CONTRACT NO.
70-713-7 #1A

PROJECT MANUAL

VOLUME 1 OF 2

FOR

Russian River County Sanitation District
Treatment Plant
Biological Nutrient Removal

MAY 2013

DOCUMENT 00001

PROJECT MANUAL

VOLUME 1 OF 3

for

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT BIOLOGICAL NUTRIENT REMOVAL

RUSSIAN RIVER COUNTY SANITATION DISTRICT

BOARD OF DIRECTORS

Susan Gorin
Shirlee Zane
Michael McGuire
Efren Carrillo
David Rabbitt, Chair

Advertisement Date: May 2013

Bid Date: Tuesday, June 25, 2013

Contract Number: 70-713-7 #1A

© 2013 Russian River County Sanitation District

DOCUMENT 00007

SEALS PAGE

Russian River County Sanitation District

REGISTERED PROFESSIONAL ENGINEER
Craig Olson
No. 39819
Exp. 12/31/2013
CIVIL
STATE OF CALIFORNIA

Craig Olson, P. E. Date: 02/7/13

REGISTERED PROFESSIONAL ENGINEER
Mallika
Ramanathan
No. 66364
Exp. 6/30/2014
CIVIL
STATE OF CALIFORNIA

Mallika Ramanathan, P. E. Date: 02/7/13

REGISTERED PROFESSIONAL ENGINEER
William F. Ettlich
No. 7625
Exp. 9/30/2014
ELECTRICAL
STATE OF CALIFORNIA

William Ettlich, P. E. Date: 2-7-13

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END OF DOCUMENT

DOCUMENT 00010

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END OF DOCUMENT

BIDDING REQUIREMENTS

DOCUMENT 00100

ADVERTISEMENT FOR BIDS

1. **NOTICE.** The Russian River County Sanitation District ("Owner"), a public agency a local district of the State of California, hereby gives notice that it will accept Bids for construction of the following public work:

Contract Number 70-713-7 #1A
Russian River County Sanitation District Treatment Plant
Biological Nutrient Removal

2. **DESCRIPTION AND LOCATION OF THE WORK.** The Work consists of construction of a biological nutrient removal system at Owner's treatment plant, 18400 Neeley Road, near the community of Guerneville, Sonoma County, California. The Work includes, but is not limited to the construction of baffle walls, pumping recirculation, micro diffuser aeration, blowers, mixers, motor control center, electrical panels, instruments, and controls. Bidding Documents contain the full description of the Work.

3. **ESTIMATED PROJECT COST RANGE:** $2.4 to $2.8 million.

4. **REQUIRED CONTRACTOR'S LICENSE(S).** A California "A" contractor's license is required to Bid this Contract. Joint ventures must secure a joint venture license prior to award of this Contract.

5. **CONTACT INFORMATION.**

Mailing address:
Russian River County Sanitation District
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

Phone: 707-547-1900
Fax: 707-544-6123
Email: BidderQuestions@scwa.ca.gov

Office:
Russian River County Sanitation District
c/o Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

Website address:
www.sonomacountywater.org

6. **PROCUREMENT OF BIDDING DOCUMENTS.** Bidders may examine Bidding Documents at Owner's Office. Bidders may obtain hard copies of Bidding Documents upon registration as a Planholder through Owner's office and payment of a non-refundable fee of $20 for each copy. Owner will accept cash or checks payable to "Russian River County Sanitation District." Bidding Documents need not be returned to Owner. Bidding Documents contain a reduced set of Drawings. Bidders may arrange to obtain full-size Drawings from Digital Prints & Imaging, 375 Tesconi Circle, Santa Rosa, CA 95401, 707-546-0401, for an additional charge to be paid directly to Digital Prints & Imaging. Electronic Bidding Documents are available on Owner's website: www.sonomacountywater.org.

7. **MANDATORY PRE-BID SITE VISIT.** Owner will conduct Pre-Bid Site Visits at the Site as listed below.

Time	Day	Date	Location
10:00 a.m.	Tuesday	June 4, 2013	Aeration Basin 1 at the Site
2:00 p.m.	Thursday	June 6, 2013	Aeration Basin 1 at the Site

Bidders must attend one of the Pre-Bid Site Visits and sign an attendance roster as a condition to bidding.

Bidders will be provided the opportunity to investigate conditions or otherwise conduct invasive investigations, explorations, tests, or studies at the Pre-Bid Site Visit, subject to delivering an executed Document 00210 (Indemnity and Release Agreement) and providing an insurance certificate as described therein by noon of the Day prior to the Pre-Bid Site Visit. This will be the Bidders' only opportunity to investigate conditions at the Site. Bidders who intend only to observe Site conditions and not conduct such examinations are not required to provide an executed Document 00210 (Indemnity and Release Agreement) or an insurance certificate for the Pre-Bid Site Visit. The Pre-Bid Site Visit is merely a showing of the Site and existing conditions and will not provide an opportunity for Bidders to have questions answered. Bidders are encouraged, however, to submit written questions. Owner will transmit to all Registered Planholders (all parties recorded as having received Bidding Documents) such Addenda as Owner in its discretion considers necessary in response to written questions. Bidding Documents will not be available at the Pre-Bid Site Visit.

Bidders shall not rely on oral statements. Oral statements will not be binding or legally effective.

Other Pre-Bid Site Visits may be scheduled at Owner's sole discretion, depending on staff availability.

8. **RESTRICTIONS ON SUBSTITUTIONS.** As a limitation on Bidder's privilege to substitute "or equal" items, Owner has found that certain items are designated as Owner standards and certain items are designated to match existing items in use on a particular public improvement either completed or in the course of completion or are available from one source. As to such items, Owner will not permit substitution. Such items are: Programmable logic controller (PLC), variable frequency drive (VFD), dissolved oxygen (DO) sensor and transmitter, and pressure transmitter.

9. **INSTRUCTIONS.** Bidders shall refer to Document 00200 (Instructions to Bidders) for required documents and items to be submitted in sealed envelopes for deposit into the Bid boxes, located at Owner's Office, and applicable times for submission.

10. **STATEMENTS OF QUALIFICATIONS.** Each Bidder shall be required to submit, in accordance with Document 00200 (Instructions to Bidders) and Document 00450 (Statement of Qualifications for Construction Work), a Statement of Qualifications.

11. **BID SUBMISSION.** Sealed Bids will be received at Owner's Office (see paragraph 5) until 10:00 a.m., Tuesday, June 25, 2013. Owner's staff will determine official time and will call out the designated time in the Bid reception area of Owner's Office, stating that the period for accepting Bids is closed. The Bid opening will be in accordance with procedures set forth in Document 00200 (Instructions to Bidders).

12. **BID PREPARATION COST.** Bidders are solely responsible for the cost of preparing their Bids.

13. **CONTRACT TIME.** Work shall be completed within 490 Days from the date when Contract Time commences to run.

14. **PAYMENT BONDS.** In accordance with California Civil Code Section 9550, payment bonds as set forth in Document 00200 (Instructions to Bidders) will be required from the successful Bidder.

15. **PREVAILING WAGE LAWS.** The successful Bidder must comply with all prevailing wage laws applicable to the Project, and related requirements contained in the Contract Documents.

16. **SUBSTITUTION OF SECURITIES.** Owner will permit successful Bidder to substitute securities for retention monies withheld to ensure performance of Contract, as set forth in Document 00680 (Escrow Agreement for Security Deposits in Lieu of Retention), in accordance with California Public Contract Code, Section 22300. By this reference, Document 00680 (Escrow Agreement for Security Deposits in Lieu of Retention) is incorporated in full in this Document 00100.

17. **RESERVATION OF RIGHTS.** Owner specifically reserves the right, in its sole discretion, to reject any or all Bids, or re-bid, or to waive inconsequential deviations from Bid requirements not involving time, price, or quality of the Work.

By order of the Sonoma County Water Agency's General Manager acting on behalf of Russian River County Sanitation District.

END OF DOCUMENT

DOCUMENT 00200

INSTRUCTIONS TO BIDDERS

STANDARD EDITION

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INSTRUCTIONS TO BIDDERS

Formal Bids are requested for a general construction contract, or work described in general, as follows:

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT

BIOLOGICAL NUTRIENT REMOVAL

Bid submission: Tuesday, June 25, 2013. Bid submittal deadlines are listed in Document 00100 (Advertisement for Bids) and in paragraph 22 herein.

1. DEFINITIONS

A. All abbreviations and definitions of terms used in this Document 00200 are set forth in Document 00700 (General Conditions) and Section 01420 (References and Definitions).

2. CONTACT INFORMATION

Mailing address:
Russian River County Sanitation District
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

Phone: 707-547-1900
Fax: 707-544-6123
Email: BidderQuestions@scwa.ca.gov

Office:
Russian River County Sanitation District
c/o Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

Website address:
www.sonomacountywater.org

3. MINIMUM REQUIREMENTS TO BID

A. Bidder must constitute a "responsible bidder" within the meaning of Public Contract Code section 1103. Minimum requirements for Bidder:

1) Owner will accept Bids only from Bidders duly licensed in accordance with the California Business & Professions Code. A California "A" contractor's license is required to Bid this Contract. Joint ventures must secure a joint venture license prior to award of this Contract.

2) Bidders must attend one of the Pre-Bid Site Visits and sign an attendance roster as a condition to bidding.

3) The following are minimum requirements for the Bidder to be found responsible to perform the Work.

a. Five years experience as a continuously operating entity engaged in the performance of similar work.

b. Within the past five years completed three water or wastewater construction projects of a similar nature and complexity with a contract dollar amount of at least $1,000,000 each. At least one of the three projects must be a wastewater project that included construction of an aeration system and related controls.

c. Sufficient financial strength, stability and resources as measured by Bidder's equity, debt-to-assets ratio, and capability to finance the Work to be performed.

d. Ability to secure, in accordance with the Contract Documents, the required forms of Construction Performance Bond and Construction Labor and Material Payment Bond.

e. Ability to obtain required insurance with coverage values that meet minimum requirements.

f. Satisfactory experience on public works, including without limitation no history of default termination, excessively delayed completion, or excessive defective work.

B. Minimum requirements for Bidder and its team:

1) Evidence that Bidder and its team have the human and physical resources of sufficient quantity and quality to perform the Work under Contract Documents in a timely and Specification-compliant manner, to include:

a. Evidence demonstrating Bidder's commitment to project safety and its ability to complete projects in a safe manner.

b. Construction and management organizations with sufficient personnel and requisite disciplines, licenses, skills, experience, and equipment for the Project.

c. Minimum licensing requirements including evidence of a valid California class "A" contractor's license for the Bidder and evidence of requisite licenses for Key Personnel of Bidder.

d. A field organization with skills, experience, and equipment sufficient to perform all on-Site Work and necessary scheduling.

e. Sufficient financial strength, stability and resources as measured by Bidder's equity, debt-to-assets ratio, and capability to finance the Work to be performed.

2) Minimum requirements for Key Personnel:

a. Expertise of Key Personnel to accomplish the duties and responsibilities required to perform the Work under Contract Documents. Minimum experience requirements of each Key Personnel include the completion of three projects of similar nature and complexity and three years of experience on projects of similar nature and complexity.

4. PROCUREMENT OF BIDDING DOCUMENTS

A. Bidders may examine and obtain Bidding Documents at Owner's Office at the address listed in paragraph 2, Contact Information.

B. Electronic Bidding Documents are available on Owner's website: www.sonomacountywater.org.

C. Bidders may obtain hard copies of Bidding Documents upon registration as a Planholder through Owner's office and payment of a non-refundable fee of $20 for each copy. Owner will accept cash or checks payable to "Russian River County Sanitation District." Bidding Documents need not be returned to Owner. Bidding Documents contain a reduced set of Drawings. Bidders may arrange to obtain full-size Drawings as described in Document 00100 (Advertisement for Bids).

5. EXISTING DRAWINGS AND GEOTECHNICAL DATA

A. Bidders may examine any available existing conditions information (e.g., record documents, specifications, studies, drawings of previous work) and applicable environmental assessment information (if any) regarding the Project at the Owner's Office by giving Owner reasonable advance notice. Documents may also be available at Owner's website: (www.sonomacountywater.org). Document 00320 (Geotechnical Data and Existing Conditions) applies to all supplied existing conditions information and geotechnical reports

and all other information supplied regarding existing conditions either above ground or below ground.

6. BIDDERS' OPPORTUNITY TO INVESTIGATE CONDITIONS

A. Bidders will be provided the opportunity to investigate conditions or otherwise conduct invasive investigations, explorations, tests, or studies at the Pre-Bid Site Visit, subject to delivering an executed Document 00210 (Indemnity and Release Agreement) and providing an insurance certificate as described therein by noon of the Day prior to the Pre-Bid Site Visit. This will be the Bidders' only opportunity to investigate conditions at the Site. Bidders who intend only to observe Site conditions at the Pre-Bid Site Visit and not conduct such examinations are not required to provide an executed Document 00210 (Indemnity and Release Agreement) or an insurance certificate for the Pre-Bid Site Visit.

7. MANDATORY PRE-BID SITE VISITS

A. Owner will conduct Pre-Bid Site Visits at the times and locations listed.

Time	Day	Date	Location
10:00 a.m.	Tuesday	June 4, 2013	Aeration Basin 1 at the Site
2:00 p.m.	Thursday	June 6, 2013	Aeration Basin 1 at the Site

B. Pre-Bid Site Visits will occur at the Site on each day and time listed. Bidder is required to attend only one of the Pre-Bid Site Visits.

C. Other Pre-Bid Site Visits may be scheduled at Owner's sole discretion, depending on staff availability.

D. The Pre-Bid Site Visit is merely a showing of the Site and existing conditions and will not provide an opportunity for Bidders to have questions answered. Bidders are encouraged, however, to submit written questions. Bidding Documents will not be available at the Pre-Bid Site Visit. Attendees who would like copies of the Bidding Documents must register with Owner as a Planholder.

E. Attendance at the Pre-Bid Site Visit does not guarantee receipt of Addenda. The only way to ensure receipt of Addenda is to register as a Planholder with Owner.

F. Bidders shall not rely on oral statements. Oral statements will not be binding or legally effective.

8. SUBSTITUTIONS

A. Bidders must base their Bids on products and systems specified in Contract Documents or listed by name in Addenda.

B. Except as provided herein, Owner will consider substitution requests only for "or equal items." Bidders wanting to use "or equal" item(s) may submit Document 00660 (Substitution Request Form) no later than 14 Days prior to submitting their Bids. After that date, Owner will not accept "or equal" substitution requests. To assess "or equal" acceptability of product or system, submittals of substitutions shall contain the information required in Document 00660 (Substitution Request Form) and set forth in Section 01600 (Product Requirements). Insufficient information will be grounds for rejection of substitution. Owner shall, within a reasonable period of time after having received a Request for Substitution, issue in writing its decision as to whether the proposed substitute item is an Equal item. Owner's decision shall be conclusive on all Bidders.

C. Approved substitutions shall be listed in Addenda and become part of the Contract Documents.

D. [PCC 3400] As further limitation on Bidder's privilege to substitute items, Owner has found that:

1) Certain items are designated as Owner standards and certain items are designated to match existing items in use on a particular public improvement, either completed or in the course of completion. Items that fall in this category include:

a. Programmable logic controller (PLC), variable frequency drive (VFD), dissolved oxygen (DO) sensor and transmitter, and pressure transmitter.

2) Certain items are designated in order that a field test or experiment may be made to determine the product's suitability for future use. Items that fall in this category include:

a. None.

3) Certain necessary items are only available from one source. Items that fall in this category include:

a. None.

E. As to such items listed above, Owner will not permit substitution.

F. Substitutions may be requested after submitting Bids and Award of Contract only in accordance with requirements specified in Section 01600 (Product Requirements).

9. BIDDER QUESTIONS

A. Bidders must direct all questions about the meaning or intent of Bidding Documents to Owner in writing (see paragraph 2, Contact Information). Inquiries must include the full name of the Project. Owner may not answer questions received less than fourteen Days prior to the date for opening Bids. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

Email: BidderQuestions@scwa.ca.gov

10. ADDENDA

A. Owner will respond to questions and issue interpretations or clarifications as Owner, in its discretion, considers necessary, in the form of Addenda. Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner. Addenda will be written and will be issued to each Registered Planholder to the address, fax number, or email supplied to Owner by Bidder.

B. Owner may, in its discretion, choose to delay issuance of addenda in order to address several issues at once. Owner will endeavor to issue addenda in a timely manner.

C. Addenda shall be acknowledged by number with signature in Document 00400 (Bid Form) and shall be part of the Contract Documents. A complete listing of Addenda may be secured from Owner upon written request (see paragraph 2, Contact Information).

11. WAGE RATES

A. State prevailing wage rates are applicable to the Project. Copies of the state's general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of

Industrial Relations, are on file at Owner's Office and are deemed included in the Bidding Documents. Upon request, Owner will make copies available to any interested party. Copies of state wage rates are also available at www.dir.ca.gov/labor_law.html.

B. Contractor shall post the applicable State prevailing wage rates at the Site.

12. OTHER REQUIREMENTS PRIOR TO BIDDING

A. Submission of Bid signifies Bidder's careful examination of Bidding Documents and complete understanding of the nature, extent, and location of Work to be performed. As a condition to Bidding, Bidder must complete tasks listed in Document 00520 (Agreement), Article 5. Submission of Bid shall constitute Bidder's express representation to Owner that Bidder has fully completed these tasks.

13. PREPARATION OF BIDS

A. Bidders must submit Bids in accordance with this Document 00200.

B. All Bidders must submit Bids using, where applicable, documents supplied in these Bidding Documents, including without limitation Document 00400 (Bid Form), Document 00420 (Bidder Registration Form), Document 00430 (Subcontractors List), and Document 00450 (Statement of Qualifications for Construction Work). Bids must be full and complete. Bidders must complete all Bid items and supply all information required by Bidding Documents. Bidders may not modify the Bid Form or qualify their Bids. Bidders must submit clearly and distinctly written Bids. Bidders must clearly make any changes in their Bids by crossing out original entries, entering new entries, and initialing new entries.

C. The submission of a Bid does not commit Owner to award a contract for the Project, to pay costs incurred in the preparation of a Bid, or to procure or contract for any goods or services.

14. REQUIRED BID SECURITY

A. Bidders must submit with their Bids either cash, a cashier's check, or certified check from a responsible bank in the United States, or corporate surety bond furnished by a surety authorized to do business in the State of California, of not less than ten percent of amount of Total Bid price, payable to "Russian River County Sanitation District." All Bidders choosing to submit a surety bond must submit it on the required form, Document 00411 (Bond Accompanying Bid).

15. REQUIRED SUBCONTRACTORS LIST

A. All Bidders must submit with their Bids the required information on all Subcontractors in Document 00430 (Subcontractors List) for those Subcontractors who will perform any portion of Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent of total Bid. Violation of this requirement may result in Bid being deemed non-responsive and not being considered.

16. REQUIRED STATEMENT OF QUALIFICATIONS

A. In order for a Bidder to be eligible to Bid on this Contract, Bidder must submit a Statement of Qualifications responsive to the requirements identified in Document 00450 (Statement of Qualification for Construction Work) ("SOQ"), including without limitation qualification information for Subcontractors and schedulers, if any. Information in the SOQ shall be current.

17. REQUIREMENT FOR SEPARATE SEALED ENVELOPES

A. Owner will receive Bids in two separate opaque sealed 10" x 13" envelopes, labeled Envelope "A" and Envelope "B," each containing the respective items described in paragraphs 18 and 19 of this Document 00200.

18. CONTENTS OF ENVELOPE "A" - BID PRICE

A. Envelope "A" shall include:

1) Document 00400 (Bid Form) completed in accordance with paragraph 13 of this Document 00200.

2) Bid security completed in accordance with Document 00411 and with paragraph 14 of this Document 00200.

3) Document 00430 (Subcontractors List) in accordance with paragraph 15 of this Document 00200 and Document 00430 (Subcontractors List).

4) Document 00481 (Noncollusion Declaration).

19. CONTENTS OF ENVELOPE "B" - BIDDER QUALIFICATIONS

A. Envelope "B" shall include:

1) Statement of Qualifications including all necessary attachments and supporting documents submitted in accordance with paragraph 16 of this Document 00200 and Document 00450 (Statement of Qualifications for Construction Work).

2) Document 00420 (Bidder Registration Form). Bidder must complete this form and include comprehensive answers to all questions.

20. LABELING OF BID ENVELOPES

A. Bidder shall mark its Bid envelopes on the outside with Bidder's name and the following:

BID FOR THE RUSSIAN RIVER COUNTY SANITATION DISTRICT,
CONTRACT NUMBER 70-713-7 #1A,
RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL
"Envelope A" or "Envelope B" (as appropriate)

21. WITHDRAWAL OF BIDS PRIOR TO BID OPENING TIME

A. Bidders may withdraw their Bids at any time prior to the Bid opening time fixed in this Document 00200, only by written request for the withdrawal of Bid filed with Owner. Bidder or its duly authorized representative shall execute request to withdraw Bid.

22. SUBMITTAL OF BIDS

A. Sealed Bids will be received on Tuesday, June 25, 2013, at Owner's Office at the address listed in paragraph 2, Contact Information and as shown in the map provided in Document 00203 (Bid Submittal Vicinity Map).

B. Owner's staff will determine official time and will call out the specified time in the Bid reception area of Owner's Office.

C. Envelope "A" shall be due by 10:00 a.m.

D. Envelope "B" shall be due by 11:00 a.m.

E. All Bid envelopes will be time-stamped by Owner to reflect their submittal time.

23. BID OPENING

A. Owner's staff will determine official time and will call out the specified time in the Bid reception area of Owner's Office.

B. Owner will open all Bidders' Envelopes "A" at 11:00 a.m. on the date specified in paragraph 22 above, initially evaluate them for responsiveness, and determine an Apparent Low Bidder as specified herein. Owner will not open Envelopes "B" publicly and, except for the Apparent Low Bidder's Envelope "B" (or as otherwise provided in this Document 00200), they will remain unopened.

24. BID EVALUATION

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, unit prices, and other data, as may be requested in Document 00400 (Bid Form) or prior to the Notice of Award. Owner will also consider Bidders' qualifications.

25. DETERMINATION OF APPARENT LOW BIDDER (ENVELOPE "A")

A. Apparent Low Bid will be based solely on the total amount of all Bid items based on assumptions contained in Document 00400 (Bid Form). All Bidders are required to submit Bids on all Bid items.

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

C. Quantities stated in the Bidding Documents are approximate only and are subject to correction upon final measurement of the Work, and are subject further to the rights reserved by Owner to increase or diminish the amount of work under any classification as advantages to design or construction needs require.

26. EVALUATION OF BIDDER RESPONSIBILITY (ENVELOPE "B")

A. Owner may determine whether a Bidder is qualified in its sole discretionary judgment.

B. Owner will open Apparent Low Bidder's Envelope "B" and check its contents for compliance with paragraph 19 of this Document 00200 and this paragraph 26. Owner will notify Apparent Low Bidder in writing of any deficiencies found and will provide Bidder the opportunity to respond in writing with reasonable clarifications but will not allow any changes in the nature of Bidder as a business entity.

C. Written clarifications made by Bidder in response to Owner's requests for clarifications during the Bid evaluation process become part of the Bid.

D. If any Apparent Low Bidder is determined to be non-responsive or non-responsible, Owner may open the next Apparent Low Bidder's Envelope "B" pursuant to any procedures determined in Owner's reasonable discretion, and proceed for all purposes as if this Apparent Low Bidder were the original Apparent Low Bidder.

E. In order to evaluate Bidder's ability to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time, Owner may conduct reasonable investigations and reference checks of Bidder, proposed Subcontractors, suppliers and other persons and organizations as Owner deems necessary to assist in the

evaluation of any Bid and to establish Bidder's responsibility, qualifications, financial ability, proposed Subcontractors, suppliers, and other persons and organizations. Submission of a Bid constitutes Bidder's consent to the foregoing. Owner shall have the right to consider information provided by sources other than Bidder. Owner shall also have the right to communicate directly with Bidder's surety regarding Bidder's bonds.

F. Bidder's compliance with the minimum qualification requirements in this paragraph will be measured by the experience of both the Bidder itself as well as the Key Personnel identified by Bidder in Document 00450 (Statement of Qualifications for Construction Work) who will have responsible charge of the various major components of the Work. If Bidder subcontracts portions of the Work, Owner, in its determination of whether the minimum qualification requirements have been met, will consider the qualifications of the Subcontractor's Key Personnel identified by Bidder in Document 00450 (Statement of Qualifications for Construction Work).

G. Except as otherwise provided in this Document 00200 or in Document 00450 (Statement of Qualification for Construction Work), Owner will make final determinations regarding Bidder responsibility based solely upon the SOQ submitted as part of Envelope "B" on Bid day.

27. PUBLIC RECORDS ACT REQUESTS, BID INFORMATION, AND CONFIDENTIALITY WAIVER

A. Per the Public Records Act, Owner will make available to the public Bidder's SOQ (if Bidder's Envelope "B" is opened), all correspondence and written questions submitted during the Bid period, all Bid submissions opened in accordance with the procedures of this Document 00200, and all subsequent Bid evaluation information. All submissions not opened will remain sealed and eventually be returned to the submitter. Except as otherwise required by law, Owner will not disclose proprietary financial information submitted that has been designated confidential by Bidder (including but not limited to audited financial statements and Part C, Financial Information in Bidder's SOQ. Any such proprietary financial information that a Bidder believes should be exempted from disclosure shall be specifically identified and marked as such. Blanket-type identification by designating whole pages or sections shall not be permitted and shall be invalid.

B. Upon a request for records regarding this Bid which specifically includes confidential information marked by Bidder in accordance with Paragraph A, above, Owner will notify Bidder within ten Days from receipt of the request. If Owner agrees that the information so marked is proprietary financial information exempt from disclosure, Owner shall refuse to disclose the information and Bidder shall take all appropriate legal action and defend Owner's refusal to produce the information in all forums. If Owner does not agree that the information so marked is exempt from disclosure, Owner will so notify Bidder of a specific time when, in response to the request, the records will be made available for inspection in accordance with the Public Records Act.

C. By submitting a bid, Bidder shall be deemed to have waived any objections to the release of all other information and also to the release of any financial information that was not designated as confidential at the time the bid is submitted.

28. OWNER'S RIGHT TO REJECT BIDS

A. Bidder's failure to submit all required documents strictly as required entitles Owner to reject the Bid as non-responsive.

B. Owner will reject all Bids received after the specified time and will return such Bids to Bidders unopened.

C. Owner will reject as non-responsive any Bid not submitted on the required forms.

D. Owner reserves the right in its sole discretion to reject any Bid as non-responsive as a result of any error or omission in the Bid.

E. Owner reserves the right to reject any Bid not clearly written.

F. Owner will reject as non-responsive any Bid submitted without the necessary Bid security.

G. Owner may reject any or all Bids and waive any informalities or minor irregularities in the Bids. Owner also reserves the right, in its discretion, to reject any or all Bids and to re-Bid the Project. Owner reserves the right to reject any or all nonconforming, non-responsive, unbalanced, or conditional Bids, and to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. For purposes of this paragraph, an "unbalanced Bid" is one having nominal prices for some Bid items and enhanced prices for other Bid items.

29. NOTICE OF INTENT TO AWARD FOR CONSTRUCTION

A. Document 00505 (Notice of Intent to Award for Construction) will be posted at Owner's Office and in the main lobby of the County of Sonoma Administration Building, 575 Administration Drive, Santa Rosa, California. Owner will use reasonable efforts to deliver an electronic copy of Document 00505 (Notice of Intent to Award for Construction) to all Bidders who submitted Bids no later than the Business Day after issuance, although any delay or failure to do so will not extend the Bid protest deadline described below.

30. BID PROTESTS

A. Any Bid protest must be submitted in writing to Owner (Attention: Contract Administration), before 3:30 p.m. of the fifth Business Day following posting of Document 00505 (Notice of Intent to Award for Construction). Owner's staff will determine official time and will call out the specified time in the Bid reception area of Owner's Office, stating that the period for accepting Bid protests is closed.

B. The initial protest document must contain a complete statement of the basis for the protest. The protest must refer to the specific portion of the document that forms the basis for the protest. The protest must include the name, address, and telephone number of the person representing the protesting party.

C. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

D. The procedure and time limits set forth in this paragraph are mandatory and are Bidder's sole and exclusive remedy in the event of Bid protest. Bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings. A Bidder may not rely on a protest submitted by another Bidder but must timely pursue its own protest.

31. NOTICE OF AWARD

A. If the Contract is to be awarded, it will be awarded to the lowest responsible responsive Bidder. Following completion of all required Owner procedures and receipt of all Owner approvals, Owner will issue Document 00510 (Notice of Award) to successful Bidder.

32. POST-NOTICE OF AWARD REQUIREMENTS

A. After Notice of Award, the successful Bidder must execute and submit the following documents as indicated below.

B. Submit the following documents to Owner by 5:00 p.m. of the 20th Day following Notice of Award. Execution of Contract by Owner depends upon approval of these documents.

1) Document 00520 (Agreement): To be executed by successful Bidder. Submit four originals, each bearing an original signature on the signature page and initials on each page.

