount enclosures larger than 48 inches high.
3. Provide a full-size equipment-grounding conductor in accordance with NEC included with the power feeder. Terminate to the incoming power circuit-grounding terminal.

3.04 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.05 REPAIR/RESTORATION (NOT USED)

3.06 RE-INSTALLATION (NOT USED)

3.07 FIELD QUALITY CONTROL

A. General:
1. Failure testing:
    a. In addition to demonstrating correct operation of all specified features, demonstrate how the system reacts and recovers from abnormal conditions including, but not limited to:
        1) Equipment failure.
        2) Operator error.
        3) Communications sub-system error.
        4) Power failure.
        5) Process equipment failure.
        6) High system loading conditions.

B. Loop check/validation:
1. Check all control loops under simulated operating conditions.
2. Provide “end-to-end” tests:
    a. Test PLC/controller inputs and outputs from field device to all operator displays and pilot devices.

C. Pre-commissioning (functional) test:
1. General:
    a. Commence pre-commissioning tests after completion of all loop check/validation tests:
        1) Pre-commissioning to demonstrate proper operation of all systems with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

2. Control logic operational validation:
    a. The purpose of control logic validation is to field test the operation of the complete control system, including all parts of the system, all control panels (including vendor control panels), all control circuits, all control stations, all monitored/controlled equipment, and final control elements.
3. Loop tuning:
    a. Optimally tune all electronic control stations and software control logic incorporating proportional, integral, or derivative control. Apply control signal disturbances at various process variable levels and adjusting the gain, reset, or rate settings as required to achieve proper response.
4. Pre-commissioning validation sheets:
    a. Document each pre-commissioning test on an approved test form.
    b. Document loop tuning with a report for each loop, including two-pen chart recordings showing the responses to step disturbance at a minimum of 3 setpoints or process rates approved by the Engineer. Show tuning parameters on the charts, along with time, date, and sign-off by supplier and Engineer.
5. Pre-commissioning certification:
    a. Document via a certified report the completion of all pre-commissioning and test activities:
        1) Including all test forms with test data entered, submitted to the Engineer with a clear and unequivocal statement that all pre-commissioning test requirements have been satisfied.

D. Performance/reliability/operational tests:
1. After successful completion of the pre-commissioning test as accepted by the Engineer and Owner, the performance test can proceed.

E. The performance test may be performed concurrently with the 7-day operational test specified in Section 01756 - Commissioning.

3.08 ADJUSTING

A. Control valves:
1. Stroke all control valves, cylinders, drives and connecting linkages from the control system as well as local control devices and adjust to verify proper control action, hand switch action, limit switch settings, torque settings, remote control actions, and remote feedback of valve status and position.
2. Check control valve actions and positioner settings with the valves in place to ensure that no changes have occurred since the bench calibration.

3.09 CLEANING

A. Vacuum clean all control panels and enclosures before start-up and again after final completion of the project.

B. Clean all panel surfaces.

C. Return to new condition any scratches and/or defects.

D. Wipe all instrument faces and enclosures clean.

E. Leave wiring in panels, manholes, boxes, and other locations in a neat, clean, and organized manner:
   1. Neatly coil and label all spare wiring lengths.
   2. Shorten, re-terminate, and re-label excessive spare wire and cable lengths, as determined by the Engineer.

3.10 DEMONSTRATION AND TRAINING

A. Training:
   1. Provide system maintenance and operator training courses for all the instrumentation, control systems furnished.
   2. Training course requirements:
      a. Operator training:
         1) Operator's training shall include:
            a) Control system overview: Architecture, equipment functions, software components, etc.
            b) Display navigation, overview, and types of displays.
            c) Process and equipment monitoring and control: Basic principles and operation.
            d) Logging ON and OFF the system and description of the security and access system.
            e) Alarm subsystem.
      b. Instrumentation training:
         1) Furnish training covering all instruments and control panels.
         2) Train maintenance staff in the use, cleaning, calibration, maintenance, and troubleshooting of all the instruments furnished within this project.
         3) Furnish training on the operation of new hardwired controls.

3.11 PROTECTION

A. As specified in Section 17050 - Common Work Results for Process Control and Instrumentation Systems.

B. Fully protect all instruments after installation and before commissioning. The Contractor shall replace any instruments damaged before commissioning:
   1. The sole party responsible for determining the corrective measures is the Engineer.

END OF SECTION