2) Document 00611 (Construction Performance Bond): To be executed by successful Bidder and surety, in the amount set forth in Document 00611 (Construction Performance Bond). Submit four originals. Liquidated Damages are described in Document 00520 (Agreement).

3) Document 00612 (Construction Labor and Material Payment Bond): To be executed by successful Bidder and surety, in the amount set forth in Document 00612 (Construction Labor and Material Payment Bond). Submit four originals.

4) The Guaranty in the form set forth in Document 00630 (Guaranty). Submit four originals, each bearing an original signature.

5) One complete set of documentary information received or generated by successful Bidder in preparation of Bid prices for its Bid, as set forth in Document 00670 (Escrow Bid Documents).

6) Insurance certificates and endorsements required by Article 4 of Document 00700 (General Conditions). Submit one original set.

C. Owner shall have the right to communicate directly with Apparent Low Bidder's proposed performance bond surety, to confirm the performance bond.

1) If Bidder exercises the option to open an Escrow Account, Owner and Contractor shall, at the time the account is opened, deliver to Escrow Agent a fully executed counterpart of Document 00680, Escrow Agreement for Security Deposits in Lieu of Retention.

33. FAILURE TO EXECUTE AND DELIVER DOCUMENTS

A. Successful Bidder's failure to submit the documents required herein, in a proper and timely manner, entitles Owner to rescind its award and to cause Bidder's Bid security to be forfeited as provided herein.

B. If Bidder to whom Contract is awarded, within the period described in paragraph 32 of this Document 00200, fails or neglects to execute and deliver all required Contract Documents and file all required bonds, insurance certificates, and other documents, Owner may, in its sole discretion, exercise either of the following remedies:

1) Foreclose on Bidder's surety bond, or deposit Bidder's cashier's check or certified check for collection, and retain the proceeds thereof as liquidated damages for Bidder's failure

to enter into the Contract Documents. Bidder agrees that calculating the damages Owner may suffer as a result of Bidder's failure to execute and deliver all required Contract Documents would be extremely difficult and impractical and that the amount of Bidder's required Bid security shall be the agreed and presumed amount of Owner's damages. In addition, upon such failure, Owner may determine the next Apparent Low Bidder and proceed accordingly.

34. RETURN OF BID SECURITY

A. Owner may retain Bid security of other than the Apparent Low Bidder for a period of 60 Days after issuance of the Notice of Award. After award, Owner will return to the respective unsuccessful Bidders their Bid securities and Bid bonds.

35. CONFORMED PROJECT MANUAL

A. Following Award of Contract, Owner may prepare a conformed Project Manual reflecting Addenda issued during bidding, which will, failing objection, constitute the approved Project Manual.

36. MODIFICATION OF COMMENCEMENT OF WORK

A. Owner expressly reserves the right to modify the date for the Commencement of Work under the Contract and to independently perform and complete work related to the Project. Owner accepts no responsibility to Contractor for any delays attributed to its need to complete independent work at the Site.

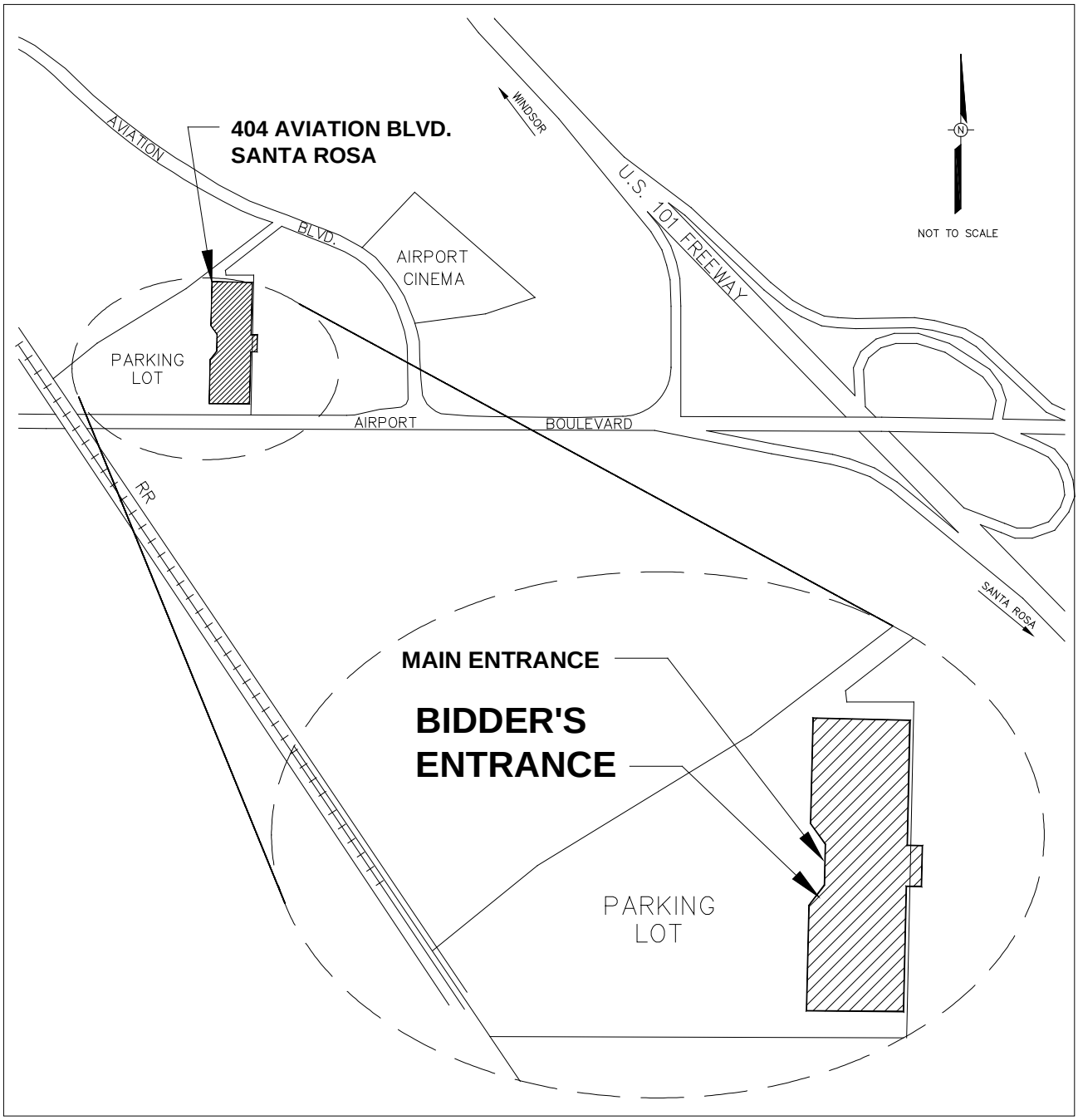
37. EQUAL EMPLOYMENT OPPORTUNITY

A. Contractor shall comply with all applicable federal, state, and local laws, rules, and regulations in regard to nondiscrimination in employment because of race, color, ancestry, national origin, religion, sex, marital status, age, medical conditions, disability, or any other reason.

END OF DOCUMENT

DOCUMENT 00203

BID SUBMITTAL VICINITY MAP



END OF DOCUMENT

DOCUMENT 00210

INDEMNITY AND RELEASE AGREEMENT

Dated _____

POTENTIAL BIDDER: _____

OWNER: RUSSIAN RIVER COUNTY SANITATION DISTRICT

SITE: _____

PROJECT: RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT BIOLOGICAL NUTRIENT REMOVAL

In consideration of the above-referenced Owner's permitting the undersigned potential bidder ("Bidder") to have access to, and to conduct investigations, tests and/or inspections on, the Site, Bidder hereby agrees as follows:

1. To the greatest extent permitted by law, Bidder hereby releases, and shall defend, indemnify and hold harmless Owner, and its officers, employees, consultants, representatives, and agents, including without limitation, the Sonoma County Water Agency and its officers, employees, consultants, representatives, and agents, and all other parties having any other interest in the Site, against any claim or liability, including attorney's fees, arising from or relating to any Site-related access, investigation, test, inspection and/or other activity conducted by Bidder or any of Bidder's officers, employees, consultants, representatives, and/or agents, regardless of whether claim or liability is caused in part by the negligence of Owner or by any released and indemnified party.

2. Bidder hereby waives the provisions of California Civil Code Section 1542 which provides as follows:

   > A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him, must have materially affected his settlement with the debtor.

3. Bidder shall repair any damage to the Site or adjacent property resulting from activities authorized hereunder, and return Site to its original condition as directed by Owner, and comply with and be subject to all other requirements and obligations described or referenced in Document 00320 (Geotechnical Data and Existing Conditions).

4. Attached hereto (or to be delivered separately before Bidder's visit to the Site) is a certificate for comprehensive general liability insurance satisfying the requirements of Document 00700 (General Conditions).

5. Although this Indemnity and Release Agreement is not a Contract Document (see Document 00520 [Agreement]), it shall be fully effective and binding regardless of

whether Bidder submits a Bid for the subject Project, is awarded a contract for the Project, or otherwise.

_____
Name of Bidder

By: _____
Signature

Its: _____
Title (If Corporation: Chairman, President or Vice President)

By: _____
Signature

Its: _____
Title (If Corporation: Secretary, Assistant Secretary, Chief Financial Officer or Assistant Treasurer)

END OF DOCUMENT

DOCUMENT 00320

GEOTECHNICAL DATA AND EXISTING CONDITIONS

1. SUMMARY

A. This Document 00320 sets forth the terms and conditions under which Bidder may review, study, use, or rely upon geotechnical data at or contiguous to the Site, and existing conditions information concerning existing conditions and Underground Facilities at or contiguous to the Site. This Document 00320, the available geotechnical data, and the supplied existing conditions information are not Contract Documents.

2. REPORT AND INFORMATION

A. Existence of Reports. Owner, its consultants, and prior contractors may have collected documents providing a general description of the Site and conditions of the Work. These documents may consist of geotechnical reports for and around the Site, contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding Underground Facilities. These reports, documents and other information are not part of the Contract Documents.

B. Inspection of Reports. Bidders may inspect geotechnical reports, documents, and information regarding existing conditions available at the Owner's Office, and may obtain copies at cost of reproduction and handling upon Bidder's payment for the costs. These reports, documents, and other information are not part of the Contract Documents. Nevertheless, by submitting a Bid, Bidder accepts full responsibility for reviewing, knowing and understanding the contents of all of these materials.

C. Inclusion in Project Manual. Geotechnical reports may be included in the Project Manual and information regarding existing conditions may also be included in the Project Manual, but neither shall be considered part of the Contract Documents.

D. Available Documentation. The following documentation is available for review for Contract Number 70-713-7 #1A through Owner:

1. None.

3. USE OF INFORMATION ON EXISTING CONDITIONS

A. Aboveground Existing Conditions. Under no circumstances shall Owner be deemed to make a warranty or representation of existing aboveground conditions, as-built conditions, or other aboveground actual conditions verifiable by reasonable independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder must perform prior to bidding and Bidder must not rely on the information supplied by Owner regarding existing conditions. Bidder represents and agrees that in submitting its Bid, it is not relying on any information regarding existing conditions supplied by Owner.

B. Underground Facilities. Information supplied regarding existing Underground Facilities at or contiguous to the Site is based on information furnished to Owner by others (e.g., the owners or builders of such Underground Facilities or others). Except as expressly set forth in this Document 00320, Owner does not assume responsibility for the accuracy, completeness or thoroughness of this information, and Bidder is solely responsible for any interpretation or conclusion drawn from this information. Except as expressly set forth in this Document 00320, Owner will be responsible only for the general accuracy of information regarding Underground Facilities, and only for those Underground Facilities

that are owned by Owner. This express assumption of responsibility applies only if Bidder has conducted the independent investigation required of it and discrepancies were not apparent.

4. LIMITED RELIANCE PERMITTED ON CERTAIN GEOTECHNICAL INFORMATION

A. Geotechnical Data. Except as expressly set forth in this Document 00320, Owner does not warrant, and makes no representation regarding, the accuracy or thoroughness of any geotechnical data. Bidder represents and agrees that in submitting its Bid, it is not relying on any geotechnical data supplied by Owner, except as specifically set forth herein.

1. Bidder may rely upon the general accuracy of the "technical data" contained in the geotechnical reports and drawings identified above, but only insofar as it relates to subsurface conditions, provided Bidder has conducted the independent investigation required of it and discrepancies were not apparent. The term "technical data" in the referenced reports and drawings shall be limited as follows:
   a. The term "technical data" shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment, or structures that were encountered during subsurface exploration.
   b. The term "technical data" does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures.
   c. The term "technical data" shall not include the location of Underground Facilities.
   d. Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder may rely upon the general accuracy of the "technical data" contained in such reports or drawings.
   e. Bidder is solely responsible for any interpretation or conclusion drawn from any "technical data" or any other data, interpretations, opinions, or information contained in supplied geotechnical data.

5. INVESTIGATIONS

A. Before submitting a Bid, each Bidder shall be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site or otherwise, which may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of Contract Documents. Bidders shall advise Owner in writing during the Bid period of any questions, suppositions, inferences or deductions Bidders may have for Owner's review and response.

B. Owner has provided time in the period prior to bidding for Bidder to perform these investigations.

6. ACCESS TO SITE FOR INVESTIGATIONS

A. During the Pre-Bid Site Visit(s), Owner will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidders must fill all holes and clean up and restore the Site to its former conditions upon completion of such explorations, investigations, tests, and studies. Such investigations may be performed only under the provisions of Document 00200 (Instructions to Bidders) and Document 00700 (General

Conditions) including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such investigation work. Each Bidder shall supply all equipment required to perform any investigations as each Bidder deems necessary. Owner has the right to limit the number of pieces of machinery operating at one time due to safety concerns.

END OF DOCUMENT

DOCUMENT 00400

BID FORM

To be submitted as part of Envelope "A" by the time and date specified in Document 00200 (Instructions to Bidders), paragraph 1.

TO THE HONORABLE BOARD OF DIRECTORS OF THE RUSSIAN RIVER COUNTY SANITATION DISTRICT

THIS BID IS SUBMITTED BY:

_____

(Firm/Company Name)

Re: CONTRACT NUMBER 70-713-7 #1A, RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT BIOLOGICAL NUTRIENT REMOVAL

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the Russian River County Sanitation District, a local district of the State of California ("Owner") in the form included in the Contract Documents, Document 00520 (Agreement), to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Contract Documents, Document 00100 (Advertisement for Bids), and Document 00200 (Instructions to Bidders), including, without limitation, those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for 90 Days after the day of Bid opening.

3. In submitting this Bid, Bidder represents:

   (a) Bidder has examined all of the Contract Documents and all of the Addenda (receipt of all of which is hereby acknowledged). The Addenda are listed below.

Addendum Number	**Addendum Date**	**Signature of Bidder**

   (b) Bidder has visited the Site and performed all tasks, research, investigation, reviews, examinations, and analysis and given notices, regarding the Project and the Site, as set forth in Document 00520 (Agreement), Article 5.

(c) Bidder has given Owner prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents and as-built drawings and actual conditions and the written resolution thereof through Addenda issued by Owner is acceptable to Contractor.

4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sums of money listed in the following Schedule of Bid Prices:

SCHEDULE OF BID PRICES

All Bid items, including lump sums and unit prices, must be filled in completely. Bid items are described in Section 01100 (Summary of Work). Quote in figures only, unless words are specifically requested.

ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL
1.	Bonds	XXXXXX	Lump Sum	XXXXX	$
2.	Insurance	XXXXXX	Lump Sum	XXXXX	$
3.	Safety Program and Implementation	XXXXXX	Lump Sum	XXXXX	$
4.	Construction Material Waste Management Plan and Implementation	XXXXXX	Lump Sum	XXXXX	$
5.	Installation, Operation, and Maintenance Manuals	XXXXXX	Lump Sum	XXXXX	$
6.	Mobilization/ Demobilization	XXXXXX	Lump Sum	XXXXX	$
7.	Biological Nutrient Removal System and Appurtenances	XXXXXX	Lump Sum	XXXXX	$
8.	All Other Work	XXXXXX	Lump Sum	XXXXX	$
				TOTAL BID PRICE	$

Total: _____
(Words)

5. Subcontractors for work included in all Bid items are listed on the attached Document 00430 (Subcontractors List).

6. The undersigned Bidder understands that Owner reserves the right to reject this Bid.

7. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Award, is mailed or delivered to the undersigned Bidder within the time described in paragraph 2 of this Document 00400 or at any other time thereafter unless the Notice of Award is withdrawn, the undersigned Bidder will execute and deliver the documents required by Document 00200 (Instructions to Bidders) within the times specified therein. These documents include, but are not limited to, Document 00520 (Agreement), Document 00611 (Construction Performance Bond), and Document 00612 (Construction Labor and Material Payment Bond).

8. Notice of Award or request for additional information may be addressed to the undersigned Bidder at the address set forth below.

9. The undersigned Bidder herewith encloses cash, a cashier's check, or certified check of or on a responsible bank in the United States, or a corporate surety bond furnished by a surety authorized to do a surety business in the State of California, in form specified in Document 00200 (Instructions to Bidders), in the amount of ten percent (10%) of the Total Bid Price and made payable to "Russian River County Sanitation District."

10. The undersigned Bidder agrees to commence Work under the Contract Documents on the date established in Document 00700 (General Conditions) and to complete all work within the time specified in Document 00520 (Agreement). The undersigned Bidder acknowledges that Owner has reserved the right to delay or modify the commencement date. The undersigned Bidder further acknowledges Owner has reserved the right to perform independent work at the Site, the extent of such work may not be determined until after the opening of the Bids, and that the undersigned Bidder will be required to cooperate with such other work in accordance with the requirements of the Contract Documents.

11. The undersigned Bidder agrees that, in accordance with Document 00700 (General Conditions), liquidated damages for failure to complete all Work in the Contract within the time specified in Document 00520 (Agreement) shall be as set forth in Document 00520 (Agreement).

12. The names of all persons interested in the foregoing Bid as principals are:

(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full).

NAME OF BIDDER: _____
licensed in accordance with an act for the registration of Contractors, and with license number: _____ Expiration: _____.

_____ _____
Where incorporated, if applicable

_____

_____

Principals

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

_____
Signature of Bidder

_____
Date of Execution

_____
Place of Execution

NOTE: If Bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If Bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

Business Address: _____
_____
_____

Contractor's Representative(s), (name, title): _____
_____

Officers authorized to sign contracts: _____
_____
_____

_____
Signature of Officer

_____
Title

_____
Date of Execution

_____
Place of Execution

Telephone Number(s): _____

Fax Number(s): _____

Email address(es): _____

Date of Bid: _____

END OF DOCUMENT

DOCUMENT 00411

BOND ACCOMPANYING BID

KNOW ALL BY THESE PRESENTS:

That the undersigned _____ [Name of Contractor] as Principal and the undersigned as Surety are held and firmly bound unto the RUSSIAN RIVER COUNTY SANITATION DISTRICT, a local district of the State of California ("Owner"), as obligee, in the penal sum of _____ _____ _____ Dollars ($_____) lawful money of the United States of America being at least ten percent (10%) of the aggregate amount of said Principal _____'s base Bid, for the payment of which, well and truly to be made, we bind ourselves, our successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal is submitting a Bid for Owner Contract Number 70-713-7 #1A, Russian River County Sanitation District Treatment Plant Biological Nutrient Removal.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Bid submitted by the said Principal be accepted and the Contract be awarded to said Principal and said Principal shall within the required periods enter into the Contract so awarded and provide the required Construction Performance Bond, Construction Labor and Material Payment Bond, insurance certificates, and all other endorsements, forms, and documents required under Document 00200 (Instructions to Bidders), then this obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument this _____ day of _____, 20_____, in _____, California.

(Corporate Seal)

By

_____

Principal

_____

Surety

(Corporate Seal)

By

_____

Attorney in Fact

(Evidence of execution shall be provided by Notarial Acknowledgement of the same, in accordance with California Civil Code section 1189, as amended January 1, 2008.)

END OF DOCUMENT

DOCUMENT 00420

BIDDER REGISTRATION FORM

INSTRUCTIONS

In order to register to undertake work for the Russian River County Sanitation District, Bidder must provide the following:

1) Fill out this registration form completely; do not leave blanks.
2) Provide certificates of insurance or a letter evidencing coverage complying with paragraph 4.2 of Document 00700 (General Conditions).

INDEPENDENT CONTRACTOR REGISTRATION

Contractor's License # _____

Date: _____ Fed I.D. # _____

Full Corporate Name of Company: _____

Street Address: _____

_____

Mailing Address: _____

_____

Phone: _____ Fax: _____

Name of Principal Contact: _____

Type of Business: _____ Sole Proprietor _____ Partnership
_____ Non-Profit 501 C3 _____ Corporation
_____ other (please explain:_____)

INSURANCE

Workers' Compensation:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

General Liability:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limits: $ _____

A.M. Best Rating: _____

Automobile Liability:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limits: $ _____

A.M. Best Rating: _____

Professional Liability (if applicable, as required by Document 00800 [Supplementary Conditions]):

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limits: $ _____

A.M. Best Rating: _____

Environmental Impairment Liability (if applicable, as required by Document 00800 [Supplementary Conditions]):

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limits: $ _____

A.M. Best Rating: _____

BIDDER CERTIFIES, UNDER PENALTY OF PERJURY, THAT THE FOREGOING INFORMATION IS CURRENT AND ACCURATE AND AUTHORIZES THE RUSSIAN RIVER COUNTY SANITATION DISTRICT, AND ITS AGENTS AND REPRESENTATIVES TO OBTAIN A CREDIT REPORT AND/OR VERIFY ANY OF THE ABOVE INFORMATION.

_____
Signature

_____
Date

END OF DOCUMENT

DOCUMENT 00430

SUBCONTRACTORS LIST

Bidder submits the following information as to the subcontractors Bidder intends to employ if awarded the Contract.

Full Name of Subcontractor and Address of Mill or Shop	Email address of Subcontractor	Description of Work: Reference To Bid Items	Subcontractor's License No.

(Bidder to attach additional sheets if necessary)

END OF DOCUMENT

DOCUMENT 00450

STATEMENT OF QUALIFICATIONS FOR CONSTRUCTION WORK

STATEMENT OF QUALIFICATIONS CHECKLIST

This checklist is for Bidder's convenience and lists some of the completed documents Bidder shall ensure are submitted with Bidder's Statement of Qualifications.

- ☐ Letter of Assurance Regarding Performance and Payment Bonds (Document 00450, Attachment "A"). Modification of this form may result in rejection of the bid as non-responsive.
- ☐ Authorization to Contact Surety Form (Document 00450, Attachment "B")
- ☐ Statement of Qualifications Questionnaire (Document 00450, Attachment "C")
- ☐ Technical Resources identification and description
- ☐ Résumés of Key Personnel
- ☐ Cal/OSHA 300A log for 2012

(This page intentionally left blank)

1. REQUIRED CONTENTS OF SOQ SUBMISSION

A. Financial Capacity. Bidder shall submit audited or reviewed financial statements for the three most recently completed fiscal years for Bidder and each member of any proposed consortium or joint venture. Bidder must also include audited or reviewed financial statements for the three most recently completed fiscal years for any parent company(ies) of Bidder and each member of any proposed consortium or joint venture. Bidder shall fully disclose the nature and extent of any material changes in Bidder's financial condition since the date of its most recent audited or reviewed financial statement(s).

B. Capability to Provide Required Performance and Payment Bonds.
   1. Include a completed "Letter of Assurance Regarding Performance and Payment Bonds" from Bidder's Surety in the form attached to this Document 00450 as Attachment "A";
   2. Include a completed "Authorization to Contact Surety" from Bidder in the form attached to this Document 00450 as Attachment "B."

C. Human and Physical Resources. Identify, describe, and quantify for Bidder, the following technical resources for the Work:
   1. For products or materials listed in the "Major Products List" (see Section 01330 [Submittal Procedures]), provide description and location of manufacturing facilities, naming products and quantifying production capacity and current demand;
   2. Description of field organization(s), naming skills and equipment;
   3. Description of safety program, quality control procedures, and safety experience; and
   4. Evidence of a valid California contractor's license and required licenses of all persons who are Key Personnel of the Bidder or any designated Subcontractor.

D. Completed Questionnaire. Include a completed "Statement of Qualifications Questionnaire" in the form attached to this Document 00450 as Attachment "C." Add supplementary information if necessary.

E. Résumés of Proposed Key Personnel. Include a resume for each named Key Personnel of Bidder, and Bidder's (including but not limited to the superintendent) designated Subcontractor(s), to include the following:
   1. Name and proposed assignment of Key Personnel - do not include home addresses or phone numbers;
   2. Years of experience;
   3. Education - degrees, schools, and years obtained;
   4. Professional registration(s);
   5. Fluency in English (Yes/No);
   6. Experience directly related to above proposed assignment;
   7. At least three client references, including contact names, addresses, and telephone numbers; and
   8. Description of experience requirements as required by Document 00200 (Instructions to Bidders).

F. Litigation History. Bidder shall submit a description of all claims and litigation matters, whether pending or resolved, brought in the last five (5) years, names of involved parties, the nature of dispute, and its disposition, including the dollar amount of any judgment or settlement.

2. GENERAL CONDITIONS

A. General Conditions for Content. The SOQ shall be clear and concise to enable management-oriented personnel to make a thorough evaluation and arrive at a sound determination as to whether the SOQ meets Owner's requirements. To this end, the SOQ shall be so specific, detailed, and complete as to demonstrate clearly and fully that the Bidder has a thorough understanding of and has demonstrated knowledge of the requirements to perform the Work (or applicable portion thereof).

B. Explanations to SOQ. Any explanation requested by a Bidder regarding the meaning or interpretation of this Document 00450 shall be requested in writing in accordance with Document 00200 (Instructions to Bidders). Oral explanations or instructions will not be binding. Any information provided to any prospective Bidder concerning this Document 00450 will be furnished to all prospective Bidders as an Addendum to the Bidding Documents.

3. DEFINITIONS

A. Except as set forth herein, all abbreviations and definitions of terms used in this Document 00450 are as set forth in Document 00700 (General Conditions) or Section 01420 (References and Definitions).

LETTER OF ASSURANCE REGARDING PERFORMANCE AND PAYMENT BONDS, AUTHORIZATION TO CONTACT SURETY FORM, AND STATEMENT OF QUALIFICATION QUESTIONNAIRE ARE ON FOLLOWING PAGES

ATTACHMENT "A" -- Letter of Assurance Regarding Performance and Payment Bonds

To Russian River County Sanitation District:

This letter is written by _____ [insert name of surety], a surety duly licensed to do business in the State of California, having a financial rating from A. M. Best Company of A or better. The purpose of this letter is to advise the Russian River County Sanitation District that this surety has agreed to provide _____ [insert name of Bidder] with the required performance and payment bonds in accordance with the requirements set forth in Documents 00611 (Construction Performance Bond) and 00612 (Construction Labor and Material Payment Bond) for the Russian River County Sanitation District Treatment Plant Biological Nutrient Removal, if the Bid submitted by said Bidder is accepted and the Contract is awarded to said Bidder. These performance and payment bonds shall be in the minimum penal sums provided therein.

_____
Signature of Surety's Authorized Representative

_____
Name and Title

_____
Date

ATTACHMENT "B" -- Authorization to Contact Surety

The Russian River County Sanitation District is hereby authorized to verify with the Surety identified in Attachment "A" that the Surety will, based upon Bid prices, issue the required bonds under the conditions stated in Attachment "A."

_____
Signature of Bidder's Authorized Representative

_____
Name and Title

_____
Date

ATTACHMENT "C" -- Statement of Qualifications Questionnaire

Bidders shall complete the entire Statement of Qualification Questionnaire and submit it in accordance with Document 00200 (Instructions to Bidders) and this Document 00450. Failure to complete the questionnaire or inclusion of any false statement(s) shall be grounds for immediate disqualification. Label attachments with a reference to the related document, part, and question number.

BIDDER'S CONTACT INFORMATION

Company Name: _____

Owner of Company: _____

Contact Person: _____

Address: _____

Phone: _____ Fax: _____

PART A: GENERAL INFORMATION

Complete Part A before proceeding to Part B.

1. Does Bidder possess a valid and current California Contractor's license for the Work proposed? Yes _____ No _____
2. Does Bidder have a minimum general liability insurance coverage as required by Document 00800 (Supplementary Conditions)? Yes _____ No _____

Bidder will be immediately disqualified if any answer to questions 1 or 2 above is No.

3. Has Bidder's license been suspended or revoked at any time in the last five years? Yes _____ No _____
4. Has Bidder been "default terminated" by an owner (other than for convenience), or has a Surety completed a contract for Bidder within the last five years? Yes _____ No _____
5. Labor Commissioner assessments or determination of ineligibility to bid:
   a. Has Bidder had a final civil wage and penalty assessment against it from the Labor Commissioner more than twice in the last five years? Yes _____ No _____
   b. Has Bidder been determined by the Labor Commissioner to be ineligible to bid on public contracts more than twice in the last five years? Yes _____ No _____

Bidder will be immediately disqualified if any answer to questions 3, 4, 5.a, or 5.b above is Yes.

PART B: SAFETY, PREVAILING WAGE, DISPUTES, AND BONDS

(SAFETY)

1. Cal/OSHA Citations and Penalties: Yes_____ No_____
   If yes, please submit the following information to determine if Bidder meets the suggested safety criteria for this Project. Describe any Cal/OSHA citations and penalties that Bidder has received in the last three years. For each occurrence state whether the action by Cal/OSHA resulted in a citation, or a penalty, or both. Describe the activities that led to the action by Cal/OSHA. Provide dates, citation numbers, penalty amounts, and any other relevant information regarding the action by Cal/OSHA. Responses shall be machine written or neatly printed on company letterhead and signed by an officer of the company.

   ☐ Separate sheet attached.

2. Experience Modification Rates:
   What were Bidder's Interstate Experience Modification Rates as established by the Workers' Compensation Insurance Rating Bureau for the following three years?

   2010: _____
   2011: _____
   2012: _____

   Average of last three years: _____ (no rounding)

   If Bidder was not eligible to obtain a formal rating from the Workers' Compensation Insurance Rating Bureau for any of the years listed above, Bidder shall submit written documentation from its workers' compensation insurance company that establishes what Bidder's equivalent experience modification rate would be.

   If average of last three years is greater than 1.1, Bidder shall provide an explanation here or as a separate attachment:

   _____

   _____

   _____

3. Total Recordable Incident Rates (RIR):
   What were Bidder's Total Recordable Incident Rates (RIR) for each of the last three complete years?

   2010: _____
   2011: _____
   2012: _____

   Average of last three years: _____ (no rounding)

4. Total Lost Time Incident Rates (LTIR):
What were Bidder's Total Lost Time Incident Rates (LTIR) for each of the last three complete years?

2010: _____
2011: _____
2012: _____

Average of last three years: _____ (no rounding)

5. State the name of Bidder's safety engineer/manager or Site Safety Officer: _____
Attach a résumé or outline of this individual's safety and health qualifications and experience.

(PREVAILING WAGE PROVISIONS)

6. In the past five years, has Bidder been fined, penalized or otherwise found to have violated any prevailing wage or labor code provision? If yes, attach description of each occurrence.
Yes_____ No_____

(LICENSE PROVISIONS)

7. In the past five years, has Bidder changed names or license numbers? If so, please state reason for change and list previous name(s) and any previous license number for any of Bidder's principals.

Yes_____ No_____ Reason: _____

_____

Previous name(s) and license number(s): _____

_____

(DISPUTES)

8. In the past five years, has Bidder had any claims, litigation (pending or resolved), or disputes resulting in mediation or arbitration, or termination for cause associated with any project? Yes _____ No _____
If yes, attach description of each such instance including details of total claim amount, judgment amount, or settlement amount, and the adverse party's (or parties') name(s) and phone number(s).

(BONDING)

9. Bonding Capacity - Provide documentation from Bidder's surety identifying the following:
   Name of bonding company/surety: _____

   Name of Surety Agent: _____

   Surety Agent address: _____

   Surety Agent phone number: _____

   Is surety a California-admitted surety? Yes _____ No _____

   Is surety listed in the current edition of the California Department of the Treasury's Listing of approved sureties? Yes _____ No _____

   List surety's A.M. Best Rating: _____

   What is Bidder's total bonding capacity? _____

   What percentage rate does Bidder pay for bonds? _____

PART C: FINANCIAL INFORMATION

1. Has Bidder ever reorganized under the protection of the bankruptcy laws?
   Yes____ No _____ If yes, please state when _____

2. If Bidder has had the general liability carrier identified in Document 00420 (Bidder Registration Form) for less than five years, please provide additional information below for balance of the past five years.
   Agency Name: _____

   Contact Name: _____

   Phone Number: _____

   Carrier: _____ Dates: _____ A.M. Best Rating: _____

   Carrier: _____ Dates: _____ A.M. Best Rating: _____

   Carrier: _____ Dates: _____ A.M. Best Rating: _____

3. Has Bidder ever had insurance terminated by a carrier? Yes _____ No _____
   If yes, explain on separate signed sheet marked with correlating cross-reference to this paragraph of the questionnaire.

4. Does Bidder have any outstanding or unsatisfied judgments? Yes _____ No _____
   If yes, attach for each such judgment an explanation of the steps Bidder has taken to ensure the judgment won't interfere with Bidder's performance of the Work.

PART D: EXPERIENCE OF PRIME CONTRACTOR

The unique nature of this Project requires prior similar experience of the firm and the Key Personnel assigned. Summarize similar project experience below and provide the detailed project information requested:

Years of Experience. List years of experience as a continuously operating entity engaged in the performance of similar work (Five years required, minimum): _____

Key Personnel. List Key Personnel who will be assigned to the Work:

Project Manager: _____

Project Superintendent: _____

Project Scheduler: _____

Qualifying Projects. List three water or wastewater construction projects of a similar nature and complexity, completed within the past five years, with a contract dollar amount of at least $1,000,000 each, one of which must be a wastewater project that included construction of an aeration system and related controls. Names and references must be current and verifiable. If a separate sheet is used, it must contain all of the information shown on the table that follows:

LIST OF QUALIFYING PROJECTS - PRIME CONTRACTOR

	Project 1	Project 2	Project 3
Project Name			
Location			
Client			
Client Contact (name and phone number)			
Architect/Engineer			
Architect/Engineer Contact (name and phone number)			
Construction Manager, Project Manager, or Superintendent (name and phone number)			
Description of Project, Scope of Work Performed			
Total Construction Cost			
Completion Date			

Indicate whether water or wastewater project			
Indicate whether project included aeration and controls			

Recent Projects.

Provide information about three most recently completed projects. Names and references must be current and verifiable. If a separate sheet is used, it must contain all of the following information:

1. Project Name: _____
   Location: _____
   Owner: _____
   Owner Contact (name and phone number): _____
   Architect/Engineer: _____
   Architect/Engineer Contact (name and phone number): _____
   Const. Mgr. or Project Mgr. (name and phone number): _____
   Description of Project, Scope of Work Performed: _____
   _____
   Total Construction Cost: _____
   Total Change Order Amount: _____
   Original Scheduled Date of Completion: _____
   Time Extensions Granted (number of Days): _____
   Actual Date of Completion: _____
   Number of Stop Notices filed by subcontractors or suppliers: _____
2. Project Name: _____
   Location: _____
   Owner: _____
   Owner Contact (name and phone number): _____
   Architect/Engineer: _____
   Architect/Engineer Contact (name and phone number): _____
   Const. Mgr. or Project Mgr. (name and phone number): _____
   Description of Project, Scope of Work Performed: _____
   _____
   Total Construction Cost: _____
   Total Change Order Amount: _____
   Original Scheduled Date of Completion: _____
   Time Extensions Granted (number of Days): _____
   Actual Date of Completion: _____

Number of Stop Notices filed by subcontractors or suppliers:_____

3. Project Name: _____

Location:_____

Owner:_____

Owner Contact (name and phone number):_____

Architect/Engineer:_____

Architect/Engineer Contact (name and phone number):_____

Const. Mgr. or Project Mgr. (name and phone number):_____

Description of Project, Scope of Work Performed:_____

_____

Total Construction Cost:_____

Total Change Order Amount:_____

Original Scheduled Date of Completion:_____

Time Extensions Granted (number of Days):_____

Actual Date of Completion:_____

Number of Stop Notices filed by subcontractors or suppliers:_____

Bidder certifies, under penalty of perjury, that the foregoing information is current and accurate and authorizes the Russian River County Sanitation District, and its agents and representatives to obtain a credit report and/or verify any of the above information.

_____
Signature

_____
Title

END OF DOCUMENT

DOCUMENT 00481

NONCOLLUSION DECLARATION
PUBLIC CONTRACT CODE §7106

NONCOLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID
The undersigned declares:

I am the _____ of _____, the party making the foregoing bid.
[Office of Declarant] [Name of Bidder]

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [city], _____ [state].

_____
Signature of Principal

END OF DOCUMENT

CONTRACTING REQUIREMENTS

DOCUMENT 00505

NOTICE OF INTENT TO AWARD FOR CONSTRUCTION

DATE POSTED: _____

CONTRACT NUMBER: 70-713-7 #1A

PROJECT TITLE: RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT BIOLOGICAL NUTRIENT REMOVAL

Grant Davis, the General Manager of the Sonoma County Water Agency, intends to recommend to the Board of Directors of the Russian River County Sanitation District the award of the above-referenced Project to _____.
(Name of Contractor)

Grant Davis
General Manager

By: _____

_____
(Print name)

Title: _____

Date: _____

END OF DOCUMENT

DOCUMENT 00510

NOTICE OF AWARD

Dated _____

TO: _____

ADDRESS: _____

CONTRACT NO.: 70-713-7 #1A

CONTRACT FOR:

Russian River County Sanitation District Treatment Plant

Biological Nutrient Removal

The Contract Sum of your contract is _____ _____ Dollars ($_____).

1. Several copies of the proposed Contract Documents listed below accompany this Notice of Award.

2. You must comply with the following conditions precedent by 5:00 p.m. of the 20th Day following the date of this Notice of Award, that is, by _____, _____ [month day, year].

   a. Deliver to Owner four fully executed counterparts of Document 00520 (Agreement). Each copy of Document 00520 (Agreement) must bear your original signature on the signature page and your initials on each page.
   b. Deliver to Owner four originals of Document 00611 (Construction Performance Bond), executed by you and your surety.
   c. Deliver to Owner four originals of Document 00612 (Construction Labor and Material Payment Bond), executed by you and your surety.
   d. Deliver to Owner original set of the insurance certificates with endorsements required under Document 00700 (General Conditions).
   e. Deliver to Owner four original copies of Document 00630 (Guaranty), each executed by you.
   f. Deliver to Owner one complete set of the documentary evidence received or generated by you in preparation of Bid prices for this Contract, as set forth in Document 00670 (Escrow Bid Documents).

3. Failure to comply with these conditions within the time specified will entitle Owner to consider your Bid abandoned, to annul this Notice of Award, and to pursue the remedies set forth in Document 00200 (Instructions to Bidders).

4. Within 21 Days after you comply with the conditions in paragraph 2 of this Document 00510, Owner will return to you one fully signed counterpart of Document 00520 (Agreement) with ten copies of the Project Manual (including Specifications and Drawings) and five sets of full-size Drawings.

5. Attend a Post-Notice of Award Meeting at Owner's office. This meeting will be scheduled for approximately one week after this Notice of Award is issued.

6. Upon commencement of Work, you and each of your Subcontractors shall certify and provide to Owner copies of payroll records on forms provided by the Division of Labor Standards Enforcement, in accordance with Section 1776 of the California Labor Code.

RUSSIAN RIVER COUNTY SANITATION DISTRICT
A Local District of the State of California ("Owner")

BY: _____
Grant Davis, General Manager

END OF DOCUMENT

DOCUMENT 00520

AGREEMENT

Order #: 7583

THIS AGREEMENT, dated this ___ day of _____, 20__ , by and between _____ [Name of Contractor] whose place of business is located at _____ [Address of Contractor] ("Contractor"), and the RUSSIAN RIVER COUNTY SANITATION DISTRICT ("Owner"), a local district of the State of California acting under and by virtue of the authority vested in the Owner by the laws of the State of California.

WHEREAS, Owner, by its Board Action on the _____ day of _____ awarded to Contractor the following Contract:

CONTRACT NUMBER 70-713-7 #1A
RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL

NOW, THEREFORE, in consideration of the mutual covenants hereinafter set forth, Contractor and Owner agree as follows:

Article 1. Work

1.1 Contractor shall complete all Work specified in the Contract Documents, in accordance with the Specifications, Drawings, and all other terms and conditions of the Contract Documents.

Article 2. Agency and Notices to Owner

2.1 The Sonoma County Water Agency, a public agency of the State of California ("Agency"), has been designated the Owner's agent for all purposes of the Contract Documents. All Contractor agreements and other obligations (including without limitation releases, representations, covenants, indemnities and obligations to provide insurance) arising from or relating to the Contract Documents in favor of the Owner shall also be in favor of the Agency, and Agency will be an express third-party beneficiary of all Contractor agreements and other obligations. All Owner rights under the Contract Documents may be exercised by Agency, either in its own name or the Owner's name. Contractor hereby expressly consents to the foregoing.

2.2 Owner has designated Dennis Daly, Construction Management Section Manager, to act as Owner's Representative(s), who will represent Owner in performing Owner's duties and responsibilities and exercising Owner's rights and authorities in Contract Documents. Owner may change the individual(s) acting as Owner's Representative(s), or delegate one or more specific functions to one or more specific Owner's Representatives, including without limitation engineering, architectural, inspection and general administrative functions, at any time with notice and without liability to Contractor. Each Owner's Representative is the beneficiary of all Contractor obligations to Owner, including without limitation, all releases and indemnities.

2.3 Consulting Engineer: HDR Engineering, Inc., 2365 Iron Point Road, Suite 300, Folsom, California 95630. Consulting Engineer's duties will include only reviewing Submittals and RFIs. Consulting Engineer has no authority to act on behalf of Owner, to stop Work, to interpret conditions of the Contract, or to give direction to Contractor.

2.4 All notices or demands to Owner under the Contract Documents shall be to Owner's Representative at:

Hard copies: 404 Aviation Blvd., Santa Rosa, California 95403-9019
Electronic: address to be provided to Contractor by Owner with Notice to Proceed

or to such other person(s) and address(es) as Owner shall provide to Contractor.

Article 3. Contract Time and Liquidated Damages

3.1 Contract Time.

Contractor shall commence Work on the date established in the Notice to Proceed. Owner reserves the right to modify or alter the Commencement Date of the Work. As indicated in Section 01100 (Summary), the Work includes a Milestone.

Contractor shall achieve Substantial Completion of the entire Work within 460 Days from the date when the Contract Time commences to run as provided in Document 00700 (General Conditions). Contractor shall achieve Final Completion of the entire Work and be ready for Final Payment in accordance with Section 01770 (Contract Closeout) 490 Days from the date when the Contract Time commences to run as provided in Document 00700 (General Conditions).

In addition to the foregoing, Contractor shall achieve Milestone 1 within 270 Days from the date when the Contract Time commences to run as provided in Document 00700 (General Conditions).

3.2 Liquidated Damages.

Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss in the form of Contract administration expenses (such as Project management and consultant expenses), if all or any part of the Work is not completed within the times specified above, plus any extensions thereof allowed in accordance with the Contract Documents. Consistent with Article 15 of Document 00700 (General Conditions), Contractor and Owner agree that because of the nature of the Project, it would be impractical or extremely difficult to fix the amount of actual damages incurred by Owner because of a delay in completion of all or any part of the Work. Accordingly, Owner and Contractor agree that as liquidated damages for delay Contractor shall pay Owner:

3.2.1 One thousand nine hundred dollars ($1,900.00) for each Day that expires after the time specified herein for Contractor to achieve Milestone 1, until achieved.

3.2.2 One thousand nine hundred dollars ($1,900.00) for each Day that expires after the time specified herein for Contractor to achieve Substantial Completion of the entire Work, until achieved.

3.2.3 Eight hundred dollars ($800.00) for each Day that expires after the time specified herein for Contractor to achieve Final Completion of the entire Work, until achieved.

These measures of liquidated damages shall apply cumulatively and except as provided below, shall be presumed to be the damages suffered by Owner resulting from delay in completion of the Work.

Liquidated damages for delay shall only cover administrative, overhead, interest on bonds, and general loss of public use damages suffered by Owner as a result of delay. Liquidated damages shall not cover the cost of completion of the Work, or other damages, including but not limited to damages resulting from Defective Work, lost revenues or costs of substitute facilities, penalties and other costs associated with violation of legal requirements or damages suffered by others who then seek to recover their damages from Owner (for example, delay claims of other contractors, subcontractors, tenants, or other third-parties), and defense costs thereof.

Article 4. Contract Sum

4.1 Owner shall pay Contractor the Contract Sum for completion of Work in accordance with Contract Documents as follows:

ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL
1.	Bonds	XXXXXX	Lump Sum	XXXXX	$
2.	Insurance	XXXXXX	Lump Sum	XXXXX	$
3.	Safety Program and Implementation	XXXXXX	Lump Sum	XXXXX	$
4.	Construction Material Waste Management Plan and Implementation	XXXXXX	Lump Sum	XXXXX	$
5.	Installation, Operation, and Maintenance Manuals	XXXXXX	Lump Sum	XXXXX	$
6.	Mobilization/ Demobilization	XXXXXX	Lump Sum	XXXXX	$
7.	Biological Nutrient Removal System and Appurtenances	XXXXXX	Lump Sum	XXXXX	$
8.	All Other Work	XXXXXX	Lump Sum	XXXXX	$
				TOTAL BID PRICE	$

Article 5. Contractor's Representations

In order to induce Owner to enter into this Agreement, Contractor makes the following representations and warranties:

5.1 Contractor has visited the Site and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as-built conditions, and all local conditions, and federal, state and local laws and regulations that in any manner may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Contractor and safety precautions and programs incident thereto.

5.2 Contractor has examined thoroughly and understood all reports of exploration and tests of subsurface conditions, as-built drawings, drawings, products specifications or reports, available for Bidding purposes, of physical conditions, including Underground Facilities, which are identified in Document 00320 (Geotechnical Data and Existing Conditions) or which may appear in the Drawings. Contractor accepts the determination set forth in these Documents and Document 00700 (General Conditions) of the limited extent of the information contained in such materials upon which Contractor may be entitled to rely. Contractor agrees that except for the information so identified, Contractor does not and shall not rely on any other information contained in such reports and drawings.

5.3 Contractor has conducted or obtained and has understood all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in Section 5.2 of this Document 00520) that pertain to the subsurface conditions, as-built conditions, Underground Facilities and all other physical conditions at or contiguous to the Site or otherwise that may affect the cost, progress, performance or furnishing of Work, as Contractor considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Document 00700 (General Conditions); and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by Contractor for such purposes.

5.4 Contractor has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.

5.5 Contractor has given Owner prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents and as-built drawings and actual conditions and the written resolution thereof through Addenda issued by Owner is acceptable to Contractor.

5.6 Contractor is duly organized, existing and in good standing under applicable state law, and is duly qualified to conduct business in the State of California.

5.7 Contractor has duly authorized the execution, delivery and performance of this Agreement, the other Contract Documents and the Work to be performed herein. The Contract Documents do

not violate or create a default under any instrument, agreement, order or decree binding on Contractor.

5.8 Contractor has listed the following Subcontractors pursuant to the Subcontractor Listing Law, California Public Contract Code §4100 *et seq.*:

Name of Subcontractor and Location of Mill or Shop	Description of Work: Reference To Bid Items	Subcontractor's License No.

5.9 Contractor has designated _____ [name], _____, [title] to act as Contractor's Representative(s), who will represent Contractor in performing Contractor's duties and responsibilities and exercising Contractor's rights and authorities in Contract Documents. Contractor may change the individual(s) acting as Contractor's Representative(s), or delegate one or more specific functions to one or more specific Contractor's Representatives, at any time with written notice and without liability to Owner, but Contractor is limited to two representatives.

Article 6. Contract Documents

6.1 Contract Documents consist of the following documents, including all changes, Addenda, and Modifications thereto:

Document 00510	Notice of Award
Document 00520	Agreement
Document 00550	Notice to Proceed
Document 00611	Construction Performance Bond
Document 00612	Construction Labor and Material Payment Bond
Document 00630	Guaranty
Document 00650	Agreement and Release of Any and All Claims
Document 00660	Substitution Request Form
Document 00670	Escrow Bid Documents
Document 00680	Escrow Agreement for Security Deposit in Lieu of Retention
Document 00700	General Conditions
Document 00800	Supplementary Conditions
Document 00910	Addenda
Specifications	Divisions 1 through 16
Drawings listed in Drawing No. G01	

6.2 There are no Contract Documents other than those listed in this Document 00520, Article 6. Document 00320 (Geotechnical Data and Existing Conditions), and the information supplied through this document, is not a Contract Document. The Contract Documents may only be amended, modified or supplemented as provided in Document 00700 (General Conditions).

Article 7. Miscellaneous

7.1 Terms and abbreviations used in this Agreement are defined in Document 00700 (General Conditions) and Section 01420 (References and Definitions) and will have the meaning indicated therein.

7.2 It is understood and agreed that in no instance are the persons signing this Agreement for or on behalf of Owner or acting as an employee, agent, or representative of Owner, liable on this Agreement or any of the Contract Documents, or upon any warranty of authority, or otherwise, and it is further understood and agreed that liability of the Owner is limited and confined to such liability as authorized or imposed by the Contract Documents or applicable law.

7.3 Contractor shall not assign any portion of the Contract Documents, and may subcontract portions of the Contract Documents only in compliance with the Subcontractor Listing Law, California Public Contract Code §4100 *et seq*. This Contract shall not be assigned or transferred without approval of Owner's Board of Directors. Any such assignment or transfer without approval of Owner's Board of Directors shall be void and of no force and effect.

7.4 The Contract Sum includes all allowances (if any).

7.5 In entering into a public works contract or a subcontract to supply goods, services or materials pursuant to a public works contract, Contractor or Subcontractor offers and agrees to assign to the awarding body all rights, title and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. §15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time Owner tenders final payment to Contractor, without further acknowledgment by the parties.

7.6 Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are deemed included in the Contract Documents and on file at Owner's Office, and shall be made available to any interested party on request. Pursuant to Section 1861 of the Labor Code, Contractor represents that it is aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor shall comply with such provisions before commencing the performance of the Work of the Contract Documents.

7.7 Should any part, term or provision of this Agreement or any of the Contract Documents, or any document required herein or therein to be executed or delivered, be declared invalid, void or unenforceable, all remaining parts, terms and provisions shall remain in full force and effect and shall in no way be invalidated, impaired or affected thereby. If the provisions of any law causing such invalidity, illegality or unenforceability may be waived, they are hereby waived to the end that this Agreement and the Contract Documents may be deemed valid and binding agreements, enforceable in accordance with their terms to the greatest extent permitted by applicable law. In the event any provision not otherwise included in the Contract Documents is

required to be included by any applicable law, that provision is deemed included herein by this reference (or, if such provision is required to be included in any particular portion of the Contract Documents, that provision is deemed included in that portion).

7.8 This Agreement and the Contract Documents shall be deemed to have been entered into in the County of Sonoma, State of California, and governed in all respects by California law (excluding choice of law rules). The exclusive venue for all disputes or litigation hereunder shall be in Sonoma County.

7.9 Contractor accepts the claims procedure established by Article 12 of Document 00700 (General Conditions), as established under Section 930.2 et seq. of the California Government Code.

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IN WITNESS WHEREOF the parties have executed this Agreement in quadruplicate the day and year first above written.

Reviewed as to substance by Owner:

_____
Grant Davis, Water Agency's General Manager

Reviewed as to funds by Owner:

_____
Division Manager - Administrative Services

Reviewed as to form by County Counsel:

_____
County Counsel

Certificates of Insurance and Guaranty are on file with and reviewed as to substance for Owner by:

_____
Contract Administration/Inspection Date

Attest:

_____
Clerk of the Board of Directors

CONTRACTOR:

_____
[Contractor's name]

By: _____
[Signature]

_____
[Please print name here]

Title: _____
[If Corporation: Chairman, President, or Vice President]

By: _____
[Signature]

_____
[Please print name here]

Title: _____
[If Corporation: Secretary, Assistant Secretary, Chief Financial Officer, or Assistant Treasurer]

OWNER:

RUSSIAN RIVER COUNTY SANITATION DISTRICT, A Local District of the State of California

By: _____
Chair, Board of Directors

END OF DOCUMENT

DOCUMENT 00550

NOTICE TO PROCEED

Dated: _____, 20__

To: _____

_____
(Contractor)

Address: _____

_____

CONTRACT FOR: **CONTRACT NUMBER 70-713-7 #1A**

You are notified that the Contract Time under the above Contract will commence to run on _____ 20___. On that date, you are to start performing your obligations with respect to Work under the Contract Documents. In accordance with Article 3 of Document 00520 (Agreement), the dates of Substantial Completion and Final Completion for the entire Work are _____, 20___ and _____, 20___, respectively. In addition to the foregoing, Contractor shall achieve Milestone 1 by _____, 20___.

In accordance with Article 11 of Document 00700 (General Conditions), on _____[date] you must submit preliminary schedules (Initial Schedule, Schedule of Submittals, and Schedule of Values).

In accordance with Section 01315 (Project Meetings), on _____ [date] you must attend a Schedule Review Meeting.

Before you may start any Work at the Site, you must:

[add conditions, if any]_____

_____

From this date forward, submit one electronic copy and at least one hard copy of all Project documents, unless otherwise required by the Contract Documents. Submit electronic copies to: [email address].

Upon commencement of the Work, you and each of your Subcontractors shall certify and provide Owner copies of payroll records on forms provided by the Division of Labor Standards Enforcement, in accordance with Section 1776 of the California Labor Code.

RUSSIAN RIVER COUNTY SANITATION DISTRICT,
A Local District of the State of California

By : _____

Its: _____

[Notice to be sent in manner required by Contract Documents]

END OF DOCUMENT

DOCUMENT 00611

CONSTRUCTION PERFORMANCE BOND
STANDARD EDITION

THIS CONSTRUCTION PERFORMANCE BOND ("Bond") dated _____, is in the penal sum of _____
_____
[which is one hundred percent of the Contract Sum], and is entered into by and between the parties listed below to ensure the faithful performance of the Construction Contract listed below. This Bond consists of this page and the Bond Terms and Conditions, paragraphs 1 through 12, attached to this page. Any singular reference to _____ [insert name of Contractor] ("Contractor"), _____ [insert name of Surety] ("Surety"), Russian River County Sanitation District, a local district of the State of California ("Owner") or other party shall be considered plural where applicable.

CONTRACTOR:	SURETY:
_____	_____
Name	Name
_____	_____
Address	Principal Place of Business
_____	_____
City/State/Zip	City/State/Zip

CONSTRUCTION CONTRACT:

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL
CONTRACT NUMBER 70-713-7 #1A

at Sonoma County, California

Signed_____, 20____ in the Amount of $_____ (the "Penal Sum")

CONTRACTOR AS PRINCIPAL	SURETY
Company: (Corp. Seal)	Company: (Corp. Seal)
Signature:_____	Signature: _____
Name and Title:_____	Name and Title:_____
_____	_____

BOND TERMS AND CONDITIONS

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

2. If Contractor completely and properly performs all of its obligations under the Construction Contract, Surety and Contractor shall have no obligation under this Bond.

3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:

   3.1 Owner has declared a Contractor Default under the Construction Contract pursuant to the terms of the Construction Contract; and

   3.2 Owner has agreed to pay the Balance of the Contract Sum:

      3.2.1 To Surety in accordance with the terms of this Bond and the Construction Contract; or

      3.2.2 To a contractor selected to perform the Construction Contract in accordance with the terms of this Bond and the Construction Contract.

4. When Owner has satisfied the conditions of paragraph 3, Surety shall promptly (within 30 Days) and at Surety's expense elect to take one of the following actions:

   4.1 Arrange for Contractor, with consent of Owner, to perform and complete the Construction Contract (but Owner may withhold consent, in which case the Surety must elect an option described in paragraphs 4.2, 4.3 or 4.4, below); or

   4.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent contractors; provided, that Surety may not select Contractor as its agent or independent contractor without Owner's consent; or

   4.3 Undertake to perform and complete the Construction Contract by obtaining bids from qualified contractors acceptable to Owner for a contract for performance and completion of the Construction Contract and, upon determination by Owner of the lowest responsive and responsible Bidder, arrange for a contract to be prepared for execution by Owner and the contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract; and, if Surety's obligations defined in paragraph 6, below, exceed the Balance of the Contract Sum, then Surety shall pay to Owner the amount of such excess; or

   4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances and, after investigation and consultation with Owner, determine in good faith its monetary obligation to Owner under paragraph 6, below, for the performance and completion of the Construction Contract and, as soon as practicable after the amount is determined,

tender payment therefor to Owner with full explanation of the payment's calculation. If Owner accepts Surety's tender under this paragraph 4.4, Owner may still hold Surety liable for future damages then unknown or unliquidated resulting from the Contractor Default. If Owner disputes the amount of Surety's tender under this paragraph 4.4, Owner may exercise all remedies available to it at law to enforce Surety's liability under paragraph 6, below.

5. If Surety does not proceed as provided in paragraph 4, above, then Surety shall be deemed to be in default on this Bond ten Days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond. At all times Owner shall be entitled to enforce any remedy available to Owner at law or under the Construction Contract including, without limitation, and by way of example only, rights to perform work, protect Work, mitigate damages, advance critical Work to mitigate schedule delay, or coordinate Work with other consultants or contractors.

6. Surety's monetary obligation under this Bond is limited by the amount of this Bond identified herein as the Penal Sum. This monetary obligation shall augment the Balance of the Contract Sum. Subject to these limits, Surety's obligations under this Bond are commensurate with the obligations of Contractor under the Construction Contract. Surety's obligations shall include, but are not limited to:

   6.1 The responsibilities of Contractor under the Construction Contract for completion of the Construction Contract and correction of Defective Work;

   6.2 The responsibilities of Contractor under the Construction Contract to pay liquidated damages, and for damages for which no liquidated damages are specified in the Construction Contract, actual damages caused by non-performance of the Construction Contract including, but not limited to, all valid and proper backcharges, offsets, payments, indemnities, or other damages;

   6.3 Additional legal, design professional and delay costs resulting from Contractor Default or resulting from the actions or failure to act of the Surety under paragraph 4, above (but excluding attorney's fees incurred to enforce this Bond).

7. No right of action shall accrue on this Bond to any person or entity other than Owner or its successors or assigns.

8. Surety hereby waives notice of any change, alteration or addition to the Construction Contract or to related subcontracts, purchase orders and other obligations, including changes of time. Surety consents to all terms of the Construction Contract, including provisions on changes to the Contract. No extension of time, change, alteration, Modification, deletion, or addition to the Contract Documents, or of the Work required thereunder, shall release or exonerate Surety on this Bond or in any way affect the obligations of Surety on this Bond.

9. Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction where a proceeding is pending between Owner and Contractor regarding the Construction Contract, or in the courts of the County of Sonoma, or in a court of competent jurisdiction in the location in which the Work is located. Communications from

Owner to Surety under paragraph 3.1 of this Bond shall be deemed to include the necessary agreements under paragraph 3.2 of this Bond unless expressly stated otherwise.

10. All notices to Surety or Contractor shall be mailed or delivered (at the address set forth on the signature page of this Bond), and all notices to Owner shall be mailed or delivered as provided in Document 00520 (Agreement). Actual receipt of notice by Surety, Owner or Contractor, however accomplished, shall be sufficient compliance as of the date received at the foregoing addresses.

11. Any provision in this Bond conflicting with any statutory or regulatory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein.

12. Definitions.

    12.1 Balance of the Contract Sum: The total amount payable by Owner to Contractor pursuant to the terms of the Construction Contract after all proper adjustments have been made under the Construction Contract, for example, deductions for progress payments made, and increases/decreases for approved Modifications to the Construction Contract.

    12.2 Construction Contract: The agreement between Owner and Contractor identified on the signature page of this Bond, including all Contract Documents and changes thereto.

    12.3 Contractor Default: Material failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract including, but not limited to, "default" or any other condition allowing a termination for cause as provided in Document 00700 (General Conditions).

    12.4 Owner Default: Material failure of Owner, which has neither been remedied nor waived, to pay Contractor progress payments due under the Construction Contract or to perform other material terms of the Construction Contract, if such failure is the cause of the asserted Contractor Default and is sufficient to justify Contractor termination of the Construction Contract.

END OF DOCUMENT

DOCUMENT 00612

CONSTRUCTION LABOR AND MATERIAL PAYMENT BOND
STANDARD EDITION

THIS CONSTRUCTION LABOR AND MATERIAL PAYMENT BOND ("Bond") is dated _____, is in the penal sum of _____
_____
[one hundred percent of the Contract Sum, and is entered into by and between the parties listed below to ensure the payment of claimants under the Construction Contract listed below. This Bond consists of this page and the Bond Terms and Conditions, paragraphs 1 through 13, attached to this page. Any singular reference to _____ [insert name of Contractor] ("Contractor"), _____ [insert name of Surety] ("Surety"), the Russian River County Sanitation District, a local district of the State of California ("Owner") or other party shall be considered plural where applicable.

CONTRACTOR:	SURETY:
_____	_____
Name	Name
_____	_____
Address	Principal Place of Business
_____	_____
City/State/Zip	City/State/Zip

CONSTRUCTION CONTRACT:

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL
CONTRACT NUMBER 70-713-7 #1A

at Sonoma County, California

Signed _____, 20____ in the Amount of $_____(the "Penal Sum")

CONTRACTOR AS PRINCIPAL	SURETY
Company: (Corp. Seal)	Company: (Corp. Seal)
Signature:_____	Signature: _____
Name and Title:_____	Name and Title:_____
_____	_____

BOND TERMS AND CONDITIONS

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

2. With respect to Owner, this obligation shall be null and void if Contractor:

   2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and

   2.2 Defends, indemnifies and holds harmless Owner from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Construction Contract, provided Owner has promptly notified Contractor and Surety (at the address set forth on the signature page of this Bond) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to Contractor and Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly through its Subcontractors, for all sums due Claimants. If Contractor or its Subcontractors, however, fail to pay any of the persons named in Section 9100 of the California Civil Code, or amounts due under the Unemployment Insurance Code with respect to Work or labor performed under the Contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of Contractor or Subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such Work and labor, then Surety shall pay for the same, and also, in case suit is brought upon this Bond, a reasonable attorney's fee, to be fixed by the court.

4. Consistent with the California Mechanic's Lien Law, Civil Code §8000, *et seq.*, Surety shall have no obligation to Claimants under this Bond unless the Claimant has satisfied all applicable notice requirements.

5. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety under this Bond.

6. Amounts due Contractor under the Construction Contract shall be applied first to satisfy claims, if any, under any Construction Performance Bond and second, to satisfy obligations of Contractor and Surety under this Bond.

7. Owner shall not be liable for payment of any costs, expenses, or attorney's fees of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

8. Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations. Surety further hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract, or to the Work to be performed thereunder, or materials or

equipment to be furnished thereunder or the Specifications accompanying the same, shall in any way affect its obligations under this Bond, and it does hereby waive any requirement of notice or any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the Work or to the Specifications or any other changes.

9. Suit against Surety on this Bond may be brought by any Claimant, or its assigns, at any time after the Claimant has furnished the last of the labor or materials, or both, but, per Civil Code §9558, must be commenced before the expiration of six months after the period in which stop notices may be filed as provided in Civil Code §9356.

10. All notices to Surety or Contractor shall be mailed or delivered (at the address set forth on the signature page of this Bond), and all notices to Owner shall be mailed or delivered as provided in Document 00520 (Agreement). Actual receipt of notice by Surety, Owner or Contractor, however accomplished, shall be sufficient compliance as of the date received at the foregoing addresses.

11. This Bond has been furnished to comply with the California Mechanic's Lien Law including, but not limited to, Civil Code §§9550, 9554, *et seq*. Any provision in this Bond conflicting with said statutory requirements shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirements shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

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

13. Definitions.

    13.1.1 Claimant: An individual or entity having a direct contract with Contractor or with a Subcontractor of Contractor to furnish labor, materials or equipment for use in the performance of the Contract, as further defined in California Civil Code §9100. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a stop notice might be asserted. The term Claimant shall also include the Unemployment Development Department as referred to in Civil Code §9554(b).

    13.1.2 Construction Contract: The agreement between Owner and Contractor identified on the signature page of this Bond, including all Contract Documents and changes thereto.

    13.1.3 Owner Default: Material failure of Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract, provided that failure is the cause of the failure of Contractor to pay the Claimants and is sufficient to justify termination of the Construction Contract.

END OF DOCUMENT

DOCUMENT 00630

GUARANTY

To the RUSSIAN RIVER COUNTY SANITATION DISTRICT, for construction of

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL

Sonoma County, California

The undersigned guarantees all construction performed on this Project and also guarantees all material and equipment incorporated therein.

Contractor hereby grants to Owner for a period of one year following the date of Final Acceptance of the Work completed, or such longer period specified in the Contract Documents, its unconditional warranty of the quality and adequacy of all of the Work including, without limitation, all labor, materials and equipment provided by Contractor and its Subcontractors of all tiers in connection with the Work.

Neither final payment nor use or occupancy of the Work performed by the Contractor shall constitute an acceptance of Work not done in accordance with this Guaranty or relieve Contractor of liability in respect to any express warranties or responsibilities for faulty materials or workmanship. Contractor shall remedy any defects in the Work and pay for any damage resulting therefrom, which shall appear within one year, or longer if specified, from the date of Final Acceptance of the Work completed.

If within one year after the date of Final Acceptance of the Work completed, or such longer period of time as may be prescribed by laws or regulations, or by the terms of Contract Documents, any Work is found to be Defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, correct such Defective Work. Contractor shall remove any Defective Work rejected by Owner and replace it with Work that is not Defective, and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If Contractor fails to promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the Defective Work corrected or the rejected Work removed and replaced. Contractor shall pay for all claims, costs, losses and damages caused by or resulting from such removal and replacement. Where Contractor fails to correct Defective Work, or defects are discovered outside the correction period, Owner shall have all rights and remedies granted by law.

Inspection of the Work shall not relieve Contractor of any of its obligations under the Contract Documents. Even though equipment, materials, or Work required to be provided under the Contract Documents have been inspected, accepted, and estimated for payment, Contractor shall, at its own expense, replace or repair any such equipment, material, or Work found to be Defective or otherwise not to comply with the requirements of the Contract Documents up to the end of the guaranty period.

All abbreviations and definitions of terms used in this Agreement shall have the meanings set forth in the Contract Documents, including, without means of limitation, Document 00700 (General Conditions) and Section 01420 (References and Definitions).

The foregoing Guaranty is in addition to any other warranties of Contractor contained in the Contract Documents, and not in lieu of, any and all other liability imposed on Contractor under the Contract Documents and at law with respect to Contractor's duties, obligations, and performance under the Contract Documents. In the event of any conflict or inconsistency between the terms of this Guaranty and any warranty or obligation of the Contractor under the Contract Documents or at law, such inconsistency or conflict shall be resolved in favor of the higher level of obligation of the Contractor.

_____
[Contractor's name]

By: _____
[Signature]

_____
[Please print name here]

Title: _____

Business Address:_____
_____
_____

Date: _____

END OF DOCUMENT

DOCUMENT 00650

AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS

THIS AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS ("Agreement and Release"), made and entered into this _____ [date] day of _____ [month], _____ [year], by and between the Russian River County Sanitation District, a local district of the State of California ("Owner"), and _____ [name of Contractor] ("Contractor"), whose place of business is at _____ _____ [address of Contractor].

RECITALS

A. Owner and Contractor entered into Contract Number 70-713-7 #1A (the "Contract").

B. The Work under the Contract has been completed.

Now, therefore, it is mutually agreed between Owner and Contractor as follows:

AGREEMENT

1. Contractor will not be assessed liquidated damages except as detailed below:

Original Contract Sum	$ _____
Modified Contract Sum	$ _____
Payment to Date	$ _____
Liquidated Damages	$ _____
Payment Due Contractor	$ _____

2. Subject to the provisions of this Agreement and Release, Owner will forthwith pay to Contractor the sum of $_____ Dollars and _____ Cents ($_____) under the Contract, less any amounts withheld under the Contract or represented by any Notice to Withhold Funds on file with Owner as of the date of such payment.

3. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against Owner arising from the Contract, except for the claims described in paragraph 4 of this Document 00650. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against Owner, and all of its agents, employees, consultants, inspectors, representatives, assignees and transferees, including without limitation the Sonoma County Water Agency ("Agency"), except for the Disputed Claims set forth in paragraph 4 of this Document 00650. Nothing in this Agreement and Release shall limit or modify Contractor's continuing obligations described in paragraph 6 of this Document 00650.

4. The following claims submitted under Document 00700 (General Conditions), Article 12, are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

Claim No.	Date Submitted	Description of Claim	Amount of Claim

[Insert information, including attachment if necessary]

5. Consistent with California Public Contract Code Section 7100, Contractor hereby agrees that, in consideration of the payment set forth in paragraph 2 of this Document 00650, Contractor hereby releases and forever discharges Owner, and all of its agents, employees, consultants, inspectors, assignees and transferees from any and all liability, claims, demands, actions or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.

6. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.

7. Contractor shall immediately defend, indemnify and hold harmless Owner, any Owner's Representatives, Engineer, and all of their agents, employees, consultants, inspectors, assignees and transferees, including without limitation the Agency, from any and all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities that may be asserted against them by any of Contractor's suppliers and/or Subcontractors of any tier and/or any suppliers to them for any and all labor, materials, supplies and equipment used, or contemplated to be used in the performance of the Contract, except for the Disputed Claims set forth in paragraph 4 of this Document 00650.

8. Contractor hereby waives the provisions of California Civil Code Section 1542, which provide as follows:

> A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release,

which if known by him, must have materially affected his settlement with the debtor.

9. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable, and if any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal or other law, ruling, or regulation, then such provision, or part thereof shall remain in force and effect only to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.

10. Contractor represents and warrants that it is the true and lawful owner of all claims and other matters released pursuant to this Agreement and Release, and that it has full right, title and authority to enter into this instrument. Each party represents and warrants that it has been represented by counsel of its own choosing in connection with this Agreement and Release.

11. All rights of Owner shall survive completion of the Work or termination of the Contract, and execution of this Agreement and Release.

* * * CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING * * *

RUSSIAN RIVER COUNTY SANITATION DISTRICT,
A Local District of the State of California

By: _____

Its: _____

ATTEST:

_____
Clerk of the Board of Directors

[CONTRACTOR]

By: _____

Name: _____

Its: _____

By: _____

Name: _____

Its: _____

REVIEWED AS TO FORM:

_____
County Counsel

_____, 20 _____

END OF DOCUMENT

DOCUMENT 00660

SUBSTITUTION REQUEST FORM

During Bid Period To:	After Award of Contract To:
Thomas Hammond Russian River County Sanitation District Fax: 707-524-3782	Construction Management Section Russian River County Sanitation District Fax: 707-524-3791

Project: Russian River County Sanitation District Treatment Plant Biological Nutrient Removal

Bidder: _____

Subcontractor/Supplier: _____

Drawing Sheet Reference/Detail No: _____

The undersigned Bidder submits for consideration the following equipment instead of the specified item for the above Project:

Section	Paragraph	Specified Item
_____	_____	_____
_____	_____	_____

Proposed Substitution: _____

_____

The undersigned encloses the information required herein. If this Document 00660 is being submitted by a Bidder wishing to use "equal" item(s) as provided in Document 00200 (Instructions to Bidders), the undersigned Bidder must also enclose the technical information (other than cost) otherwise required for a post-Award of Contract Request for Substitution ("RFS") under Section 01600 (Product Requirements). However, if this Document 00660 is being submitted under provisions of Contract Documents after Award of Contract, the undersigned Contractor must include all information required under Section 01600 (Product Requirements).

The undersigned has (a) attached manufacturer's literature, including complete technical data and laboratory test results, if applicable, (b) attached an explanation of why proposed substitution is a true equivalent to specified item, (c) included complete information on changes to Contract Documents that the proposed substitution will require for its proper installation, and (d) filled in the blanks below:

A. Does the substitution affect dimensions shown on Drawings? (If yes, please explain)

_____

B. Are the manufacturer's guarantees and warranties on the proposed substitution items identical to those on the specified items? If there are differences, please specify each and every difference in detail.

_____

C. What effect does the substitution have on other contractors, trades, or suppliers?

_____

D. What are the differences between the proposed substitution and the specified item? If proposed substitution has a color or pattern, provide a color board showing proposed substitution in relation to the other adjacent colors and patterns.

_____

E. Will granting the requested substitution cause any schedule delay? (If yes, please explain)

_____

The undersigned Bidder certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item.

Submitted by:

_____
Bidder

_____
Signature

_____
Name

_____
Address

_____
City/State/Zip

Telephone: _____

Date: _____

For Use by Owner:

___ Accepted _____Accepted as Noted

___ Not Accepted _____Received Too Late

By: _____
Owner's Representative

Date: _____

Remarks: _____

_____

_____

_____

END OF DOCUMENT

DOCUMENT 00670

ESCROW BID DOCUMENTS

1. Requirements for Escrow Bid Documents.

   a. Within the time period established in Document 00200 (Instructions to Bidders), Contractor shall submit to Owner a set of Escrow Bid Documents as defined in paragraph 2 below. Escrow Bid Documents will be used only in the manner and for the purposes described in this Document 00670.

   b. The submission of the Escrow Bid Documents, as with the bonds and insurance documents required under Document 00200 (Instructions to Bidders), is considered an essential part of the Contract award. Should Contractor fail to make the submission within the allowed time specified, Contractor may be deemed to have failed to enter into the Contract, Contractor shall forfeit the amount of its Bid security accompanying Contractor's Bid, and Owner may award the Contract to the next lowest responsive responsible Bidder.

   c. NO PAYMENTS WILL BE MADE, NOR WILL OWNER ACCEPT CHANGE ORDER REQUESTS UNTIL THE ABOVE-REQUIRED INFORMATION IS SUBMITTED AND APPROVED. ALTERNATIVELY, OWNER MAY DECLARE THE BID NON-RESPONSIVE.

   d. Contractor shall submit the Escrow Bid Documents, in person by an authorized representative of the Contractor, to:

      Construction Management Section
      Russian River County Sanitation District
      c/o Sonoma County Water Agency
      404 Aviation Boulevard
      Santa Rosa, California

2. Scope of Escrow Bid Documents.

   a. Within the time period specified in Document 00200 (Instructions to Bidders), Contractor shall submit one copy of all documentary information received or generated by Contractor in preparation of Bid prices for the Contract Documents, as specified in paragraphs 5 and 6 of this Document 00670. This material is referred to in this Document 00670 as the "Escrow Bid Documents." Contractor's Escrow Bid Documents will be held in escrow as provided in this Document 00670.

   b. Contractor represents and agrees, as a condition of award of the Contract, that the Escrow Bid Documents constitute all written information used in the preparation of its Bid, and that no other written Bid preparation information shall be considered in resolving disputes or claims or may be considered in legal proceedings. Contractor also agrees that nothing in the Escrow Bid Documents shall change or modify the terms or conditions of the Contract Documents. Contractor is advised that the Escrow Bid Documents will only be used as a guide in the resolution of disputes and claims.

3. Ownership of Escrow Bid Documents.

   a. The Escrow Bid Documents are, and shall always remain, the property of Contractor, subject to joint review by Owner and Contractor, as provided in this Document 00670.

   b. Owner stipulates and expressly acknowledges that the Escrow Bid Documents constitute trade secrets. This acknowledgement is based on Owner's express understanding that the information contained in the Escrow Bid Documents is not known outside Contractor's business, is known only to a limited extent and only by a limited number of Contractor's Employees, is safeguarded while in Contractor's possession, is extremely valuable to Contractor and could be extremely valuable to Contractor's competitors by virtue of it reflecting Contractor's contemplated construction techniques. Owner further acknowledges that the Escrow Bid Documents and the information contained in them are made available to Owner only because such action is an express pre-requisite to award of the Contract. Owner agrees to safeguard the Escrow Bid Documents, and all information contained in them, against disclosure to the fullest extent permitted by law, consistent with paragraph 4 of this Document 00670.

4. Escrow Bid Documents may be used in the determination of price adjustments and Change Orders and in the settlement of disputes and claims. If used in legal proceedings, Escrow Bid Documents shall be subject to an appropriate protective order limiting their disclosure.

5. Format and Contents of Escrow Bid Documents.

   a. Contractor may submit Escrow Bid Documents in their usual cost-estimating format; a standard format is not required. Contractor shall prepare and submit the Escrow Bid Documents in English.

   b. Owner requires Contractor to itemize clearly in the Escrow Bid Documents the estimated costs of performing the Work of each Bid item contained in Contractor's Bid. Contractor shall separate Bid items into sub-items as required to present a detailed cost estimate and allow a detailed cost review. The Escrow Bid Documents shall include all Subcontractor bids or quotes, supplier bids or quotes, quantity take-offs, crews, equipment, calculations of rates of production and progress, copies of quotes from Subcontractors and suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by Contractor to arrive at the prices contained in the Bid. Escrow Bid Documents shall include costs of scheduled maintenance, depreciation, fleet rental expense discounts and incentives, and similar cost adjustments if used by Contractor to calculate its Bid prices. Estimated costs shall be broken down into Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials and subcontract costs as appropriate. Plant and equipment and indirect costs should be detailed in Contractor's usual format. Contractor shall identify its allocation of indirect costs, contingencies, markup and other items to each Bid item.

   c. Contractor shall identify all costs. For Bid items amounting to less than $10,000, Contractor may estimate costs without a detailed cost estimate, provided that Contractor includes

applicable labor, equipment, materials and subcontracts, and allocates applicable indirect costs, contingencies and markup.

d. Bid documents provided by Owner should not be included in the Escrow Bid Documents unless needed to comply with these requirements.

6. Submittal of Escrow Bid Documents.

a. Submit Escrow Bid Documents in a container clearly marked on the outside with Contractor's name, date of submittal, Project name and the words "Escrow Bid Documents - Open only in the presence of Authorized Representatives of both Owner and Contractor." Owner will review the Escrow Bid Documents for initial compliance. Owner has three Days after receipt of Bidder's Escrow Bid Documents to demand additional information.

b. By submitting Escrow Bid Documents, Contractor represents that the material in the Escrow Bid Documents constitutes all the documentary information used in preparation of the Bid and that Contractor has personally examined the contents of the Escrow Bid Documents container and has found that the documents in the container are complete. Contractor agrees that it will not introduce or rely on any other documents to prove how it prepared its Bid.

c. If Contractor's Bid is based upon subcontracting any part of the Work, each Subcontractor whose total subcontract price exceeds five percent of the total Contract Sum proposed by Contractor, shall provide separate Escrow Documents to be included with those of Contractor. Such documents shall be opened and examined in the same manner and at the same time as the examination described above for Contractor.

d. If Contractor wishes to subcontract any portion of the Work after award, Owner retains the right to require Contractor to submit Escrow Documents for the Subcontractor before approval of the subcontract.

7. Storage, Examination, and Final Disposition of Escrow Bid Documents.

a. The Escrow Bid Documents will be placed in escrow until Final Completion of Work on the Project, in a mutually agreeable institution. Contractor shall pay the cost of storage for the Escrow Bid Documents until that time. The storage facilities shall be the appropriate size for all the Escrow Bid Documents and located conveniently to both Owner's and, to the extent reasonably possible, Contractor's offices, but in no event outside the County of Sonoma.

b. Both Owner and Contractor shall examine the Escrow Bid Documents, at any time deemed necessary by either Owner or Contractor, to assist in the negotiation of price adjustments and Change Orders or the settlement of disputes and claims. Examination of the Escrow Bid Documents is subject to the following conditions:

i. As trade secrets, the Escrow Bid Documents are proprietary and confidential under paragraph 3.b. of this Document 00670.

ii. Owner and Contractor (and any Subcontractor, to the extent Escrow Bid Documents are required by a Subcontractor) shall each designate in writing to the other party(s) at least seven Days prior to any examination, representatives who are authorized to examine the Escrow Bid Documents. Except as otherwise provided in a court order, no other persons shall have access to the Escrow Documents.

iii. Except as otherwise provided in a court order, access to the documents may take place only in the presence of duly designated representatives of both Owner and Contractor. If Contractor fails to designate a representative or appear for joint examination on seven Days' notice, then Owner's Representative may examine the Escrow Bid Documents upon an additional three Days' notice.

iv. Following Final Completion of Work on the Project and achievement of final settlement, Owner shall direct the escrow agent holding the Escrow Bid Documents in writing to return those documents to Contractor.

END OF DOCUMENT

DOCUMENT 00680

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION
P.C.C. §22300

THIS ESCROW AGREEMENT ("Escrow Agreement") is made and entered into this _____ [date] day of _____ [month], _____ [year], by and between the RUSSIAN RIVER COUNTY SANITATION DISTRICT, a local district of the State of California (hereinafter called the "Owner"), whose address is 404 Aviation Blvd., Santa Rosa, CA 95403-9019; _____ [name of Contractor] ("Contractor"), whose place of business is located at _____ [Contractor's Address]; and [Owner, as escrow agent …OR… _____ [Name of Bank], a state or federally chartered bank in the State of California, whose place of business is located at _____] ("Escrow Agent").

For the consideration hereinafter set forth, Owner, Contractor and Escrow Agent agree as follows:

1. Pursuant to Section 22300 of Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Owner pursuant to Contract Number 70-713-7 #1A entered into between Owner and Contractor for Russian River County Sanitation District Treatment Plant Biological Nutrient Removal in the amount of _____ [Contract Sum] dated _____ [Date of Contract] (the "Contract"). Alternatively, on written request of Contractor, Owner shall make payments of the retention earnings directly to Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, Escrow Agent shall notify Owner within ten Days of the deposit. The market value of the securities at the time of substitution shall be at least equal to the cash amount then required to be withheld as retention under terms of Contract between Owner and Contractor. Securities shall be held in name of _____, and shall designate Contractor as the beneficial owner.

2. Owner shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments pursuant to Contract provisions, provided that Escrow Agent holds securities in form and amount specified in paragraph 1 of this Document 00680.

3. When Owner makes payment(s) of retention earned directly to Escrow Agent, Escrow Agent shall hold said payment(s) for the benefit of Contractor until the time that the escrow created under this Escrow Agreement is terminated. Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow Agreement and the rights and responsibilities of the parties shall be equally applicable and binding when Owner pays Escrow Agent directly.

4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses of Owner. Such expenses and payment terms shall be determined by Owner, Contractor, and Escrow Agent.

5. Interest earned on securities or money market accounts held in escrow and all interest earned on that interest shall be for sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to Owner.

6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Owner to Escrow Agent that Owner consents to withdrawal of amount sought to be withdrawn by Contractor.

7. Owner shall have the right to draw upon the securities in event of default by Contractor. Upon seven Days written notice to Escrow Agent from Owner of the default, Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by Owner.

8. Upon receipt of written notification from Owner certifying that the Contract is final and complete, and that Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

9. Escrow Agent shall rely on written notifications from Owner and Contractor pursuant to paragraphs 5 through 8, inclusive, of this Document 00680 and Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of securities and interest as set forth.

10. Names of persons who are authorized to give written notice or to receive written notice on behalf of Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Owner:

General Manager
Title
Grant Davis
Name

Signature
404 Aviation Boulevard
Address
Santa Rosa, CA 95403
City/State/Zip

On behalf of Contractor:

Title

Name

Signature

Address

City/State/Zip

On behalf of Escrow Agent:

Title

Name

Signature

Address

City/State/Zip

At the time the Escrow Account is opened, Owner and Contractor shall deliver to Escrow Agent a fully executed counterpart of this Document 00680.

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IN WITNESS WHEREOF, the parties have executed this Escrow Agreement by their proper officers on the date first set forth above.

Owner

_____

_____
Title

_____
Name

_____
Signature

Contractor

_____

_____
Title

_____
Name

_____
Signature

Escrow Agent

_____

_____
Title

_____
Name

_____
Signature

REVIEWED AS TO FORM:

_____
County Counsel

_____
Date

END OF DOCUMENT

CONDITIONS OF THE CONTRACT

DOCUMENT 00700

GENERAL CONDITIONS

STANDARD EDITION

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GENERAL CONDITIONS

1. GENERAL

1.1 Documents

1.1.A. Contract Documents are complementary; what is called for by one is as binding as if called for by all. Contract Documents shall not be construed to create a contractual relationship of any kind between (1) Engineer or any Owner's Representative and Contractor; (2) Owner and/or its representatives and a Subcontractor, sub-Subcontractor, or supplier of any Project labor, materials, or equipment; or (3) between any persons or entities other than Owner and Contractor. Owner shall be deemed to be an intended third-party beneficiary of each agreement referenced in clause (2) above, and each such agreement shall so provide. Contractor is fully responsible for Contractor's own acts and omissions. Contractor is responsible for all acts and omissions of its Subcontractors, suppliers, and other persons and organizations performing or furnishing any of the Work, labor, materials, or equipment under a direct or indirect contract with Contractor.

1.2 Exercise Of Contract Responsibilities

1.2.A. In exercising its responsibilities and authorities under the Contract Documents, Owner does not assume any duties or responsibilities to any Subcontractor or supplier and does not assume any duty of care to Contractor, Contractor's Subcontractors or suppliers. Except as expressly set forth in the Contract Documents, in exercising their respective responsibilities and authorities under the Contract Documents, neither Engineer nor any Owner's Representative assumes any duties or responsibilities to any Subcontractor, sub-Subcontractor or supplier nor assumes any duty of care to Contractor or any Subcontractor, sub-Subcontractor or suppliers.

1.3 Defined Terms

1.3.A. All abbreviations and definitions of terms used and not otherwise defined in this Document 00700 are set forth in Section 01420 (References and Definitions). This Document 00700 subdivides at first level into Articles, and then into paragraphs.

2. BIDDING

2.1 Investigation Prior To Bidding

2.1.A. Prior to bidding, Bidders shall perform the work, investigations, research and analysis required by Article 5 of Document 00520 (Agreement). Under the Contract Documents, Contractor is charged with all information and knowledge that a reasonable Bidder would ascertain from having performed the required work, investigations, research, and analysis. Bid prices shall include entire cost of all "incidental work" to complete the Work, as that term is defined in Article 5 of this Document 00700.

2.1.B. Conditions Shown on Contract Documents: Information as to underground conditions, as-built conditions, or other conditions or obstructions indicated in the Contract Documents, *e.g.*, on Drawings or in Specifications, has been obtained with reasonable care, and has been recorded in good faith. Owner warrants, and Contractor may rely on, the accuracy of only limited types of information as discussed below.

1. Aboveground and As-Built Conditions: There is no express or implied warranty and no express or implied representation that any information as to aboveground conditions or as-built conditions indicated in the Contract Documents is correctly shown, or indicated, or complete. As a condition to bidding, Contractor shall verify by independent investigation all aboveground and as-built conditions. In submitting its Bid, Contractor shall rely on the results of its own independent investigation and shall not rely on Owner-supplied information regarding aboveground conditions and as-built conditions.
2. Subsurface Conditions: Contractor may rely only upon the general accuracy of actual reported depths, actual reported character of materials, actual reported soil types, actual reported water conditions, or actual obstructions shown or indicated in the Contract Documents. Owner is not responsible for (1) the completeness of any subsurface condition information for bidding or construction, (2) Contractor's conclusions or opinions drawn from any subsurface condition information, or (3) subsurface conditions that are not specifically shown. (For example, Owner is not responsible for soil conditions in areas contiguous to areas where a subsurface condition is shown.)
3. Conditions Shown in Reports and Drawings Supplied for Informational Purposes: Reference is made to Document 00320 (Geotechnical Data and Existing Conditions) for identification of geotechnical reports, "as-built" information, and other drawings or other documents describing physical conditions in or relating to existing surface or subsurface conditions or structures at or contiguous to the Site. These materials are not Contract Documents and, except for any "technical data" regarding subsurface conditions specifically identified in Document 00320 (Geotechnical Data and Existing Conditions), and "Underground Facilities" data, as limited in Document 00320 (Geotechnical Data and Existing Conditions), Contractor shall not in any manner rely on the information in these materials. Subject to the foregoing, Contractor shall make its own independent investigation of all conditions affecting the Work and must not rely on information provided by Owner.

2.2 Subcontractors

2.2.A. Consistent with Public Contract Code Sections 4101 *et seq.*, Contractor shall not substitute any other person or firm in place of any Subcontractor listed in the Bid. Subcontractors shall not assign or transfer their subcontracts or permit them to be performed by any other contractor without Owner's written approval. At Owner's request, Contractor shall provide Owner with a complete copy of all executed subcontracts or final commercial agreements with Subcontractors and/or suppliers.

2.2.B. Subcontract agreements shall preserve and protect the rights of Owner under the Contract Documents so that subcontracting will not prejudice such rights. To the extent of the Work to be performed by a Subcontractor, Contractor shall require the Subcontractor's written agreement (1) to be bound to the terms of Contract Documents and (2) to assume vis-à-vis Contractor all the obligations and responsibilities that Contractor assumes toward Owner under the Contract Documents. (These agreements include all warranties, claims procedures and rules governing submittals to which Contractor is subject under the Contract Documents.)

2.2.C. Contractor shall provide for the assignment to Owner of all rights any Subcontractor may have against any manufacturer, supplier, or distributor for breach of warranties

and guarantees relating to the Work performed by the Subcontractor under the Contract Documents.

3. CONTRACT AWARD AND COMMENCEMENT OF THE WORK

3.1 Award Of Contract

3.1.A. Owner will make the Award of Contract by issuing a Notice of Award. As a condition to Owner signing Document 00520 (Agreement), however, Contractor shall deliver to Owner the executed agreements, forms, bonds, and insurance documents required by Document 00200 (Instructions to Bidders) in the required quantities and within the required times.

3.2 Commencement Of Work

3.2.A. The Contract Time will commence to run on the 60th Day after the issuance of the Notice of Award or, if a Notice to Proceed is given, on the date indicated in the Notice to Proceed. See also paragraph 15.1.B of this Document 00700. Owner may give a Notice to Proceed at any time within 60 Days after the Notice of Award. Contractor shall not do any Work at the Site prior to the date on which the Contract Time commences to run.

4. BONDS AND INSURANCE

4.1 Bonds

4.1.A. At or before the date indicated in Document 00200 (Instructions to Bidders), Contractor shall file with Owner the following bonds:

1. Corporate surety bond, in the form of Document 00611 (Construction Performance Bond), in the penal sum of 100% of the Contractor's Bid as accepted, to guarantee faithful performance of the Work; and
2. Corporate surety bond, in the form of Document 00612 (Construction Labor and Material Payment Bond), in the penal sum of 100% of the Contractor's Bid as accepted, to guarantee payment of wages for services engaged and of bills contracted for materials, supplies, and equipment used in performance of Contract Documents.

4.1.B. Sureties shall be satisfactory to Owner. Corporate sureties on these bonds and on bonds accompanying Bids shall be duly licensed to do business in the State of California and shall have an A.M. Best Company financial rating of A or better.

4.2 Insurance

4.2.A. See paragraph 2.A of Document 00800 (Supplementary Conditions), incorporated herein by this reference.

5. DRAWINGS AND SPECIFICATIONS

5.1 Intent

5.1.A. Drawings and Specifications are intended to describe a functionally complete and operable Project (and all parts thereof) to be constructed in accordance with the requirements of Contract Documents. Contractor shall perform any work, provide services and furnish any materials or equipment that may reasonably be inferred from the requirements of Contract Documents or from prevailing custom or trade usage as

being required to produce this intended result. Contractor shall interpret words or phrases used to describe Work (including services), materials, or equipment that have well-known technical or construction industry or trade meaning in accordance with that meaning. Drawings' intent specifically includes the intent to depict construction that complies with all applicable laws, codes, and standards.

5.1.B. As part of the "Work," Contractor shall provide all labor, materials, equipment, machinery, tools, facilities, services, employee training and testing, hoisting facilities, Shop Drawings, storage, testing, security, transportation, disposal, the securing of all necessary or required field dimensions, the cutting or patching of existing materials, notices, permits, documents, reports, agreements, and any other items required or necessary to timely and fully complete Work described and the results intended by Contract Documents and, in particular, Drawings and Specifications. Divisions and Specification Sections and the identification on any Drawings shall not control Contractor in dividing Work among Subcontractors or suppliers or delineating the Work to be performed by any specific trade.

5.1.C. Contractor shall perform reasonably implied parts of Work as "incidental work" although absent from Drawings and Specifications. Incidental work includes any work not shown on Drawings or described in Specifications that is necessary or normally or customarily required as a part of the Work shown on Drawings or described in Specifications. Incidental work includes any work necessary or required to make each installation satisfactory, legally operable, functional, and consistent with the intent of Drawings and Specifications or the requirements of Contract Documents including required tasks to be performed under Division 1 of Specifications. Contractor shall perform incidental work without extra cost to Owner. Incidental work shall be treated as if fully described in Specifications and shown on Drawings, and the expense of incidental work shall be included in price Bid and Contract Sum.

5.2 Drawing Details

5.2.A. A typical or representative detail on Drawings shall constitute the standard for workmanship and material throughout corresponding parts of Work. Where necessary, and where reasonably inferable from Drawings, Contractor shall adapt such representative detail for application to such corresponding parts of Work. The details of such adaptation shall be subject to prior approval by Owner. Repetitive features shown in outline on Drawings shall be in exact accordance with corresponding features completely shown.

5.3 Interpretation Of Drawings And Specifications

5.3.A. Should any discrepancy appear or any misunderstanding arise as to the import of anything contained in Drawings and Specifications, or should Contractor have any questions or requests relating to Drawings or Specifications, Contractor shall refer the matter to Owner, in writing. Owner will issue with reasonable promptness written responses, clarifications or interpretations as Owner may determine necessary, which shall be consistent with the intent of and be reasonably inferable from Contract Documents. Such written clarifications or interpretations shall be binding upon Contractor. If Contractor believes that a written response, clarification or interpretation justifies an adjustment in the Contract Sum or Contract Time, Contractor shall give Owner prompt written notice as provided in Section 01250 (Modification Procedures). If the parties are unable to agree to the amount or extent of the adjustment, if any, then

Contractor shall perform the Work in conformance with Owner's response, clarification, or interpretation and may make a written claim for the adjustment as provided in Article 12 of this Document 00700.

5.4 Checking Of Drawings

5.4.A. Before undertaking each part of Work, Contractor shall carefully study and compare Contract Documents and check and verify pertinent figures shown in the Contract Documents and all applicable field measurements. Contractor shall be responsible for any errors that might have been avoided by such comparison. Figures shown on Drawings shall be followed; Contractor shall not scale measurements. Contractor shall promptly report to Owner, in writing, any conflict, error, ambiguity or discrepancy that Contractor may discover. Contractor shall obtain a written interpretation or clarification from Owner before proceeding with any Work affected thereby. Contractor shall provide Owner with a follow-up correspondence every ten Days until it receives a satisfactory interpretation or clarification.

5.5 Standards To Apply Where Specifications Are Not Furnished

5.5.A. The following general specifications shall apply wherever in the Specifications, or in any directions given by Owner in accordance with or supplementing Specifications, it is provided that Contractor shall furnish materials or manufactured articles or shall do Work for which no detailed specifications are shown. Materials or manufactured articles shall be of the best grade, in quality and workmanship, obtainable in the market from firms of established good reputation. If not ordinarily carried in stock, the materials or manufactured articles shall conform to industry standards for first-class materials or articles of the kind required, with due consideration of the use to which they are to be put. Work shall conform to the usual standards or codes, such as those cited in Section 01420 (References and Definitions), for first-class work of the kind required. Contractor shall specify in writing to Owner the materials to be used or Work to be performed under this paragraph 5.5 ten Business Days prior to furnishing such materials or performing such Work.

5.6 Deviation from Specifications and Drawings

5.6.A. Contractor shall perform Work in accordance with Drawings and Specifications. Contractor may deviate from Drawings or the dimensions given in the Drawings, and may deviate from the Specifications, only upon Owner's advance written approval of the proposed deviation. If Work requires a Submittal prior to commencement, then Contractor's performance of such Work prior to Submittal being favorably reviewed shall be at Contractor's sole risk.

5.6.B. Owner may order that locations, lines, and grades for Work vary from those shown on Drawings. Changes may be made in locations, lines, or grades for Work under any item of Contract Documents. No payment in addition to unit price fixed in the Contract Documents for Work under respective items will be allowed on account of variations from Drawings in unit price items. In lump sum contracts, or where there are no unit price items covering Work affected by variations of locations, lines, or grades, all changes in the Contract Documents will be made as set forth in Article 14 of this Document 00700.

5.7 Precedence Of Documents

5.7.A. In the case of discrepancy or ambiguity in the Contract Documents, the following order of precedence shall prevail:

1. Modifications in inverse chronological order (i.e., most recent first), and in the same order as specific portions they are modifying;
2. Document 00520 (Agreement), and terms and conditions referenced therein;
3. Document 00800 (Supplementary Conditions);
4. Document 00700 (General Conditions);
5. Division 1 Specifications;
6. Drawings and Division 2 through 16 Specifications;
7. Written numbers over figures, unless obviously incorrect;
8. Figured dimensions over scaled dimensions;
9. Large-scale Drawings over small-scale Drawings.

5.7.B. Any conflict between Drawings and Division 2 through 16 Specifications will be resolved in favor of the document of the latest date (i.e., the most recent document), and if the dates are the same or not determinable, then in favor of Specifications.

5.7.C. Any conflict between a bill or list of materials shown in the Contract Documents and the actual quantities required to complete Work required by Contract Documents, will be resolved in favor of the actual quantities.

5.7.D. In the event the Specifications include divisions above Division 16 (e.g., Division 17 and above), then such divisions shall be included within the Contract Documents unless identified otherwise.

5.8 Ownership And Use Of Drawings, Specifications And Contract Documents

5.8.A. Drawings, Specifications, and other Contract Documents were prepared for use for Work of Contract Documents only. No part of Contract Documents shall be used for any other construction or for any other purpose except with the written consent of Owner. Any unauthorized use of Contract Documents is prohibited and at the sole liability of the user.

6. CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 Owner's Right To Perform Construction And To Award Separate Contracts

6.1.A. Owner may perform with its own forces, construction or operations related to the Project. Owner may also award separate contracts in connection with other portions of the Project or other construction or operations, on the Site or areas contiguous to the Site, under conditions similar to these Contract Documents, or may have utility owners perform other work. When separate contracts are awarded for different portions of the Project or other construction or operations on the Site, the term "Contractor" in these Contract Documents shall mean the Contractor herein.

6.2 Mutual Responsibility

6.2.A. Contractor shall afford all other contractors, utility owners, and Owner (if Owner is performing work with its own forces), proper and safe access to the Site, and reasonable opportunity for the installation and storage of their materials. Contractor shall ensure that the execution of its Work properly connects and coordinates with others' work, and shall cooperate with them to facilitate the progress of the Work.

6.2.B. Contractor shall coordinate its Work with the work of other separate contractors, Owner, and utility owners. Contractor shall hold coordination meetings with other contractors, Owner and its representatives, and utility owners as required by Section 01315 (Project Meetings).

6.2.C. Unless otherwise provided in the Contract Documents, Contractor shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. Contractor shall not endanger any work of other separate contractors, Owner, or utility owners by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Owner and the others whose work will be affected.

6.2.D. Contractor's duties and responsibilities under paragraph 6.2.A of this Document 00700 are for the benefit of Owner and also for the benefit of such other contractors and utility owners working at the Site to the extent that there are comparable provisions for the benefit of Contractor in the direct contracts between Owner and such other contractors and utility owners.

6.2.E. To the extent that any part of Contractor's Work is to interface with work performed or installed by other contractors or utility owners, Contractor shall inspect and measure the in-place work. Contractor shall promptly report to Owner in writing any defect in in-place work that will impede or increase the cost of Contractor's interface unless corrected. Owner will require the contractor responsible for the Defective Work to make corrections so as to conform to its contract requirements, or, if the defect is the result of an error or omission in the Contract Documents, issue a Change Order. If Contractor fails to measure, inspect and/or report to Owner in writing defects that are reasonably discoverable, Contractor shall bear all costs of accomplishing the interface acceptable to Owner. This provision shall be included in any and all other contracts or subcontracts for Work to be performed where such a conflict could exist.

6.3 Owner Authority Over Coordination

6.3.A. Owner will have authority over coordination of the activities of multiple contractors in cases where Owner performs Work with its own forces or contracts with others for the performance of other Work on the Project, or utilities Work on the Site. Owner may at any time and in its sole discretion, designate a person or entity other than Owner to have authority over the coordination of the activities among the various contractors. Owner's authority with respect to coordination of the activities of multiple contractors and utility owners shall not relieve Contractor of its obligation to other contractors and utility owners to coordinate its Work with other contractors and utility owners as specified in paragraph 6.2 of this Document 00700. Contractor shall promptly notify Owner in writing when another contractor on the Project fails to coordinate its work with the Work of Contract Documents.

6.3.B. Contractor shall suspend any part of the Work or carry on the same in such manner as directed by Owner when such suspension or prosecution is necessary to facilitate the work of other contractors or workers. No damages or claims by Contractor will be allowed if the suspension or Work change is due in whole or in part to Contractor's failure to perform its obligation to coordinate its Work with other contractors and utility owners. Damages or claims will be allowed only to the extent of fault by Owner if the suspension or Work change is due in whole or in part to another contractor's failure to coordinate its work with Contractor, other contractors, and utility owners.

Owner reserves the right to back charge Contractor for any damages or claims incurred by other contractors as a result of Contractor's failure to perform its obligations to coordinate with other contractors and utility owners. Owner may deposit the funds retained with a Court of competent jurisdiction pursuant to applicable interpleader procedures and Contractor releases Owner of further liability regarding such funds.

7. OWNER AND PAYMENT

7.1 Owner's Representative(s)

7.1.A. Owner's Representative(s) will have limited authority to act on behalf of Owner as set forth in the Contract Documents. Except as otherwise provided in these Contract Documents or subsequently identified in writing by Owner, Owner will issue all communications to Contractor through Owner's Representative, and Contractor shall issue all communications to Owner through Owner's Representative in a written document delivered to Owner. Should any direct communications between Contractor and Owner's consultants, architects, or engineers not identified in Article 2 of Document 00520 (Agreement) occur during field visits or by telephone, Contractor shall immediately confirm them in a written document copied to Owner.

7.2 Means And Methods Of Construction

7.2.A. Subject to those rights specifically reserved in the Contract Documents, Owner will not supervise, or direct, or have control over, or be responsible for, Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or Contractor's failure to comply with laws and regulations applicable to the furnishing or performance of Work. Owner will not be responsible for Contractor's failure to perform or furnish the Work in accordance with Contract Documents.

7.3 Receipt And Processing Of Applications For Payment

7.3.A. As required by Section 01200 (Price and Payment Procedures), Contractor shall prepare the schedules, submit Applications for Payment and warrant title to all Work covered by each Application for Payment. Owner will review Contractor's Applications for Payment and make payment thereon, and Contractor shall make payments to Subcontractors, suppliers, and others, as required by Section 01200 (Price and Payment Procedures).

8. CONTROL OF THE WORK

8.1 Supervision Of Work By Contractor

8.1.A. Contractor shall supervise, inspect, and direct Work competently and efficiently, devoting the attention and applying such personal skills and expertise as may be required and necessary to perform Work in accordance with Contract Documents. Contractor shall be solely responsible for and have control and charge of construction means, methods, techniques, sequences and procedures, safety precautions, and programs in connection with the Work. Contractor shall be responsible to see that the completed Work complies accurately with Contract Documents.

8.1.B. Contractor shall keep on the Site at all times during Work progress a competent resident Superintendent, who shall not be replaced without Owner's express written consent. The Superintendent shall be Contractor's representative at the Site and shall

have complete authority to act on behalf of Contractor. All communications to and from the Superintendent shall be as binding as if given to or by Contractor.

8.2 Observation Of Work By Owner

8.2.A. Work shall be performed under Owner's general observation and administration. Contractor shall comply with Owner's directions and instructions in accordance with the terms of Contract Documents, but nothing contained in these General Conditions shall be taken to relieve Contractor of any obligations or liabilities under the Contract Documents. Owner's failure to review or, upon review, failure to object to any aspect of Work reviewed, shall not be deemed a waiver or approval of any non-conforming aspect of Work.

8.2.B. Owner may engage an independent consultant or engineer (collectively for purposes of this paragraph 8.2, "Engineer") to assist in administering the Work. If so engaged, Engineer will advise and consult with Owner, but will have authority to act on behalf of Owner only to extent provided in the Contract Documents or as set forth in writing by Owner. Engineer will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with Work. Engineer will not be responsible for or have control over the acts or omissions of Contractor, Subcontractors or their agents or employees, or any other persons performing Work.

8.2.C. Engineer may review Contractor's Submittals, such as Shop Drawings, Product Data, and Samples, but only for conformance with design concept of Work and with information given in the Contract Documents.

8.2.D. Engineer may visit the Site at intervals appropriate to stage of construction to become familiar generally with the progress and quality of Work and to determine in general if Work is proceeding in accordance with Contract Documents. Based on its observations, Engineer may recommend to Owner that it disapprove or reject Work that Engineer believes to be Defective or will not produce a complete Project that conforms to Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by Contract Documents. Owner will also have authority to require special inspection or testing of Work, whether or not the Work is fabricated, installed, or completed.

8.2.E. Engineer may conduct inspections to recommend to Owner the dates that Contractor has achieved Substantial Completion and Final Acceptance, and will receive and forward to Owner for review written warranties and related documents required by Contract Documents.

8.3 Access To Work

8.3.A. During performance of Work, Owner and its agents, consultants, and employees may at any time enter upon Work, shops, or studios where any part of the Work may be in preparation, or factories where any materials for use in Work are being or are to be manufactured, and Contractor shall provide proper and safe facilities for this purpose, and shall make arrangements with manufacturers to facilitate inspection of their processes and products to such extent as Owner's interests may require. Other contractors performing work for Owner may also enter upon Work for all purposes required by their respective contracts. Subject to the rights reserved in the Contract Documents, Contractor shall have sole care, custody, and control of the Site and its Work areas.

8.4 Existing Utilities Shown or Indicated In Contract Documents

8.4.A. Drawings or Specifications may indicate above- and below-grade structures, drainage lines, storm drains, sewers, water, gas, electrical, chemical, hot water, and other similar items and utilities, and additional information may be on file at the Common Ground Alliance, 811. Contractor shall locate these known existing installations before proceeding with trenching or other operations that may cause damage, shall maintain them in service where appropriate, and shall repair any damage to them caused by the Work, at no increase in Contract Sum. Additional utilities whose locations are unknown to Owner are suspected to exist. Contractor shall be alert to their existence; if they are encountered, Contractor shall immediately report to Owner for disposition of the same. In addition to reporting if any utility is damaged, Contractor shall take appropriate action as provided in this Document 00700. Additional compensation or extension of time on account of utilities not shown or otherwise brought to Contractor's attention, including reasonable action taken to protect or repair damage, shall be determined as provided in this Document 00700.

8.4.B. At no additional cost to Owner, Contractor shall incorporate into the Work main or trunk line utilities identified in the Contract Documents and other utilities or underground structures known or reasonably discernible and that will remain in service, including reasonable adjustments to the design location (including minor relocations) of the existing or new installations. Contractor shall take immediate action to restore any in-service installations damaged by Contractor's operations. Should Owner determine that Contractor has not responded in a timely manner or not diligently pursued completion of the Work, Owner may restore service and deduct the costs of such action by Owner from the amounts due under the Contract.

8.4.C. Consistent with Government Code Section 4215, as between Owner and Contractor, Owner will be responsible for the timely removal, relocation, or protection of existing main or trunk line utility facilities located on the Site only if such utilities are not identified in the Contract Documents or Document 00320 (Geotechnical Data and Existing Conditions). Owner will compensate for the cost of locating and repairing damage not due to Contractor's failure to exercise reasonable care, removing and relocating such main or trunk line utility facilities not indicated in the Contract Documents or Document 00320 (Geotechnical Data and Existing Conditions) with reasonable accuracy, and equipment on the Project necessarily idled during such Work.

8.4.D. Prior to performing Work at the Site, Contractor shall lay out the locations of known underground utilities that are to remain in service and other significant known underground installations. At no additional cost to Owner, prior to commencing other Work in proximity to such known underground utilities or installations that can be readily inferred from adjacent surface improvements, Contractor shall further locate, by carefully excavating with small equipment, potholing, and principally by hand, such utilities or installations that are to remain and that are subject to damage. This obligation applies to all utilities (including, but not limited to, those referenced in paragraph 8.4.C of this Document 00700).

8.4.E. Nothing in this Document 00700 shall be deemed to require Owner to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred by Contractor from the presence of an underground transmission main or other visible facilities, such as buildings, new asphalt, meters,

and junction boxes, on or adjacent to the Site. Contractor shall immediately secure all available information and notify Owner and utility, in writing, of its discovery, while performing Work under the Contract Documents, of any utility facilities not identified in the Drawings and Specifications.

8.5 Protection of Underground Facilities When Digging Trenches Or During Excavation

8.5.A. Before commencing Work of digging trenches or excavation, Contractor shall review all information available regarding subsurface conditions, including but not limited to information supplied in Document 00320 (Geotechnical Data and Existing Conditions), and subject to the terms and conditions of these documents, Contractor shall also comply with Government Code Sections 4216 to 4216.9, and in particular Section 4216.2 which provides, in part:

> Except in an emergency, every person planning to conduct any excavation shall contact the appropriate regional notification center at least two working days, but no more than 14 calendar days, prior to commencing that excavation, if the excavation will be conducted in an area which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the excavator, and, if practical, the excavator shall delineate with white paint or other suitable markings the area to be excavated. The regional notification center shall provide an inquiry identification number to the person who contacts the center and shall notify any member, if known, who has a subsurface installation in the area of the proposed excavation.

8.5.B. Contractor shall contact Common Ground Alliance, telephone 811, and schedule the Work to allow ample time for the center to notify its members and, if necessary, for any member to field locate and mark its facilities. Contractor is charged with knowledge of all subsurface conditions reflected in 811 records. Prior to commencing excavation or trenching Work, Contractor shall provide Owner with copies of all 811 records secured by Contractor. Contractor shall advise Owner of any conflict between information provided in Document 00320 (Geotechnical Data and Existing Conditions), the Drawings and that provided by 811 records. Contractor's excavation shall be subject to and comply with the Contract Documents, including without limitation paragraphs 2.1 and 8.4 of this Document 00700.

8.5.C. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated in the materials supplied by Owner or in information on file at 811 or is otherwise reasonably available to Contractor, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby (and in no event later than seven Days), and prior to performing any Work in connection therewith (except in an emergency as required by Article 16 of this Document 00700), identify the owner of such Underground Facility and give written notice to that owner and to Owner. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

8.5.D. Contractor shall be allowed an increase in the Contract Sum or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that is owned and was built by Owner only where the Underground Facility:

1. Was not shown or indicated in the Contract Documents or in the information supplied pursuant to Document 00320 (Geotechnical Data and Existing Conditions) or in information on file at 811; and
2. Contractor did not know of it; and
3. Contractor could not reasonably have been expected to be aware of it or to have anticipated it from the information available. (For example, if surface conditions such as pavement repairs, valve covers, or other markings, indicate the presence of an Underground Facility, then an increase in the Contract Sum or an extension of the Contract Time will not be due, even if the Underground Facility was not indicated in the Contract Documents, in the information supplied to Contractor pursuant to Document 00320 [Geotechnical Data and Existing Conditions], in information on file at 811, or otherwise reasonably available to Contractor.)

8.5.E. Contractor shall bear the risk that Underground Facilities not owned or built by Owner may differ in nature or locations shown in information made available by Owner pursuant to Document 00320 (Geotechnical Data and Existing Conditions), in information on file at 811, or otherwise reasonably available to Contractor. Underground Facilities are inherent in construction involving digging of trenches or other excavations and Contractor is to apply its skill and industry to verify the information available.

8.5.F. The cost of all of the following will be included in the Contract Sum and Contractor shall have full responsibility for (a) reviewing and checking all available information and data including, but not limited to, Document 00320 (Geotechnical Data and Existing Conditions) and information on file at 811; (b) locating all Underground Facilities shown or indicated in the Contract Documents, available information, or indicated by visual observation including, but not limited to, and by way of example only, engaging qualified locating services and all necessary backhoeing and potholing; (c) coordinating the Work with the owners of such Underground Facilities during construction; and (d) the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

9. WARRANTY, GUARANTY, AND INSPECTION OF WORK

9.1 Warranty And Guaranty

9.1.A. General Representations and Warranties: Contractor represents and warrants that it is and will be at all times fully qualified and capable of performing every Phase of the Work and to complete Work in accordance with the terms of Contract Documents. Contractor warrants that all construction services shall be performed in accordance with generally accepted professional standards of good and sound construction practices and all requirements of Contract Documents. Contractor warrants that Work, including but not limited to each item of materials and equipment incorporated therein, shall be new, of suitable grade of its respective kind for its intended use, and free from defects in design, engineering, materials, construction and workmanship. Contractor warrants that Work shall conform in all respects with all applicable requirements of federal, state and local laws, applicable construction codes and standards, licenses, and permits, Drawings and Specifications and all descriptions set forth therein, and all other requirements of Contract Documents. Contractor shall not be responsible, however, for the negligence of others in the specification of specific

equipment, materials, design parameters and means or methods of construction where that is specifically shown and expressly required by Contract Documents.

9.1.B. Extended Warranties and Guaranties and Co-guarantor Obligation:

1. Extended Warranties or Guaranties: For any warranty or guaranty exceeding one year provided by the supplier or manufacturer of any equipment or materials used in the Project ("Extended Warranty"), Contractor shall assign such warranties and guaranties to Owner and supply Owner with all warranty and guaranty documents relative thereto.
2. Contractor as Co-guarantor: Contractor shall act as co-guarantor of equipment and materials for either the term of the Extended Warranty or 3 years, whichever is shorter, if the performance of the equipment or materials involves or affects water-tightness (above grade or below grade) or any type of moisture intrusion.

9.1.C. Environmental and Toxics Warranty: The covenants, warranties and representations contained in this paragraph 9.1.B. are effective continuously during Contractor's Work on the Project and following cessation of labor for any reason including, but not limited to, Project completion. Except as expressly shown in the Contract Documents, Contractor covenants, warrants and represents to Owner that:

1. To Contractor's knowledge after due inquiry, no lead or Asbestos-containing materials were installed or discovered in the Project at any time during Contractor's construction thereof. If any lead or Asbestos-containing materials were discovered, Contractor made immediate written disclosure to Owner.
2. To Contractor's knowledge after due inquiry, no electrical transformers, light fixtures with ballasts or other equipment containing PCBs were installed or discovered on the Project at any time during Contractor's construction thereof. If any such materials were discovered, Contractor made immediate written disclosure to Owner.
3. To Contractor's knowledge after due inquiry, no storage tanks for gasoline or any other toxic substance were installed or discovered on the Project at any time during Contractor's construction thereof. If any such materials were discovered, Contractor made immediate written disclosure to Owner.
4. Contractor's operations concerning the Project are and were not in violation of any applicable environmental federal, state, or local statute, law or regulation dealing with hazardous materials substances or toxic substances and no notice from any governmental body has been served upon Contractor claiming any violation of any such law, ordinance, code or regulation, or requiring or calling attention to the need for any Work, repairs, construction, alteration, or installation on or in connection with the Project in order to comply with any such laws, ordinances, codes, or regulations, with which Contractor has not complied. If there are any such notices with which Contractor has complied, Contractor shall provide Owner with copies thereof.

9.2 Inspection Of Work

9.2.A. All materials, equipment, and workmanship used in Work shall be subject to inspection and testing at all times during construction and/or manufacture in accordance with the terms of Contract Documents. Work and materials, and manufacture and preparation of materials, from beginning of construction until Final Completion and acceptance of Work, shall be subject to inspection and rejection by Owner, its agents, representatives or independent contractors retained by Owner to

perform inspection services, or governmental agencies with jurisdictional interests. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and program so that they may comply therewith as applicable. Upon request or where specified, Owner shall be afforded access for inspection at the source of supply, manufacture or assembly of any item of material or equipment, with reasonable accommodations supplied for making such inspections.

9.2.B. Contractor shall furnish, in such quantities and sizes as may be required for proper examination and tests, Samples or test specimens of all materials to be used or offered for use in connection with Work. Contractor shall prepare Samples or test specimens at its expense and furnish them to Owner. Contractor shall submit all Samples in ample time to enable Owner to make any necessary tests, examinations, or analyses before the time it is desired to incorporate the material into the Work.

9.2.C. Contractor shall give Owner timely notice of readiness of Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

9.2.D. If applicable laws or regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, and furnish Owner with the required certificates of inspection, or approval. Owner will pay the cost of initial testing and Contractor shall pay all costs in connection with any follow-up or additional testing. Contractor shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for the acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

9.2.E. If Contractor covers any Work, or the work of others, prior to any required inspection, test or approval without written approval of Owner, Contractor shall uncover the Work at Owner's request. Contractor shall bear the expense of uncovering Work and replacing Work.

9.2.F. In any case where Contractor covers Work contrary to Owner's request, Contractor shall uncover Work for Owner's observation or inspection at Owner's request. Contractor shall bear the cost of uncovering Work.

9.2.G. Whenever required by Owner, Contractor shall furnish tools, labor and materials necessary to make examination of Work that may be completed or in progress, even to extent of uncovering or taking down portions of finished Work. Should Work be found unsatisfactory, cost of making examination and of reconstruction shall be borne by Contractor. If Work is found to be satisfactory, Owner, in manner herein prescribed for paying for alterations, Modifications, and extra Work, except as otherwise herein specified, will pay for examination.

9.2.H. Inspection of the Work by or on behalf of Owner, or Owner's failure to do so, shall not under any circumstances be deemed a waiver or approval of any non-conforming aspect of the Work. Contractor shall have an absolute duty, in the absence of a written Change Order signed by Owner, to perform Work in conformance with the Contract Documents and to correct Defective Work immediately upon Contractor's knowledge.

9.2.I. Any inspection, evaluation, or test performed by or on behalf of Owner relating to the Work is solely for the benefit of Owner, and shall not be relied upon by Contractor. Contractor shall not be relieved of the obligation to perform Work in accordance with the Contract Documents, nor relieved of any guaranty, warranty, or other obligation, as a result of any inspections, evaluations, or tests performed by Owner, whether or not such inspections, evaluations, or tests are permitted or required under the Contract Documents. Contractor shall be solely responsible for testing and inspecting Work already performed to determine whether such Work is in proper condition to receive later Work.

9.3 Correction Of Defective Work

9.3.A. If Contractor fails to supply sufficient skilled workers, suitable materials or equipment, or to furnish or perform the Work in such a way that the completed Work will conform to Contract Documents, Owner may order Contractor to replace any such Defective Work, or stop any portion of Work to permit Owner (at Contractor's expense) to replace such Defective Work. These Owner rights are entirely discretionary on the part of the Owner, and shall not give rise to any duty on the part of Owner to exercise the rights for the benefit of Contractor or any other party.

9.3.B. Owner may direct Contractor to correct any Defective Work or remove it from the Site and replace it with Work that is not Defective and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting from the correction or removal. Contractor shall be responsible for any and all claims, costs, losses, and damages caused by or resulting from such correction or removal. A Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Contract Sum. If the parties are unable to agree to the amount of an appropriate decrease in the Contract Sum, Owner may decide the proper amount or, in its discretion may elect to leave the Contract Sum unchanged and deduct from moneys due Contractor, all such claims, costs, losses, and damages caused by or resulting from the correction or removal. If Contractor disagrees with Owner's calculations, it may make a claim as provided in Article 12 of this Document 00700. Owner's rights under this paragraph 9.3.B shall be in addition to any other rights it may have under the Contract Documents or by law.

9.3.C. Correction Period: If within one year after the date of Final Acceptance, or such longer period of time as may be prescribed by laws or regulations, or by the terms of Contract Documents, any Work (completed or incomplete) is found to be Defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, correct such Defective Work. Contractor shall remove any Defective Work rejected by Owner and replace it with Work that is not Defective, and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If Contractor fails to promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the Defective Work corrected or the rejected Work removed and replaced. Contractor shall pay for all claims, costs, losses, and damages caused by or resulting from such removal and replacement. Where Contractor fails to correct Defective Work, or defects are discovered outside the correction period, Owner shall have all rights and remedies granted by law.

9.3.D. In special circumstances where a part of the Work is occupied or a particular item of equipment is placed in continuous service before Final Acceptance of all the Work, the

correction period for that part of Work or that item may start to run from an earlier date if so provided by Change Order.

9.3.E. Where Defective Work or rejected Work (and damage to other Work resulting therefrom) has been corrected, removed, or replaced under this provision after the commencement of the correction period, the correction period hereunder with respect to such Work shall be extended for an additional period of one year, or such longer period of time as may be prescribed by laws, regulations, or by the terms of the Contract Documents, after such correction or removal and replacement has been satisfactorily completed.

9.4 Acceptance And Correction Of Defective Work By Owner

9.4.A. Owner may accept Defective Work. Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such Defective Work. If Owner accepts any Defective Work prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Contract Sum. If the parties are unable to agree to the amount of an appropriate decrease in the Contract Sum, Owner may deduct from moneys due Contractor, all claims, costs, losses, damages, expenses, and liabilities attributable to the Defective Work. If Contractor disagrees with Owner's calculations, Contractor may make a claim as provided in Article 12 of this Document 00700. If Owner accepts any Defective Work after final payment, Contractor shall pay to Owner, an appropriate amount as determined by Owner.

9.4.B. Owner may correct and remedy deficiency if, after five Days' written notice to Contractor, Contractor fails to correct Defective Work or to remove and replace rejected Work in accordance with paragraph 9.3.B of this Document 00700; or provide a plan for correction of Defective Work acceptable to Owner; or perform Work in accordance with Contract Documents. In connection with such corrective and remedial action, Owner may exclude Contractor from all or part of the Site; take possession of all or part of Work and suspend Contractor's Work related thereto; take possession of all or part of Contractor's tools, appliances, construction equipment, and machinery at the Site; and incorporate in Work any materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, its representatives, agents, employees, and other contractors and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph 9.4.B. Contractor shall be responsible for all claims, costs, losses, damages, expenses and liabilities incurred or sustained by Owner in exercising such rights and remedies. A Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to Work and the Contract Sum. If the parties are unable to agree to the amount of an appropriate decrease in the Contract Sum, Owner may deduct from moneys due Contractor, all claims, costs, losses and damages caused by or resulting from the correction or removal. If Contractor disagrees with Owner's calculations, Contractor may make a claim as provided in Article 12 of this Document 00700.

9.5 Rights Upon Inspection, Correction, Or Acceptance

9.5.A. Contractor shall not be allowed an extension of Contract Time because of any delay in the performance of Work attributable to the exercise by Owner of its rights and remedies under this Article 9. Where Owner exercises its rights under this Article 9, it

retains and may still exercise all other rights it has by law or under the Contract Documents including, but not limited to, the right to terminate Contractor's right to proceed with the Work under the Contract Documents for cause and/or make a claim or back charge where a Change Order cannot be agreed upon.

9.5.B. Inspection by Owner or its authorized agents or representatives shall not relieve Contractor of its obligation to have furnished material and workmanship in accordance with Contract Documents. Payment for Work completed through periodic progress payments, Final Payment, or otherwise shall not operate to waive Owner's right to require full compliance with Contract Documents and shall in no way be deemed as acceptance of any Defective Work paid therefor. Contractor's obligation to complete the Work in accordance with Contract Documents shall be absolute, unless Owner agrees otherwise in writing.

9.5.C. Neither acceptance of the whole or any part of Work by Owner nor any verbal statements on behalf of Owner or its authorized agents or representatives shall operate as a waiver or Modification of any provision of the Contract Documents, or of any power reserved to Owner herein nor any right to damages provided in the Contract Documents.

9.6 Proof Of Compliance Of Contract Provisions

9.6.A. In order that Owner may determine whether Contractor has complied or is complying with requirements of Contract Documents not readily enforceable through inspection and tests of Work and materials, Contractor shall at any time, when requested, submit to Owner properly authenticated documents or other satisfactory proofs of compliance with all applicable requirements.

10. CONTRACTOR'S ORGANIZATION AND EQUIPMENT

10.1 Contractor's Legal Address

10.1.A. Address and facsimile number given in Contractor's Bid are hereby designated as Contractor's legal address and facsimile number. Contractor may change its legal address and facsimile number by notice in writing, delivered to Owner, which in conspicuous language advises Owner of a change in legal address or facsimile number, and which Owner accepts in writing. Delivery to Contractor's legal address or depositing in any post office or post office box regularly maintained by the United States Postal Service, in a wrapper with postage affixed, directed to Contractor at legal address, or of any drawings, notice, letter or other communication, shall be deemed legal and sufficient service thereof upon Contractor. Facsimile to Contractor's designated facsimile number of any letter, memorandum, or other communication on standard or legal sized paper, with proof of facsimile transmission, shall be deemed legal and sufficient service thereof upon Contractor.

10.2 Contractor's Office At The Work Site

10.2.A. Contractor shall maintain an office at the Site, which office shall be headquarters of a Contractor representative authorized to transmit to and receive from Owner, communications, instructions, or Drawings. Communications, instructions, or Drawings given to Contractor's representative or delivered at the Site office in representative's absence shall be deemed to have been given to Contractor.

10.3 Contractor's Superintendents Or Forepersons

10.3.A. Contractor shall at all times be represented on Site by one or more superintendents or forepersons authorized and competent to receive and carry out any instructions that Owner may give, and shall be liable for faithful observance of instructions delivered to Contractor or to authorized representative or representatives on Site.

10.4 Proficiency In English

10.4.A. Supervisors, security guards, safety personnel, and employees who have unescorted access to the Site shall possess proficiency in the English language in order to understand, receive, and carry out oral and written communications or instructions relating to their job functions, including safety and security requirements.

10.5 Contractor's And Subcontractors' Employees

10.5.A. Contractor shall employ, and shall permit its Subcontractors to employ, only competent and skillful personnel to do Work. If Owner notifies Contractor that any of its employees, or any of its Subcontractors' employees on Work is incompetent, unfaithful, disorderly, or profane, or fails to observe customary standards of conduct, or refuses to carry out any provision of the Contract Documents, or uses threatening or abusive language to any person on Work representing Owner, or violates sanitary rules, or is otherwise unsatisfactory, and if Owner requests that such person be discharged from Work, then Contractor or its Subcontractor shall immediately discharge such person from Work and the discharged person shall not be re-employed on the Work except with consent of Owner.

10.6 Contractor To Supply Sufficient Workers And Materials

10.6.A. Unless otherwise required by Owner under the terms of Contract Documents, Contractor shall at all times keep on the Site materials and employ qualified workers sufficient to prosecute Work at a rate and in a sequence and manner necessary to complete Work within the Contract Time. This obligation shall remain in full force and effect notwithstanding disputes or claims of any type.

10.6.B. At any time during progress of Work should Contractor directly or indirectly (through Subcontractors) refuse, neglect, or be unable to supply sufficient materials or employ qualified workers to prosecute the Work as required, then Owner may require Contractor to accelerate the Work and/or furnish additional qualified workers or materials as Owner may consider necessary, at no cost to Owner. If Contractor does not comply with the notice within three Business Days of date of service thereof, Owner shall have the right (but not a duty) to provide materials and qualified workers to finish the Work or any affected portion of Work, as Owner may elect. Owner may, at its discretion, exclude Contractor from the Site, or portions of the Site or separate Work elements during the time period that Owner exercises this right. Owner will deduct from moneys due or which may thereafter become due under the Contract Documents, the sums necessary to meet expenses thereby incurred and paid to persons supplying materials and doing Work. Owner will deduct from funds or appropriations set aside for purposes of Contract Documents the amount of such payments and charge them to Contractor as if paid to Contractor. Contractor shall remain liable for resulting delay, including liquidated damages and indemnification of Owner from claims of others.

10.6.C. Exercise by Owner of the rights conferred upon Owner in paragraph 10.6.B of this Document 00700, is entirely discretionary on the part of Owner. Owner shall have no duty or obligation to exercise the rights referred to in paragraph 10.6.B of this Document 00700 and its failure to exercise such rights shall not be deemed an approval of existing Work progress or a waiver or limitation of Owner's right to exercise such rights in other concurrent or future similar circumstances. The rights conferred upon Owner under paragraph 10.6.B of this Document 00700 are cumulative to Owner's other rights under any provision of the Contract Documents.

10.7 Contractor To List Trades Working

10.7.A. Contractor shall list the trades working on the Site and their scheduled activities on a daily basis, and provide a copy of that list to Owner.

10.8 Contractor's Use Of The Site

10.8.A. Contractor shall not make any arrangements with any person to permit occupancy or use of any land, structure, or building within the limits of the Work, for any purpose whatsoever, either with or without compensation, in conflict with any agreement between Owner and any owner, former owner or tenant of such land, structure, or buildings. Contractor may not occupy Owner-owned property outside the limit of the Work as indicated on the Drawings unless it obtains prior approval from Owner.

10.9 Apprenticeship Program

10.9.A. Contractor and Subcontractors shall comply with the requirements of California Labor Code Sections 1776, 1777.5, and 1777.6 concerning the employment of apprentices by Contractor or Subcontractors. Willful failure to comply may result in penalties, including loss of the right to Bid on or receive public works contracts.

10.9.B. Section 1777.5, as amended, requires a Contractor or Subcontractor employing tradespersons in any apprenticeable occupation to apply to the joint apprenticeship committee nearest the site of a public works project and which administers the apprenticeship program in that trade for a certification of approval. The certificate shall also fix the ratio of apprentices to journeypersons that will be used in performance of the Contract. The ratio of work performed by apprentices to journeypersons in such cases shall not be less than one *hour* of apprentice's work for every five *hours* of labor performed by journeypersons (the minimum ratio for the land surveyor classification shall not be less than one apprentice for each five journeypersons), except:

1. When unemployment for the previous three-month period in the area exceeds an average of 15 percent;
2. When the number of apprentices in training in the area exceeds a ratio of one to five;
3. When a trade can show that it is replacing at least 1/30 of its membership through apprenticeship training on an annual basis state-wide or locally; or
4. Assignment of an apprentice to any work performed under a public works contract would create a condition which would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyperson.

10.9.C. Contractor is required to make contributions to funds established for administration of apprenticeship programs if Contractor employs registered apprentices or journeypersons in any apprenticeable trade on such contracts and if other contractors on the public works site are making such contributions.

10.9.D. Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of the California Department of Industrial Relations, or from the Division of Apprenticeship Standards and its branch offices.

11. PROSECUTION AND PROGRESS OF THE WORK

11.1 Schedules And Examinations Of Contract Documents

11.1.A. Contractor shall submit schedules, reports, and Submittals in the appropriate quantity and within the required time, arrange conferences and meetings, and proceed with the Work in accordance with Contract Documents, including Sections 01315 (Project Meetings), 01320 (Progress Schedules and Reports), and 01330 (Submittal Procedures).

11.1.B. Contractor shall submit to Owner for review and discussion at the initial Schedule Review Meeting described in Section 01315 (Project Meetings):

1. Progress Schedules and Reports as required by Sections 01320 (Progress Schedules and Reports) and 01330 (Submittal Procedures). Contractor shall utilize Progress Schedule in planning, scheduling, coordinating, performing, and controlling Work (including all activities of Subcontractors, assigned contractors, equipment vendors, and suppliers). Contractor shall update Progress Schedule on a monthly basis to depict accurately the actual progress of Work and for evaluating and preparing Contractor's monthly progress payments. Contractor's failure to submit and maintain an acceptable Progress Schedule may, in Owner's discretion, and without limiting the materiality of Contractor's other obligations under the Contract Documents, constitute grounds to declare Contractor in material breach of the Contract Documents.
2. Within 21 Days after issuance of Notice to Proceed, a preliminary schedule of Submittals that shall list each required Submittal and the times for submitting, reviewing and processing such Submittal, as required by Section 01330 (Submittal Procedures). If no such schedule is agreed upon, then all Submittals shall be completed and submitted within 35 Days after the Notice of Award.
3. Within 21 Days after issuance of Notice to Proceed, a preliminary Schedule of Values for all the Work which shall include quantities and prices of items aggregating the Contract Sum and shall subdivide each Schedule of Values into component activities in sufficient detail to serve as the basis for progress payments during construction. Such Schedule of Values shall include an appropriate amount of overhead and profit applicable to each item of Work, a line item for Project Record Documents, and a line item for Project scheduling, and shall conform to Section 01200 (Price and Payment Procedures).

11.1.C. Unless otherwise provided in the Contract Documents, at least 15 Days before submission of the first Application for Payment, a conference attended by Contractor, Owner, and others as appropriate, will be held to review for acceptability the schedules submitted in accordance with paragraph 11.1.B of this Document 00700. Contractor shall have an additional seven Days to make corrections and adjustments and to complete and resubmit the schedules. Schedules shall be updated and

completed as required by Sections 01200 (Price and Payment Procedures), 01320 (Progress Schedules and Reports) and 01330 (Submittal Procedures). No progress payment shall be due or owing to Contractor until the schedules are submitted to and acceptable to Owner or Engineer or both as meeting the requirements of the Contract Documents, including Sections 01200 (Price and Payment Procedures), 01320 (Progress Schedules and Reports) and 01330 (Submittal Procedures). Owner's acceptance of Contractor's schedules will not create any duty of care or impose on Owner any responsibility for the sequencing, scheduling, or progress of Work, nor will it interfere with or relieve Contractor from Contractor's full responsibility therefor.

11.1.D. Before commencing any portion of Work, Contractor shall inform Owner in writing as to time and place at which Contractor wishes to commence Work, and nature of Work to be done, in order that proper provision for inspection of Work may occur, and to assure measurements necessary for record and payment. Information shall be given to Owner a reasonable time in advance of time at which Contractor proposes to begin Work, so that Owner may complete necessary preliminary work without inconvenience or delay to Contractor.

11.1.E. Contractor shall submit Submittals to Owner (or Engineer if Owner so designates) for review in strict accordance with Section 01330 (Submittal Procedures). Submission of a Submittal shall constitute Contractor's representation that all requirements of Section 01330 (Submittal Procedures) have been complied with. All Submittals will be identified as Owner may require and in the number of copies specified in Section 01330 (Submittal Procedures).

11.1.F. Contractor shall not perform Work that requires submission of a Submittal prior to submission and favorable review of the Submittal. Where a Submittal is required by Contract Documents or the final Schedule of Submittals accepted by Owner, any related Work performed prior to Owner's approval of the pertinent Submittal shall be at the sole expense, responsibility, and risk of Contractor.

11.2 Cost Data

11.2.A. Contractor shall maintain full and correct information as to the number of workers employed in connection with each subdivision of Work, the classification and rate of pay of each worker in the form of certified payrolls, the cost to Contractor of each class of materials, tools, and appliances used by Contractor in Work, and the amount of each class of materials used in each subdivision of Work. Contractor shall provide Owner with copies of certified payrolls every 2 weeks. If Contractor maintains or is capable of generating summaries or reports comparing actual Project costs with Bid estimates or budgets, Contractor shall provide Owner with a copy of such report upon Owner's request and whenever it is generated.

11.2.B. Contractor shall maintain daily job reports recording all significant activity on the job, including the number of workers on Site, Work activities, problems encountered, and delays. Contractor shall provide Owner with copies for each Day Contractor works on the Project, to be delivered to Owner either the same Day or the following morning before starting Work at the Site. Contractor shall take monthly progress photographs of all areas of the Work. Contractor shall maintain copies of all correspondence with Subcontractors and records of meetings with Subcontractors.

11.2.C. Owner shall have the right to audit and copy Contractor's books and records of any type, nature, or description relating to the Project (including but not limited to financial

records reflecting in any way costs claimed on the Project), and to inspect the Site, including Contractor's trailer, or other job Site office, and this requirement shall be contained in the subcontracts of Subcontractors working on Site. By way of example, Owner shall have the right to inspect and obtain copies of all Contract Documents, planning and design documents, Bid proposal and negotiation documents (subject to Document 00670 [Escrow Bid Documents]), cost records and job cost variance reports, design modification proposals, value engineering or other cost reduction proposals, revisions made to the original design, job Progress Reports, photographs, and as-built drawings maintained by Contractor. Owner and any other applicable governmental entity shall have the right to inspect all information and documents maintained under this paragraph 11.2 at any time during the Project and for a period of five years following Substantial Completion. This right of inspection shall not relieve Contractor of its duties and obligations under the Contract Documents. This right of inspection shall be specifically enforceable in a court of law, either independently or in conjunction with enforcement of any other rights in the Contract Documents.

11.2.D. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Contract Modifications, Change Orders, Work Directives, Force Account orders, and written interpretations and clarifications in good order and annotated to show all changes made during construction. These Project Record Documents, together with all approved Samples and a counterpart of all approved Shop Drawings, shall be maintained and available to Owner for reference. Upon completion of the Work, Contractor shall deliver to Owner, the Project Record Documents.

12. CLAIMS BY CONTRACTOR

12.1 General

12.1.A. Contract Interpretation Disputes: Should it appear to Contractor that Work to be performed or any of the matters relative to Contract Documents (including without limitation Drawings or Specifications) are not satisfactorily detailed or explained therein, or should any questions arise as to the meaning or intent of Contract Documents (including without limitation Drawings or Specifications), Contractor shall give written notice to Owner. Contractor shall bear all costs incurred in giving notice. Owner will render a determination regarding the issue, which shall be final. If Contractor disagrees with Owner's decision, Contractor's sole and exclusive remedy is to file a claim in accordance with this Article 12. Contractor shall diligently prosecute the Disputed Work (as defined below) to Final Completion pending resolution of any claim.

12.1.B. Work Disputes: Contractor shall give written notice to Owner of any dispute arising under the Contract Documents respecting the true value of any Work performed, the implementation of Work required by Contract Documents, any Work omitted, any extra Work that Contractor may be required to perform or time extensions, respecting the size of any payment to Contractor during the performance of Contract Documents, or of compliance with Contract Documents procedures. Owner will render a determination regarding the issue, which shall be final. If Contractor disagrees with Owner's decision, Contractor's sole and exclusive remedy is to file a claim in accordance with this Article 12. Pending the resolution of any claim, Contractor shall diligently prosecute the Disputed Work to Final Completion.

12.1.C. The claim notice and documentation procedure described in this Article 12 shall constitute a mandatory non-judicial settlement procedure and shall apply to all claims and disputes arising under the Contract Documents, including without limitation any claim or dispute by any Subcontractor or material supplier. All Subcontractor and supplier claims of any type shall be brought only through Contractor as provided in this Article 12. Under no circumstances shall any Subcontractor or supplier make any direct claim against Owner.

12.1.D. "Claim" means a written demand or written assertion by Contractor seeking, as a matter of right, the payment of money, the adjustment or interpretation of Contract Documents terms, or other relief arising under or relating to Contract Documents. In order to qualify as a "claim," the written demand must state that it is a claim submitted under this Article 12.

12.1.E. A voucher, invoice, proposed change, Application for Payment, or other routine or authorized form of request for payment is not a claim under the Contract Documents. If such request is disputed as to liability or amount, then the disputed portion of the submission may be converted to a claim under the Contract Documents by submitting a separate claim in compliance with claim submission requirements.

12.1.F. The provisions of this Article 12 survive termination, breach, or completion of the Contract Documents. Contractor shall bear all costs incurred in the preparation and submission of a claim.

12.2 Procedure

12.2.A. Should any clarification, determination, action or inaction by Owner or Engineer, Work, or any other event, in the opinion of Contractor, exceed the requirements of or not comply with Contract Documents, or otherwise result in Contractor seeking additional compensation in time or money for any reason (collectively "Disputed Work"), then Contractor and Owner will make good faith attempts to resolve informally any and all such issues, claims and/or disputes. Before commencing the Disputed Work, or within seven Days after Contractor's first knowledge of the Disputed Work, whichever is earlier, Contractor shall file a written notice and cost proposal for the Disputed Work with Owner stating clearly and in detail its objection and reasons for contending the Work or interpretation is outside the requirements of Contract Documents. If a written notice and cost proposal for Disputed Work is not issued within this time period, or if Contractor proceeds with the Disputed Work without first having given the notice required by this paragraph 12.2.A, Contractor shall waive its rights to further claim on the specific issue.

12.2.B. Owner will review Contractor's timely notice and cost proposal for Disputed Work and provide a decision. If, after receiving the decision, Contractor disagrees with it or still considers the Work required of it to be outside of the requirements of Contract Documents, it shall so notify Owner, in writing, within seven Days after receiving the decision, by submitting a notice of potential claim, stating that a formal claim will be issued. Within 30 Days of receiving the decision, Contractor shall submit its claim in the form specified herein and all arguments, justification, cost or estimates, schedule analysis, and detailed documentation supporting its position. Contractor's failure to furnish notification within seven Days and all justifying documentation within 30 Days will result in Contractor waiving its right to the subject claim. If Disputed Work persists longer than 30 Days, then Contractor shall, every 30 Days until the Disputed

Work ceases, submit to Owner a document titled "Claim Update" that shall update and quantify all elements of the claim as completely as possible. Contractor's failure to submit a Claim Update or to quantify costs every 30 Days shall result in waiver of the claim for that 30-Day period. Claims or Claim Updates stating that damages, total damages (direct and indirect), schedule input and/or any time extension will be determined at a later date shall not comply with this paragraph 12.2.B and shall result in Contractor waiving its claim(s).

12.2.C. Upon receipt of Contractor's formal claim including all arguments, justifications, cost or estimates, schedule analysis, and all other documentation supporting its position as required herein, Owner or its designee will review the issue and render a final determination. Owner may in its discretion first conduct an administrative hearing on the claim, in which event Contractor shall appear and provide further substantiating information and documents if requested by Owner.

12.2.D. Claims shall be calculated in the same manner as Change Orders per Section 01250 (Modification Procedures). EXCEPT WHERE PROVIDED BY LAW, OR ELSEWHERE IN THESE CONTRACT DOCUMENTS (IF APPLICABLE), OWNER SHALL NOT BE LIABLE FOR SPECIAL OR CONSEQUENTIAL DAMAGES, AND CONTRACTOR SHALL NOT INCLUDE THEM IN ITS CLAIMS. CONTRACTOR SHALL BE LIMITED IN ITS RECOVERY ON CLAIMS TO THE CHANGE ORDER CALCULATIONS SET FORTH IN SECTION 01250 (MODIFICATION PROCEDURES).

12.3 Claim Format

12.3.A. Contractor shall submit the claim justification in the following format:

1. Cover letter and certification under penalty of perjury of the accuracy of the claim;
2. Summary of claim, including underlying facts, entitlement, schedule analysis, quantum calculations, Contract provisions supporting relief;
3. List of documents relating to claim including Specifications, Drawings, clarifications/requests for information, schedules, notices of delay, and any others;
4. Chronology of events and correspondence;
5. Analysis of claim merit;
6. Analysis of claim cost; and
7. Attach supporting documents referenced in paragraph 12.3.A.3.

12.4 Mediation

12.4.A. All Contractor claims not subject to the claim resolution procedures set forth in Section 01410 (Regulatory Requirements) shall, as a condition precedent to litigation (or if otherwise permitted by the Contract Documents, arbitration) thereon, first be mediated. Mediation shall be non-binding and utilize the services of a mediator mutually acceptable to the parties and, if the parties cannot agree, a mediator selected by the American Arbitration Association from its panel of approved mediators trained in construction industry mediation. Except as provided below in Section 12.7, all statutes of limitation shall be tolled from the date of the demand for mediation until a date two weeks following the mediation's conclusion. All unresolved Contractor claims shall be submitted to the same mediator. The cost of mediation shall be equally shared.

12.5 Subcontractor Claims

12.5.A. Contractor shall present as its claims all Subcontractor, sub-Subcontractor and supplier claims of any type, and prove them under the terms of the Contract Documents. Owner shall not be directly liable to any Subcontractor, any supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages or extra costs of any type arising out of or resulting from the Project.

12.6 Exclusive Remedy

12.6.A. Contractor's performance of its duties and obligations specified in this Article 12 and administration of a claim as provided in this Article 12 is Contractor's sole and exclusive remedy for disputes of all types pertaining to the payment of money, extension of time, the adjustment or interpretation of the Contract Documents terms or other contractual or tort relief arising from Contract Documents. This exclusive remedy and the limitation of liability (expressed herein and elsewhere throughout the Contract Documents) apply notwithstanding the completion, termination, suspension, cancellation, breach, or rescission of the Work or Contract Documents, negligence or strict liability by Owner, its representatives, consultants, or agents, or the transfer of Work or the Project to Owner for any reason whatsoever. Contractor waives and covenants not to raise any claims of waiver, estoppel, release, bar, or any other type of excuse for non-compliance with these Article 12 claim submission, administration, and mediation requirements. Compliance with the claim submission, administration, and mediation procedures described in this Article 12 is a condition precedent to the right to file a Government Code Claim, commence litigation or commence any other legal action. Claim(s) or issue(s) not raised in a timely protest and timely claim submitted under this Article 12 may not be asserted in any subsequent Government Code Claim, litigation or legal action. Owner shall not be deemed to waive any provision under this Article 12, if at Owner's sole discretion, a claim is administered in a manner not in accord with this Article 12.

12.7 Final Claim Disposition

12.7.A. If the Contractor's claims submitted in accordance with this Article 12 at Project completion total $375,000 or less, then claims resolution shall proceed in the manner prescribed by Article 1.5, Chapter 1, Part 3 of Division 2 of the California Public Contract Code. If such claims exceed $375,000, then Contractor shall prepare a compendium of claims submitted and not resolved as a result of these procedures, and submit them in a Govt. Code Section 910 form of claim for final investigation and consideration of their settlement prior to initiation of any litigation thereon, as required by Government Code Section 945.4. Pursuant to Government Code Section 930.2, the one-year period in Government Code Section 911.2 shall be reduced to 150 days.

13. LEGAL AND MISCELLANEOUS

13.1 Laws And Regulations

13.1.A. Contractor shall keep fully informed of and shall comply with all laws, ordinances, regulations, and orders of any properly constituted authority affecting the Contract Documents, Work and persons connected with Work, and shall protect and indemnify Owner and its officers, employees, consultants, and agents against any claim or liability, including attorneys' fees, arising from or based on violation of law, ordinance,

regulation or order, whether by Contractor or by Subcontractors, employees, or agents. Authorized persons may at any time enter upon any part of Work to ascertain compliance of all applicable laws, ordinances, regulations and orders.

13.1.B. Whenever Drawings and Specifications require larger sizes or higher standards than are required by any applicable law, ordinance, regulation, or order, Drawings and Specifications shall govern. Whenever Drawings and Specifications require something that will violate such laws, ordinances, regulations, or orders, then such laws, ordinances, regulations, or orders shall govern.

13.2 Permits And Taxes

13.2.A. Contractor shall procure all permits and licenses applicable to the Work (including environmental matters to the extent applicable); pay all charges and fees, including fees for street opening permits; comply with, implement, and acknowledge effectiveness of all permits; initiate and cooperate in securing all required notifications or approvals therefore; and give all notices necessary and incident to due and lawful prosecution of Work, unless otherwise provided herein. Owner will pay applicable building permits, school, sanitation, and water fees for the completed construction. Contractor shall pay all sales and/or use taxes levied on materials, supplies, or equipment purchased and used on or incorporated into Work, and all other taxes properly assessed against equipment or other property used in connection with Work, without any increase in the Contract Sum. Contractor shall make necessary arrangements with proper authorities having jurisdiction over roads, streets, pipelines, navigable waterways, railroads, and other works in advance of operations, even where Owner may have already obtained permits for the Work.

13.3 Responsibility Of Contractor And Indemnification

13.3.A. Owner and each of its officers, employees, consultants, and agents including, but not limited to, Agency, the Board, Engineer, and each Owner's Representative, shall not be liable or accountable in any manner for loss or damage that may happen to any part of the Work; loss or damage to materials or other things used or employed in performing the Work; injury, sickness, disease, or death of any person; or damage to property resulting from any cause whatsoever except their sole negligence, willful misconduct or active negligence, attributable to performance or character of the Work, and Contractor releases all of the foregoing persons and entities from any and all such claims.

13.3.B. To the furthest extent permitted by law (including without limitation California Civil Code Section 2782), Contractor shall assume defense of, and indemnify and hold harmless, Owner and each of its officers, employees, consultants, and agents, including but not limited to, Agency, the Board, Engineer, and each Owner's Representative, from claims, suits, actions, losses and liability of every kind, nature and description, including but not limited to claims and fines of regulatory agencies and attorneys' fees and consultants' fees, directly or indirectly arising out of, connected with or resulting from performance of the Work, failure to perform the Work, or condition of the Work which is caused in whole or part by any act or omission of Contractor, Subcontractors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether it is caused in part by the negligence of Owner or by any person or entity required to be indemnified hereunder.

13.3.C. With respect to third-party claims against Contractor, Contractor waives any and all rights to any type of express or implied indemnity against Owner and each of its officers, employees, consultants, and agents including, but not limited to, Agency, Owner, the Board, Engineer and each Owner's Representative.

13.3.D. Approval or purchase of any insurance contracts or policies shall in no way relieve from liability nor limit the liability of Contractor, its Subcontractors of any tier, or the officers or agents of any of them.

13.3.E. To the furthest extent permitted by law (including, without limitation, Civil Code Section 2782), the indemnities, releases of liability and limitations of liability, claims procedures, and limitations of remedy expressed throughout Contract Documents shall apply even in the event of breach of Contract, negligence (active or passive), fault or strict liability of the party(ies) indemnified, released, or limited in liability, and shall survive the termination, rescission, breach, abandonment, or completion of the Work or the terms of the Contract Documents. If Contractor fails to perform any of these defense or indemnity obligations, Owner may in its discretion back charge Contractor for Owner's costs and damages resulting therefrom and withhold such sums from progress payments or other Contract moneys which may become due.

13.3.F. The indemnities in the Contract Documents shall not apply to any indemnified party to the extent of its sole negligence or willful misconduct; nor shall they apply to Owner or other indemnified party to the extent of its active negligence.

13.4 Concealed Or Unknown Conditions

13.4.A. If either of the following conditions is encountered at Site when digging trenches or other excavations that extend deeper than four feet below the surface, Contractor shall give a written Notice of Differing Site Conditions to Owner promptly before conditions are disturbed, except in an emergency as required by paragraph 16.4 of this Document 00700, and in no event later than seven Days after first observance of:

1. Subsurface or Latent physical conditions which differ materially from those indicated in the Contract Documents; or
2. Unknown physical conditions of an unusual nature or which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

13.4.B. In response to Contractor's Notice of Differing Site Conditions under paragraph 13.4.A, Owner will investigate the identified conditions, and if they differ materially and cause increase or decrease in Contractor's cost of, or time required for, performance of any part of the Work, Owner will issue either a Request for Proposal or a Construction Change Directive under the procedures described in the Contract Documents, including without limitation Section 01250 (Modification Procedures). If Owner determines that physical conditions at the Site are not Latent or are not materially different from those indicated in Contract Documents or that no change in terms of the Contract Documents is justified, Owner will so notify Contractor in writing, stating reasons (with Contractor retaining its rights under Article 12 of this Document 00700).

13.4.C. Contractor shall not be entitled to any adjustment in the Contract Sum or Contract Time regarding claimed Latent or materially different Site conditions (whether above or below grade) if:

1. Contractor knew of the existence of such conditions at the time Contractor submitted its Bid; or
2. Contractor should have known of the existence of such conditions as a result of having complied with the requirements of Contract Documents, including without limitation paragraphs 2.1 and 8.4 of this Document 00700; or
3. The information or conditions claimed by Contractor to be Latent or materially different consist of information, conclusions, opinions, or deductions of the kind that paragraph 2.1 of this Document 00700 precludes reliance upon; or
4. Contractor was required to give written Notice of Differing Site Conditions and failed to do so within the time required.

13.4.D. If Owner and Contractor are unable to agree on entitlement to or as to the amount or length of any adjustment in the Contract Sum or Contract Time required under this paragraph 13.4, Contractor shall proceed with the Work as directed by Owner and may make a claim as provided in Article 12 of this Document 00700.

13.5 Notice Of Hazardous Waste Or Materials Conditions

13.5.A. Contractor shall give a written Notice of Hazardous Materials Condition to Owner promptly, before any of the following conditions are disturbed (except in an emergency as required by paragraph 16.4 of this Document 00700), and in no event later than 24 hours after first observance of any:

1. Material that Contractor believes may be hazardous waste or hazardous material, as defined in Section 25117 of the Health and Safety Code (including, without limitation, Asbestos, lead, PCBs, petroleum and related hydrocarbons, and radioactive material) that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law ("hazardous material"); or
2. Other material that may present an imminent substantial danger to persons or property exposed thereto in connection with Work at the Site ("other materials").

13.5.B. Except as otherwise provided in the Contract Documents or as provided by applicable law, Contractor shall not be required to give any notice for the disturbance or observation of any such hazardous materials or other materials where such matter is disturbed or observed as part of the scope of Work under the Contract Documents (such as hazardous waste or hazardous material investigation, remediation or disposal activities which are identified as the subject of Work under the Contract Documents), where Contractor complies with all requirements in the Contract Documents and applicable law respecting such materials.

13.5.C. Contractor's Notice of Hazardous Materials Condition shall indicate whether the hazardous materials or other materials were shown or indicated in the Contract Documents to be within the scope of Work, and whether the hazardous materials or other materials were brought to the Site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible.

13.5.D. Contractor shall not be entitled to any adjustment in the Contract Sum or Contract Time regarding claimed hazardous waste or materials if:

1. Contractor knew of the existence of such hazardous materials or other materials at the time Contractor submitted its Bid; or
2. Contractor should have known of the existence of such hazardous material or other materials as a result of its having the responsibility to obtain additional or

supplementary examinations, investigation, explorations, tests, studies, and data concerning the conditions at or contiguous to the Site prior to submitting its Bid; or

3. Contractor failed to give the written notice within the time required by paragraph 13.5.A of this Document 00700.

13.5.E. If Owner determines that conditions involve hazardous materials or other materials and that a change in Contract Document terms is justified, Owner will issue either a Request for Proposal or Construction Change Directive under the procedures described in the Contract Documents, including without limitation Section 01250 (Modification Procedures). If Owner determines that conditions do not involve hazardous materials or other materials or that no change in Contract Document terms is justified, Owner will notify Contractor in writing, stating the reasons for its determination.

13.5.F. In addition to the parties' other rights under paragraph 13.5.E of this Document 00700, if Contractor does not agree to resume Work based on a reasonable belief that it is unsafe, or does not agree to resume Work under special conditions, Owner may order the disputed portion of Work deleted from the Work, or performed by others, or Owner may invoke its right to terminate Contractor's right to proceed under the Contract Documents in whole or in part, for convenience or for cause as the facts may warrant.

13.5.G. If Contractor does not agree with any Owner determination of any adjustment in the Contract Sum or Contract Time under this paragraph 13.5, Contractor may make a claim as provided in Article 12 of this Document 00700.

13.6 Suspension Of Work

13.6.A. Owner may, without cause, order Contractor in writing to suspend, delay or interrupt Work in whole or in part for such period of time as Owner may determine. An adjustment shall be made for increases in cost of performance of Work of the Contract Documents caused by any such suspension, delay or interruption, calculated using the measures set forth in Section 01250 (Modification Procedures). No adjustment shall be made to extent that:

1. Performance is, was or would have been so suspended, delayed or interrupted by another cause for which Contractor is responsible; or
2. An equitable adjustment is made or denied under any other provision of Contract Documents; or
3. The suspension of Work was the direct or indirect result of Contractor's failure to perform any of its obligations hereunder. Adjustments made in cost of performance may have a mutually agreed fixed or percentage fee; if the parties cannot agree, Contractor may file a claim under Article 12 of this Document 00700.

13.7 Termination Of Contract For Cause

13.7.A. Owner may declare Contractor in default of Contract Documents and Owner may terminate Contractor's right to proceed under the Contract Documents for cause:

1. Should Contractor make an assignment for the benefit of creditors; admit in writing its inability to pay its debts as they become due; file a voluntary petition in bankruptcy; be adjudged a bankrupt or insolvent; be the subject of an involuntary petition in bankruptcy which is not dismissed within 60 Days; file a petition or answer seeking for itself any reorganization, arrangement, composition, readjustment, liquidation, dissolution, or similar relief under any present or future

statute, law, or regulation; file any answer admitting or not contesting the material allegations of a petition filed against Contractor in any such proceeding; or seek, consent to, or acquiesce in, the appointment of any trustee, receiver, custodian or liquidator of Contractor or of all or any substantial part of its properties or if Contractor, its directors or shareholders, take action to dissolve or liquidate Contractor; or

2. Should Contractor commit a material breach of the Contract Documents. If Owner declares Contractor in default due to material breach, however, Owner must allow Contractor an opportunity to cure such breach within ten Days of the date of notice from Owner to Contractor providing notice of the default; or, if such breach is curable but not curable within such ten-Day period, within such period of time as is reasonably necessary to accomplish such cure. (In order for Contractor to avail itself of a time period in excess of ten Days, Contractor must provide Owner within the ten-Day period with a written plan acceptable to Owner to cure said breach which includes, for example, evidence of necessary resources, Subcontractor commitments, schedules and recovery schedules meeting Contract Document requirements and showing a realistic and achievable plan to cure the breach. Contractor must then diligently commence and continue such cure according to the written plan); or
3. Should Contractor violate or allow (by a Subcontractor or other person or entity for which Contractor is responsible) a violation of any valid law, statute, regulation, rule, ordinance, permit, license or order of any governmental agency applicable to the Project or Work and does not cure (or cause to be cured) such violation within ten Days of the date of the notice from Owner to Contractor demanding such cure; or, if such violation is curable but not curable within such ten-Day period, within such period of time as is reasonably necessary to accomplish such cure. (In order for Contractor to avail itself of a time period in excess of ten Days, Contractor shall provide Owner within the ten-Day period with a written plan to cure said violation acceptable to Owner, and then diligently commence and continue performance of such cure according to the written plan.)

13.7.B. If Owner at any time reasonably believes that Contractor is or may be in default under the Contract Documents as provided in paragraph 13.7.A of this Document 00700, Owner may in its sole discretion notify Contractor of this fact and request written assurances from Contractor of performance of Contract Documents and a written plan from Contractor to remedy any default under the terms of Contract Documents which Owner may advise Contractor of in writing. Contractor shall, within 10 Days of Owner's request, deliver a written cure plan which meets the requirements of the written plan deliverable under paragraph 13.7.A.2 of this Document 00700. Failure of Contractor to provide such written assurances of performance and the required written plan, within ten Days of request, will constitute a material breach of Contract Documents sufficient to justify termination for cause.

13.7.C. In event of termination for cause, Owner will immediately serve written notice thereof upon Surety and Contractor. Surety shall have the rights and obligations set forth in Document 00611 (Construction Performance Bond). Subject to the Surety's rights under the Performance Bond (which rights are waived upon a default thereunder), Owner may take over the Work and prosecute it to completion by contract or by any other methods it may deem advisable.

13.7.D. In the event of termination by Owner as provided in paragraph 13.7.A of this Document 00700 for cause:

1. Owner will compensate Contractor for the value of the Work delivered to Owner upon termination as determined in accordance with the Contract Documents, subject to all rights of offset and back charges, and provided that Contractor provides Owner with updated as-builts and Project Record Documents showing the Work performed up to the date of termination. However, Owner will not compensate Contractor for its costs in terminating the Work or any cancellation charges owed to third parties.
2. Contractor shall deliver to Owner possession of the Work in its then condition including, but not limited to, all designs, engineering, Project records, Project Record Documents, cost data of all types, Drawings and Specifications and contracts with vendors and Subcontractors, all other documentation associated with the Project, and all construction supplies and aids dedicated solely to performing the Work which, in the normal course of construction, would be consumed or only have salvage value at the end of the construction period. Contractor shall remain fully liable for the failure of any Work completed and materials and equipment provided through the date of such termination to comply with the provisions of the Contract Documents. The provisions of this paragraph 13.7.D shall not be interpreted to diminish any right which Owner may have to claim and recover damages for any breach of Contract Documents or otherwise, but rather, Contractor shall compensate Owner for all loss, cost, damage, expense, and/or liability suffered by Owner as a result of such termination and failure to comply with Contract Documents.
3. Owner's rights under paragraph 13.7.D.2 shall be specifically enforceable to the greatest extent permitted by law. Owner shall, to the extent applicable, have all other rights and remedies set forth in any Bidding Document.

13.7.E. Owner may terminate portions or parts of the Work for cause, provided these portions or parts (1) have separate geographic areas from parts or portions of the Work not terminated or (2) are limited to the Work of one or more specific trades or Subcontractors. In such case, Contractor shall cooperate with a competing contractor as required under Article 6 of this Document 00700.

13.7.F. In the event a termination for cause is determined to have been made wrongfully or without cause, then the termination shall be treated as a termination for convenience, and Contractor shall have no greater rights than it would have had following a termination for convenience. Any Contractor claim arising out of a termination for cause shall be made in accordance with the provisions of the Contract Documents on claims and calculated in accordance with the provisions of the Contract Documents on Change Orders and claims. No other loss cost, damage, expense or liability may be claimed, requested or recovered by Contractor.

13.8 Termination Of Contract For Convenience

13.8.A. Owner may terminate performance of the Work under the Contract Documents in accordance with this clause in whole, or from time to time in part, whenever Owner shall determine that termination is in Owner's best interest. Termination shall be effected by Owner delivering to Contractor notice of termination specifying the extent to which performance of the Work under the Contract Documents is terminated and the effective date of the termination.

13.8.B. After receiving a notice of termination under paragraph 13.8.A of this Document 00700, and except as otherwise directed by Owner, Contractor shall:

1. Stop Work under the Contract Documents on date and to extent specified in notice of termination;
2. Place no further orders or subcontracts for materials, services, or facilities except as necessary to complete portion of Work under the Contract Documents which is not terminated;
3. Terminate all orders and subcontracts to extent that they relate to performance of Work terminated by the notice of termination;
4. Assign to Owner in manner, at times, and to extent directed by Owner, all right, title, and interest of Contractor under orders and subcontracts so terminated. Owner shall have the right, in its sole discretion, to settle or pay any or all claims arising out of termination of orders and subcontracts;
5. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with approval or ratification of Owner to extent Owner may require. Owner's approval or ratification shall be final for purposes of this paragraph 13.8;
6. Transfer title to Owner, and deliver in the manner, at the times, and to the extent, if any, directed by Owner, all fabricated or unfabricated parts, Work in process, completed Work, supplies, and all other material produced as part of, or acquired in connection with performance of, Work terminated by the notice of termination, and completed or partially completed drawings, drawings, specifications, information, and other property which, if the Project had been completed, would have been required to be furnished to Owner;
7. Use its best efforts to sell, in manner, at times, to extent, and at price or prices that Owner directs or authorizes, any property of types referred to in paragraph 13.8.B.6 of this Document 00700, but Contractor shall not be required to extend credit to any purchaser, and may acquire any such property under conditions prescribed and at price or prices approved by Owner. Proceeds of transfer or disposition shall be applied to reduce payments to be made by Owner to Contractor under the Contract Documents or shall otherwise be credited to the price or cost of Work covered by Contract Documents or paid in such other manner as Owner may direct;
8. Complete performance of the part of the Work which was not terminated by the notice of termination; and
9. Take such action as may be necessary, or as Owner may direct, to protect and preserve all property related to Contract Documents which is in Contractor's possession and in which Owner has or may acquire interest.

13.8.C. After receipt of a notice of termination under paragraph 13.8.A of this Document 00700, Contractor shall submit to Owner its termination claim, in form and with all certifications required by Article 12 of this Document 00700. Contractor's termination claim shall be submitted promptly, but in no event later than 6 months from effective date of the termination. Contractor and Owner may agree upon the whole or part of the amount or amounts to be paid to Contractor because of a total or partial termination of Work under this paragraph 13.8. If Contractor and Owner fail to agree on the whole amount to be paid to Contractor because of the termination of the Work under this paragraph 13.8, Owner's total liability to Contractor by reason of the termination shall be the total (without duplication of any items) of:

1. The reasonable cost to Contractor, without profit, for all Work performed prior to the effective date of the termination, including Work done to secure the Project for termination. Reasonable cost may not exceed the applicable percentage completion values derived from the Progress Schedule and the Schedule of Values. Deductions shall be made for cost of materials to be retained by Contractor, cost of Work defectively performed, amounts realized by sale of materials, and for other appropriate credits against cost of Work. Reasonable cost will include reasonable allowance for Project overhead and general administrative overhead not to exceed a total of ten percent of direct costs of such Work. When, in Owner's opinion, the cost of any item of Work is excessively high due to costs incurred to remedy or replace Defective or rejected Work, reasonable cost to be allowed will be the estimated reasonable cost of performing the Work in compliance with requirements of Contract Documents and excessive actual cost shall be disallowed.
2. A reasonable allowance for profit on cost of Work performed as determined under paragraph 13.8.C.1 of this Document 00700, provided that Contractor establishes to Owner's satisfaction that Contractor would have made a profit had the Project been completed, and provided further that the profit allowed shall not exceed 5 percent of cost.
3. Reasonable costs to Contractor of handling material returned to vendors, delivered to Owner or otherwise disposed of as directed by Owner.
4. A reasonable allowance for Contractor's internal administrative costs in preparing termination claim.
5. Except as provided in this paragraph 13.8.C of this Document 00700, Owner shall not be liable for costs incurred by Contractor or Subcontractors after receipt of a notice of termination. Such non-recoverable costs include, but are not limited to, anticipated profits on Work not performed as of the date of termination, post-termination employee salaries, post-termination general administrative expenses, post-termination overhead or unabsorbed overhead, costs of preparing and submitting Contractor's Bid, attorneys' fees of any type, and all costs relating to prosecution of claim or lawsuit.
6. Owner shall have no obligation to pay Contractor under this paragraph 13.8 unless and until Contractor provides Owner with updated and acceptable as-builts and Project Record Documents for Work completed prior to termination.

13.8.D. In arriving at the amount due Contractor under this clause, there shall be deducted:

1. All unliquidated advances or other payments on account previously made to Contractor which are applicable to the terminated portion of Contract Documents;
2. Any claim which Owner may have against Contractor in connection with Contract Documents; and
3. The agreed price for, or proceeds of sale of, any materials, supplies, or other things kept by Contractor or sold under provisions of this paragraph 13.8, and not otherwise recovered by or credited to Owner.

13.9 Contingent Assignment Of Subcontracts

13.9.A. Contractor hereby assigns to Owner each Subcontract for a portion of the Work, provided that:

1. The assignment is effective only after Owner's termination of Contractor's right to proceed under the Contract Documents (or portion thereof relating to that Subcontract) pursuant to paragraphs 13.7 or 13.8 of this Document 00700.

2. The assignment is effective only for the Subcontracts which Owner expressly accepts by notifying the Subcontractor in writing;
3. The assignment is subject to the prior rights, if any, of the Surety, obligated by Document 00611 (Construction Performance Bond) provided under the Contract Documents, where the Surety exercises its rights to complete the Contract;
4. After the effectiveness of an assignment, Contractor shall, at its sole cost and expense (except as otherwise provided in paragraphs 13.7 or 13.8 of this Document 00700), sign all instruments and take all actions reasonably requested by Owner to evidence and confirm the effectiveness of the assignment in Owner; and
5. Nothing in this paragraph 13.9 shall modify or limit any of Contractor's obligations to Owner arising from acts or omissions occurring before the effectiveness of any Subcontract assignment, including but not limited to all defense, indemnity and hold-harmless obligations arising from or related to the assigned Subcontract.

13.10 Remedies and Contract Integration

13.10.A. Subject to Contract Documents provisions regarding Contractor claims, claim review, and claim resolution, and subject to the limitations therein, the exclusive jurisdiction and venue for resolving all claims, counter-claims, disputes and other matters in question between Owner and Contractor arising out of or relating to Contract Documents, any breach thereof or the Project shall be the applicable court of competent jurisdiction located in the State of California, County of Sonoma. All Owner remedies provided in the Contract Documents shall be taken and construed as cumulative and not exclusive; that is, in addition to each and every other remedy herein provided; and in all instances Owner shall have any and all other equitable and legal rights and remedies which it would have according to law.

13.10.B. The Contract Documents, any Contract Modifications, and Change Orders shall represent the entire and integrated agreement between Owner and Contractor regarding the subject matters hereof and thereof and shall constitute the exclusive statement of the terms of the parties' agreement. The Contract Documents, and any Contract Modifications and Change Orders, shall supersede any and all prior negotiations, representations or agreements, written or oral, express or implied, that relate in any way to the subject matter of the Contract Documents or written Modifications. Owner and Contractor represent and agree that, except as otherwise expressly provided in the Contract Documents, they are entering into the Contract Documents and any subsequent written Modification in sole reliance upon the information set forth or referenced in the Contract Documents or Contract Modifications and the parties are not and will not rely on any other information.

13.10.C. In any proceeding to enforce the Contract Documents, Contractor and Owner agree that the finder of fact shall receive detailed instructions on the meaning and operation of the Contract Documents, including their conditions, limitations of liability and remedies clauses, claims procedures and any other provisions impacting major defenses and theories of liability of the parties. Detailed findings of fact shall be requested, to verify Contract enforcement.

13.10.D. Either party's waiver of any breach or failure to enforce any of the terms, covenants, conditions or other provisions of the Contract Documents at any time shall not in any way affect, limit, modify or waive that party's right thereafter to enforce or compel strict compliance with every term, covenant, condition or other provision hereof, any course of dealing or custom of the trade or oral representations notwithstanding.

13.11 Patents

13.11.A. Fees or claims for any patented invention, article or arrangement that may be used upon or in any manner connected with performance of the Work or any part thereof shall be included in the Bid price for doing the Work. Contractor shall defend, indemnify and hold harmless Owner and each of its officers, employees, consultants and agents, including, but not limited to, the Board and each Owner's Representative, including Agency from all damages, claims for damages, costs or expenses in law or equity, including attorneys' fees, arising from or relating to any claim that any article supplied or to be supplied under the Contract Documents infringes on the patent rights, copyright, trade name, trademark, service mark, trade secret or other intellectual property right of any person or persons or that the person or entity supplying the article does not have a lawful right to sell the same. Such costs or expenses for which Contractor agrees to indemnify and hold harmless the above indemnities include but are not limited to any and all license fees, whether such fees are agreed by any indemnitee or ordered by a court or administrative body of any competent jurisdiction.

13.12 Substitution For Patented And Specified Articles

13.12.A. Except as provided otherwise in Document 00200 (Instructions to Bidders) or in the Contract Documents, whenever in Specifications, material or process is designated by patent or proprietary name or by name of manufacturer, such designation shall be deemed to be used for purpose of facilitating description of material and process desired, and shall be deemed to be followed by the words "or Approved Equal" and Contractor may offer any substitute material or process that Contractor considers "equal" in every respect to that so designated and if material or process offered by Contractor is, in opinion of Owner, Equal in every respect to that so designated, its use will be approved. However, Contractor may utilize this right only by timely submitting Document 00660 (Substitution Request Form) as provided in Document 00200 (Instructions to Bidders). A substitution will be approved only if it is a true Equal item in every aspect of its design and quality, including but not limited to its dimensions, weights, service requirements, durability, functioning, impact on contiguous construction elements, overall schedule and design.

13.13 Interest Of Public Officers

13.13.A. No representative, officer, or employee of Owner or Agency, no member of the governing body of the locality in which the Project is situated, no member of the locality in which Owner or Agency was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the Project, during the tenure of the official or for one year thereafter, shall, as principal, agent, attorney or otherwise, be directly or indirectly interested, in the Contract Documents or the proceeds thereof.

13.14 Limit Of Liability

13.14.A. OWNER, AND EACH OF ITS OFFICERS, BOARD MEMBERS, EMPLOYEES, CONSULTANTS AND AGENTS INCLUDING, BUT NOT LIMITED TO, ENGINEER, THE AGENCY, AND EACH OTHER OWNER REPRESENTATIVE, SHALL HAVE NO LIABILITY TO CONTRACTOR FOR SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, EXCEPT TO THE LIMITED EXTENT THAT THESE CONTRACT

DOCUMENTS OR APPLICABLE PUBLIC CONTRACTING STATUTES MAY SPECIFY THEIR RECOVERY.

14. MODIFICATIONS OF CONTRACT DOCUMENTS

14.1 Alterations, Modifications And Force Account Work

14.1.A. No modification or deviation from the Drawings and Specifications will be permitted except by written Contract Modification.

14.1.B. Owner may, without notice to the sureties, make alterations, deviations, additions to, or deletions from Contract Documents; increase or decrease the quantity of any item or portion of the Work; expand, contract or otherwise change the Contract Time; delete any item or portion of the Work; and require extra Work. Contractor shall perform such Work under applicable provisions of the Contract Documents, unless specifically provided otherwise at the time the change is ordered. In the case of any ordered extra Work, Owner reserves the right to furnish all or portions of associated labor, material, and equipment, which Contractor shall accept and use without payment for costs, markup, profit, or otherwise for such Owner-furnished labor, materials, and equipment.

14.1.C. Changes affecting the Contract Time or Contract Sum of the Work shall be set forth in a written Change Order that shall specify:

1. The Work performed in connection with the change to be made;
2. The amount of the adjustment of the Contract Sum, if any, and the basis for compensation for the Work ordered; and
3. The extent of the adjustment in the Contract Time, if any.

14.1.D. A Change Order will become effective when signed by Owner. If Owner exercises its right to decide disputed issues pertaining to changed Work as set forth in Articles 12 and 14 of this Document 00700, then the resulting Change Order shall be effective when signed by Owner, notwithstanding that Contractor has not signed it.

14.1.E. Changes not affecting the Contract Time or Contract Sum of the Work, in Owner's discretion, may be set forth in a written RFI-Reply executed by Owner. Execution of such an RFI-Reply constitutes Contractor's agreement to make the specified change without change to the Contract Sum or the Contract Time.

14.1.F. Changes or deviations from Contract Documents affecting the Contract Time or Contract Sum of the Work shall not be made without the authority of an effective Change Order or Construction Change Directive as provided in Section 01250 (Modification Procedures), except in cases of emergency discussed in Article 16 of this Document 00700.

14.1.G. If changes ordered in design, workmanship or materials are of such a nature as to increase or decrease the cost of any part of the Work, the price fixed in the Contract Documents shall be increased or decreased by the amount that Contractor and Owner may agree upon as a reasonable and proper allowance for the cost increase or decrease. If an agreement cannot be reached, then Owner will reach a determination, which shall be final, subject to Contractor's rights under Article 12 of this Document 00700. In all cases Contractor shall perform the changed Work as directed by Owner subject to Contractor's rights under Article 12 of this Document 00700.

14.1.H. Contractor shall, upon Owner's request, permit inspection of the original unaltered Bid estimate, subcontract agreements, purchase orders relating to the change, and

documents substantiating all costs associated with its cost proposal or claims arising from changes in the Work.

14.1.I. Changes in the Work made pursuant to this Article 14 and extensions of Contract Time necessary by reason thereof shall not in any way release the guarantees and warranties given by Contractor pursuant to provisions of the Contract Documents, nor shall such changes in the Work relieve or release the Sureties of bonds executed pursuant to said provisions. The Sureties, in executing such bonds, shall be deemed to have expressly agreed to any such change in the Work and to any extension of time made by reason thereof.

14.1.J. Procedures for Modifications of Contract Documents and for calculating the cost of extra and deleted Work are given in Section 01250 (Modification Procedures). Regarding delay and impact costs of any nature, Contractor may not seek delay compensation for on-Site or off-Site costs based on formulas, e.g., "Eichlay" or other formula. Rather, Contractor shall prove actual costs resulting from such delays. If Contractor requests compensation for delay to the construction, then Contractor shall prove and document actual costs plus markup per the cost categories and procedures in Section 01250 (Modification Procedures) in order to request, claim or prove compensation for delay.

14.1.K. Owner's General Manager is authorized to approve Change Orders in accordance with Resolution No. 04-0547 dated June 8, 2004. The approval period for such Change Orders is approximately seven Days from receipt of the signed Change Order from Contractor. If a Change Order is equal to or greater than the amounts authorized by Resolution No. 04-0547, it may be necessary for the Board to approve the Change Order, and if so the approval period is approximately 28 Days from receipt of the signed Change Order from Contractor. A performance bond rider covering the changed Work must be executed and delivered to Owner before proceeding with the changed Work. Contractor is charged with knowledge of Owner's approved Change Order limits and procedures in effect at the applicable time.

15. TIME ALLOWANCES

15.1 Time Allowances For Performance Of Contract Documents

15.1.A. When Contractor and Owner have signed the Contract Documents, Owner will serve a Notice to Proceed upon Contractor to that effect, either by depositing notice in a post office or post office box regularly maintained by United States Postal Service in a pre-paid wrapper directed to Contractor at legal address or (at Owner's option) by delivery by other means at legal address.

15.1.B. The start date for Contract Time shall be on the date indicated in the applicable Notice to Proceed. If no date is indicated, the start date for Contract Time shall be the fifth Day from the date that Contractor receives, by hand delivery or facsimile transmission, Owner's written Notice to Proceed, unless the Notice to Proceed is served by mail only, in which case the start date for Contract Time shall be the fifth Day following the mailing date. The total number of Days for completion of the Work under the Contract Documents shall be as provided in Document 00520 (Agreement).

15.2 Entitlement to Change Of Contract Time

15.2.A. The Contract Time may only be changed by Change Order or by Contract Modification, and all time limits stated in the Contract Documents are of the essence of Contract Documents.

15.2.B. The Contract Time will be adjusted in an amount equal to the time lost due to:

1. Changes in the Work ordered by Owner;
2. Acts or neglect by Owner, Engineer, any Owner's Representative, utility owners or other contractors performing other work, provided that Contractor has fully and completely performed its responsibilities under the Contract Documents; or
3. Fires, floods, epidemics, abnormal weather conditions beyond the parameters otherwise set forth in this paragraph 15.2, earthquakes, civil or labor disturbances, strikes or Acts of God, provided damages resulting therefrom are not the result of Contractor's failure to protect the Work as required by Contract Documents.

15.2.C. The Contract Time shall not be extended for any cause identified in paragraph 15.2.B above, however, unless:

1. Contractor actually has been prevented from completing any part of the Work within the Contract Time due to delay that is beyond Contractor's control and due to reasons for which Contractor is not responsible (delays attributable to and within the control of a Subcontractor, or its subcontractors, or supplier shall be deemed to be delays within the control of Contractor);
2. A claim for delay is made as provided herein; and
3. Contractor submits a Time Impact Evaluation as required under Section 01320 (Progress Schedules and Reports) that demonstrates actual delay to critical Work activities that actually delay the progress of the Work in the amount of time requested.

15.2.D. Where Contractor is prevented from completing any part of the Work within the Contract Time due to delay beyond the control of both Owner and Contractor (including, but not limited to, adverse weather of all types and acts of other contractors or utilities), an extension of Contract Time, in an amount equal to the time lost due to such delay (without compensation), shall be Contractor's sole and exclusive remedy for such delay.

15.3 Weather-Related Delays

15.3.A. Delays due to abnormal or adverse weather conditions will not be allowed for weather conditions that fall within the parameters listed herein. Adverse weather delays may be allowed only if the number of workdays of adverse weather exceeds these on a monthly basis and Contractor proves that adverse weather actually caused delays. Contractor shall give written notice of intent to claim an adverse weather Day within one Day of the adverse weather delay occurring. Rain parameters are as follows, pro-rated in the individual month Contractor starts and finishes Work.

Rain Days: January, [9]; February, [8]; March, [7]; April, [4]; May, [2]; June, [1]; July, [0]; August, [0]; September, [1]; October, [3]; November, [6]; and December, [8].

In order to qualify as an adverse weather delay with respect to the foregoing parameters, daily rainfall must exceed 0.10 of an inch or more at the Santa Rosa, California station, as measured by the National Oceanic & Atmospheric Administration, and Contractor must prove that the rain actually caused delay as set forth above.

15.3.B. Contractor shall include the foregoing rain parameters as a monthly activity in its Progress Schedule. As Work on the critical path is affected by rain, Contractor shall notify Owner and request that the Days be moved to the affected activities. Any adverse weather Days remaining shall be considered Project Float.

15.3.C. Adverse weather delay for rain shall be recognized for the actual period of time Contractor proves it was delayed by rain exceeding the specified parameters. For example, and not by way of limitation, if rain exceeding the specified parameters does not in fact delay Contractor's progress on the critical path, then no time extension shall be recognized; and conversely, if Contractor proves that rain exceeding the specified parameters causes delay to Contractor for a period longer than the number of rain Days incurred (e.g., if it rains during grading Work), then Contractor shall be entitled to a time extension equal to the actual period of such delay.

15.3.D. Contractor shall take reasonable steps to mitigate potential weather delays, such as dewatering the Site, covering Work and material that could be affected adversely by weather, and using all necessary construction means and methods to dry and/or aerate wet soils. Failure to do so shall be cause for Owner to not grant a time extension due to adverse weather, where Contractor could have avoided or mitigated the potential delay by exercising reasonable care.

15.4 Notice Of Delay

15.4.A. Within seven Days of the beginning of any delay, Contractor shall notify Owner in writing, by submitting a notice of potential claim, of all anticipated delays resulting from the delay event in question. Any request for extension of time shall be accompanied by Contractor's written statement that the adjustment claimed is the entire adjustment to which the Contractor is entitled as a result of the occurrence of said event, and shall include a written schedule document that demonstrates delay to the critical path using a Time Impact Evaluation as specified in Section 01320 (Progress Schedules). Owner will determine all claims and adjustments in the Contract Time. No claim for an adjustment in the Contract Time will be valid and such claim will be waived if not submitted in accordance with the requirements of this paragraph 15.4.A.

15.5 Time Extensions And/Or Compensation Entitlement For Delays

15.5.A. Contractor may receive a time extension and be compensated for delays caused directly and solely by Owner.

15.5.B. Contractor may receive a time extension without compensation for delays resulting in whole or in part from causes beyond the reasonable control of Contractor and Owner, e.g., adverse weather conditions exceeding Contract Documents parameters, acts of third parties unrelated to Contractor's obligations herein, earthquakes, Acts of God and epidemics. In such cases, a time extension without compensation shall constitute Contractor's sole and exclusive remedy for such delays.

15.5.C. Contractor shall not be entitled to any time extension or compensation including, but not limited to, extended field or home office overhead, field supervision, costs of capital, interest, escalation charges, acceleration costs or other impacts for any delays caused in whole or in part by Contractor's failure to perform its obligations under the Contract Documents, or during periods of delay concurrently caused by Contractor and either Owner or others.

15.5.D. Contractor shall not be entitled to damages for delay to the Work caused by the following reasons:

1. Owner's right to sequence the Work in a manner which would avoid disruption to Owner's contractors and their subcontractors and Owner's employees, exercised as a result of Contractor's failure to perform its cooperation and coordination responsibilities required by Contract Documents; Owner's enforcement of any government act or regulation; or the provisions of the Contract Documents;
2. For changed Site conditions that are beyond the parties' contemplation, except that Owner may approve direct costs associated with unknown conditions (but not costs or damages which result from such delays); and
3. Extensive requests for clarifications to Contract Documents or Contract Modifications thereto, provided such clarifications or Contract Modifications are processed by Owner or its consultants in a reasonable time commensurate with Contract Documents requirements.

15.6 Liquidated Damages

15.6.A. Time is of the essence. Execution of Contract Documents by Contractor shall constitute acknowledgement by Contractor that Contractor understands, has ascertained and agrees that Owner will actually sustain damages in the amount fixed in the Contract Documents for each and every Day during which completion of Work required is delayed beyond expiration of time fixed for completion or extensions of time allowed pursuant to provisions hereof. Contractor and Owner agree that specified measures of liquidated damages shall be presumed to be the damages actually sustained by Owner as defined below, and that because of the nature of the Project, it would be impracticable or extremely difficult to fix the actual damages.

15.6.B. Liquidated damages shall be considered not as a penalty but as agreed monetary damage sustained by Owner for increased Project administration expenses, including extra inspection, construction management, and architectural and engineering expenses related to the Project and Contract Documents because Contractor failed to perform and complete Work within time fixed for completion or extensions of time allowed pursuant to provisions hereof. Liquidated damages shall not be deemed to include within their scope additional damages or administrative costs arising from Defective Work, lost revenues, interest expenses, cost of completion of the Work, cost of substitute facilities, claims and fines of regulatory agencies, damages suffered by others or other forms of liability claimed against Owner as a result of delay (e.g., delay or delay-related claims of other contractors or subcontractors), and defense costs thereof. Contractor shall be fully responsible for the actual amount of any such damages it causes, in addition to the liquidated damages otherwise due Owner.

15.6.C. Owner may deduct from any money due or to become due to Contractor subsequent to time for completion of entire Work and extensions of time allowed pursuant to provisions hereof, a sum representing then-accrued liquidated damages. Should Contractor fall behind the approved Progress Schedule, Owner may deduct liquidated damages based on its estimated period of late completion. Owner need not wait until Final Completion to withhold liquidated damages from Contractor's progress payments. Should money due or to become due to Contractor be insufficient to cover aggregate liquidated damages due, then Contractor forthwith shall pay the remainder of the assessed liquidated damages to Owner.

16. WORKING CONDITIONS AND PREVAILING WAGES

16.1 Use Of Site/Sanitary Rules

16.1.A. All portions of the Work shall be maintained at all times in neat, clean and sanitary condition. Contractor shall furnish toilets for use of Contractor's and Subcontractors' employees on the Site where needed, and their use shall be strictly enforced. All toilets shall be properly secluded from public observation, and shall be located, constructed and maintained subject to Owner's approval.

16.1.B. Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Site and land areas identified in and permitted by Contract Documents and other land and areas permitted by applicable laws and regulations, rights of way, permits and easements or as designated by Owner, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, any improvement located thereon, or to the owner or occupant thereof resulting from the performance of Work.

16.1.C. During the progress of the Work, Contractor shall keep the Site and the Project free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, Contractor shall clean the Site, remove all waste materials, rubbish and debris from and about the Site as well as all tools, appliances, construction equipment and machinery and surplus materials. Contractor shall leave the premises clean and ready for occupancy by Owner at Substantial Completion of Work. Contractor shall restore to original condition all property not designated for alteration by Contract Documents.

16.1.D. Contractor shall not load nor permit any part of any structure or pavement to be loaded in any manner that will endanger the structure or pavement, nor shall Contractor subject any part of Work or adjacent property to stresses or pressures that will endanger it. Contractor shall conduct all necessary existing conditions investigation regarding structural, mechanical, electrical or any other system existing, shall perform Work consistent with such existing conditions, and shall have full responsibility for insufficiencies or damage resulting from insufficiencies of existing systems, equipment or structures to accommodate performing the Work.

16.2 Protection Of Work, Persons, And Property

16.2.A. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with Work. Contractor shall comply with all safety requirements specified in any safety program established by Owner, or required by state, federal or local laws and ordinances. Contractor shall be responsible for all damage to Work, property or structures, and all injuries to persons either on the Site or constituting the Work (e.g., materials in transit), arising from the performance of Work of the Contract Documents from any cause.

16.2.B. Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property.

16.2.C. Contractor shall remedy all damage, injury or loss to any property referred to in paragraph 16.2.A of this Document 00700, caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, supplier, or any other person or organization directly or indirectly employed by any of them to perform or furnish any Work or anyone for whose acts any of them may be liable. Contractor's duties and responsibility for safety and for protection of Work shall continue until such time as all the Work is completed and Final Acceptance of the Work. Owner and its agents do not assume any responsibility for collecting any indemnity from any person or persons causing damage to Contractor's Work.

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

16.2.E. Owner may, at its option, retain such moneys due under the Contract Documents as Owner deems necessary until any and all suits or claims against Contractor for injury to persons or property shall be settled and Owner receives satisfactory evidence to that effect.

16.3 Responsibility For Safety And Health

16.3.A. Contractor shall ensure that its and each tier of Subcontractors' employees, agents and invitees comply with applicable health and safety laws while at the Site. These laws include the Occupational Safety and Health Act of 1970 and rules and regulations issued pursuant thereto, and Owner's safety regulations as amended from time to time. Contractor shall comply with all Owner directions regarding protective clothing and gear.

16.3.B. Contractor shall be fully responsible for the safety of its and its Subcontractors' employees, agents and invitees on the Site. Contractor shall notify Owner, in writing, of the existence of hazardous conditions, property or equipment at the Site that are not under Contractor's control. Contractor shall be responsible for taking all the necessary precautions against injury to persons or damage to the property of Contractor, Subcontractors or persons from recognized hazards until the responsible party corrects the hazard.

16.3.C. Contractor shall confine all persons acting on its or its Subcontractors' behalf to that portion of the Site where Work under the Contract Documents is to be performed, Owner-designated routes for ingress and egress thereto, and any other Owner-designated area. Except those routes for ingress and egress over which Contractor has no right of control, within such areas, Contractor shall provide safe means of access to all places at which persons may at any time have occasion to be present.

16.4 Emergencies

16.4.A. In emergencies affecting the safety or protection of persons or Work or property at the Site or adjacent thereto, Contractor, without special instruction or authorization from Owner, is obligated to act to prevent threat and damage, injury or loss, until directed otherwise by Owner. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in Work or variations from Contract Documents have been caused thereby. If Owner determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Change Order or Construction Change Directive will be issued to document the consequences of such action.

16.5 Use Of Roadways And Walkways

16.5.A. Contractor shall not unnecessarily interfere with use of any roadway, walkway or other facility for vehicular or pedestrian traffic. Before beginning any interference and only with Owner's prior concurrence, Contractor may provide detour or temporary bridge for traffic to pass around or over the interference, which Contractor shall maintain in satisfactory condition as long as interference continues. Unless otherwise provided in the Contract Documents, Contractor shall bear the cost of these temporary facilities.

16.6 Nondiscrimination

16.6.A. No person or entity shall discriminate in the employment of persons upon public works because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sexual preference, or gender of such persons, except as provided in Section 12940 of the Government Code. Every contractor for public works violating the provisions of Section 1735 of the Labor Code is subject to all the penalties imposed for a violation of Chapter 1, Part 7, Division 2 of the Labor Code. Contractor agrees to comply with the provisions of Chapter 19, Article II, of the Sonoma County Code prohibiting discrimination in housing, employment, and services because of AIDS or HIV infection during the term of this Contract and any extensions of the term.

16.7 Prevailing Wages

16.7.A. Contractor shall pay to persons performing labor in and about Work provided for in the Contract Documents an amount equal to or more than the general prevailing rate of per diem wages for (1) work of a similar character in the locality in which the Work is performed and (2) legal holiday and overtime work in said locality. The per diem wages shall be an amount equal to or more than the stipulated rates contained in a schedule that has been ascertained and determined by the Director of the State Department of Industrial Relations and Owner to be the general prevailing rate of per diem wages for each craft or type of workman or mechanic needed to execute this Contract. Contractor shall also cause a copy of this determination of the prevailing rate of per diem wages to be posted at each Site.

16.7.B. Contractor shall forfeit, as a penalty to Owner, Fifty Dollars ($50.00) for each laborer, workman, or mechanic employed in performing labor in and about the Work provided for in the Contract Documents for each Day, or portion thereof, that such laborer, workman or mechanic is paid less than the said stipulated rates for any Work done under the Contract Documents by him or her or by any Subcontractor under him or her, in violation of Articles 1 and 2 of Chapter 1 of Part 7 of Division II of the California Labor Code. The sums and amounts which shall be forfeited pursuant to this paragraph 16.7.B and the terms of the Labor Code shall be withheld and retained from payments due to Contractor under the Contract Documents, pursuant to this Document 00700 and the Labor Code, but no sum shall be so withheld, retained or forfeited except from the final payment without a full investigation by either the State Department of Industrial Relations or by Owner. The Labor Commissioner pursuant to Labor Code Section 1775 shall determine the final amount of forfeiture.

16.7.C. Contractor shall insert in every subcontract or other arrangement which Contractor may make for performance of Work or labor on Work provided for in the Contract, provision that Subcontractor shall pay persons performing labor or rendering service

under subcontract or other arrangement not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the Work is performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work fixed in the Labor Code.

16.7.D. Contractor stipulates that it shall comply with all applicable wage and hour laws, including without limitation Labor Code Sections 1813 and 1815.

16.8 Environmental Controls

16.8.A. Contractor shall comply with all rules, regulations, ordinances, and statutes that apply to any Work performed under the Contract Documents including, without limitation, any toxic, water, storm water management, and soil pollution controls and air pollution controls specified in Government Code Section 11017. Contractor shall be responsible for insuring that Contractor's Employees, Subcontractors, and the public are protected from exposure to airborne hazards or contaminated water, soil, or other toxic materials used during or generated by activities on the Site or associated with the Project.

16.9 Shoring Safety Plan

16.9.A. Any conflict between this paragraph 16.9 and Division 2 of the Specifications shall be resolved in favor of the most stringent requirement.

16.9.B. At least five Days in advance of any excavation five feet or more in depth, Contractor shall submit to Owner a detailed plan showing the shoring, bracing and sloping design (including calculations) and other provisions to be made for worker protection from the hazard of caving ground during the excavation, as required by Labor Code Section 6705. A civil or structural engineer registered in California shall prepare and sign any plan that varies from the shoring system standards established by the State Construction Safety Orders.

16.9.C. During the course of Work, Contractor shall be responsible for determining where sloping, shoring, and/or bracing is necessary and the adequacy of the design, installation, and maintenance of all shoring and bracing for all excavation, including any excavation less than five feet in depth. Contractor will be solely responsible for any damage or injuries that may result from excavating or trenching. Owner's acceptance of any drawings showing the shoring or bracing design or Work schedule shall not relieve Contractor of its responsibilities under this paragraph 16.9.

16.9.D. Appoint a qualified supervisory employee who shall be responsible to determine the sloping or shoring system to be used depending on local soil type, water table, stratification, depth, etc.

END OF DOCUMENT

DOCUMENT 00800

SUPPLEMENTARY CONDITIONS

1. SUMMARY

A. This document includes requirements that supplement the paragraphs of Document 00700 (General Conditions).

2. SUPPLEMENTS

A. Supplement to paragraph 4.2:

4.2.A. General.

1. Contractor shall maintain and shall require all of its subcontractors and other agents to maintain the insurance listed below. Contractor shall not commence Work, nor allow its employees, subcontractors or anyone to commence Work until the required insurance has been submitted and approved by Owner and a Notice to Proceed has been issued. Any requirement for insurance to be maintained after completion of the Work shall survive this Agreement.
2. Owner reserves the right to review any and all of the required insurance policies and/or endorsements, but has no obligation to do so. Failure to demand evidence of full compliance with the insurance requirements set forth in this Contract or failure to identify any insurance deficiency shall not relieve Contractor from, nor be construed or deemed a waiver of, its obligation to maintain the required insurance at all times during the performance of this Contract.

4.2.B. Contractor - Required Insurance.

1. At or before the date specified in Document 00510 (Notice of Award), Contractor shall furnish to Owner satisfactory proof that Contractor has obtained the following insurance as specified below:
   a. Workers Compensation Insurance & Employers Liability Insurance.
      1) Workers Compensation insurance with statutory limits as required by the Labor Code of the State of California.
      2) Employers Liability with limits of $1,000,000 per Accident; $1,000,000 Disease per employee; $1,000,000 Disease per policy.
      3) The policy shall be endorsed to include a written waiver of the insurer's right to subrogate against Owner.
      4) Required Evidence of Insurance:
         (a) Subrogation waiver endorsement, and
         (b) Certificate of Insurance.
      5) If injury occurs to any employee of Contractor, Subcontractor, or sub-subcontractor for which the employee, or the employee's dependents in the event of employee's death, is entitled to compensation from Owner under provisions of the Workers Compensation Insurance and Safety Act (Act), as amended, or for which compensation is claimed from Owner, Owner may retain out of sums due Contractor under Contract Documents, amount sufficient to cover such compensation, as fixed by the Act, as amended, until such compensation is paid, or until it is determined that no compensation is due. If Owner is compelled to pay compensation, Owner may, in its discretion, either deduct and retain

from the Contract Sum the amount so paid, or require Contractor to reimburse Owner.

b. General Liability Insurance.
   1) Commercial General Liability Insurance on a standard occurrence form, no less broad than ISO form CG 00 01.
   2) Minimum Limits The required limits may be provided by a combination of General Liability Insurance and Commercial Umbrella Liability Insurance. If Contractor maintains higher limits than the specified minimum limits, Owner requires and shall be entitled to coverage for the higher limits maintained by Contractor.
      (a) Projects under $1,000,000: $1,000,000 per Occurrence; $2,000,000 General Aggregate; $2,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
      (b) Projects from $1,000,000 - $4,999,999: $2,000,000 per Occurrence; $4,000,000 General Aggregate; $4,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
      (c) Projects from $5,000,000 - $9,999,999: $5,000,000 per Occurrence; $5,000,000 General Aggregate; $5,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
      (d) Projects $10,000,000 and Over: Minimum Limits: $10,000,000 per Occurrence; $10,000,000 General Aggregate; $10,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
   3) Any deductible or self-insured retention shall be shown on the Certificate of Insurance. If the deductible or self-insured retention exceeds $25,000 it must be approved in advance by Owner. Contractor is responsible for any deductible or self-insured retention and shall fund it upon Owner's written request, regardless of whether Contractor has a claim against the insurance or is named as a party in any action involving Owner.
   4) Insurance shall be maintained for the entire period of the Work, including any warranty period. Completed operations insurance shall be maintained after the end of the warranty period for the additional periods specified below:
      (a) Projects under $1,000,000: One (1) year after Final Completion and acceptance of the final payment for the Work.
      (b) Projects from $1,000,000 - $4,999,999: Two (2) years after Final Completion and acceptance of the final payment for the Work.
      (c) Projects from $5,000,000 - $9,999,999: Three (3) years after Final Completion and acceptance of the final payment for the Work.
      (d) Projects $10,000,000 and Over: Five (5) years after Final Completion and acceptance of the final payment for the Work.
   5) Owner, its Board of Directors, and its employees, representatives, consultants, and agents, and Sonoma County Water Agency, its employees, representatives, consultants, and agents; shall be additional insureds for liability arising out of ongoing <u>and</u> completed operations by

or on behalf of the Contractor in the performance of the Contract Documents. Additional insureds status shall continue for the period(s) specified in paragraph 4).

6) The policy definition of "insured contract" shall include assumptions of liability arising out of both ongoing operations and the products-completed operations hazard (broad form contractual liability coverage including the "f" definition of insured contract in ISO form CG 00 01, or equivalent).
7) The insurance provided to the additional insureds shall be primary to, and non-contributory with, any insurance or self-insurance program maintained by Owner *et al.*
8) The policy shall not exclude injury or damage caused by, or resulting from, explosion, collapse and/or underground hazards.
9) The policy shall not contain a Contractors' Warranty or other similar language which eliminates or restricts insurance because of a Subcontractor's failure to carry specific insurance or to supply evidence of such insurance.
10) The policy shall be endorsed to include a written waiver of the insurer's right to subrogate against all persons or entities that are, or are required to be, additional insureds.
11) The policy shall cover inter-insured suits between Contractor and the additional insureds and shall include a "separation of insureds" or "severability" clause which treats each insured separately.
12) Required Evidence of Insurance:
    (a) Additional insured endorsements or policy language granting additional insured status;
    (b) Endorsement or policy language indicating that insurance is primary and non-contributory; and
    (c) Certificate of Insurance.

c. Automobile Liability Insurance.
1) Minimum Limits:
    (a) Projects under $1,000,000: $1,000,000 combined single limit per accident.
    (b) Projects $1,000,000 and Over: $2,000,000 combined single limit per accident.
2) Insurance shall apply to all owned, hired, and non-owned vehicles.
3) Owner, its Board of Directors, and its employees, representatives, consultants, and agents; and Sonoma County Water Agency, its employees, representatives, consultants, and agents; shall qualify as an insured.
4) Insurance shall be maintained for the entire term of this Contract, including any warranty period.
5) Required Evidence of Insurance:
    (a) Endorsement or policy language indicating that Owner, its Board of Directors, and its employees, representatives, consultants, and agents; and Sonoma County Water Agency, its employees, representatives, consultants, and agents; are insureds; and
    (b) Certificate of Insurance.

d. Contractors Pollution Liability Insurance.
   1) Minimum Limits:
      (a) Projects under $5,000,000: $1,000,000 per pollution Incident; $1,000,000 Aggregate; and
      (b) Projects $5,000,000 and Over: $2,000,000 per pollution Incident; $2,000,000 Aggregate.
   2) Any deductible or self-insured retention shall be shown on the Certificate of Insurance. If the deductible or self-insured retention exceeds $25,000 it must be approved in advance by Owner. Contractor is responsible for any deductible or self-insured retention and shall fund it upon Owner's written request, regardless of whether Contractor has a claim against the insurance or is named as a party in any action involving Owner.
   3) If the insurance is on a Claims-Made basis, the retroactive date shall be no later than the commencement of Work.
   4) Insurance shall be maintained for the entire period of the Work plus the additional periods as specified below:
      (a) Projects under $1,000,000: One (1) year after Final Completion and acceptance of the final payment for the Work.
      (b) Projects from $1,000,000 - $4,999,999: Two (2) years after Final Completion and acceptance of the final payment for the Work.
      (c) Projects from $5,000,000 - $9,999,999: Three (3) years after Final Completion and acceptance of the final payment for the Work.
      (d) Projects $10,000,000 and Over: Five (5) years after Final Completion and acceptance of the final payment for the Work.
   5) If the insurance is on a Claims-Made basis, the continuation coverage may be provided by: (a) renewal of the existing policy; (b) an extended reporting period endorsement; or (c) replacement insurance with a retroactive date no later than the commencement of the Work.
   6) Owner, its Board of Directors, and its employees, representatives, consultants, and agents; and Sonoma County Water Agency, its employees, representatives, consultants, and agents; shall be additional insureds for liability arising out of operations by or on behalf of the Contractor in the performance of the Contract Documents.
   7) The insurance provided to the additional insureds shall apply on a primary and non-contributory basis with respect to any insurance or self-insurance program maintained by Owner *et al.*
   8) Required Evidence of Insurance:
      (a) Additional insured endorsement or policy language granting additional insured status;
      (b) Endorsement or policy language indicating that coverage is primary and non-contributory; and
      (c) Certificate of Insurance.

e. Professional Liability/Errors & Omissions Insurance.
   1) Required if the Contractor or its employees engage in design or professional activities (architecture, engineering or surveying) that are not subcontracted out.
   2) Minimum Limit: $1,000,000 per occurrence.

3) Any deductible or self-insured retention shall be shown on the Certificate of Insurance. If the deductible or self-insured retention exceeds $25,000 it must be approved in advance by Owner.
4) If the insurance is on a Claims-Made basis, the retroactive date shall be no later than the commencement of the Work.
5) Insurance applicable to the Work performed under the Contract shall be continued for two (2) years after completion of the Work. Such continuation insurance may be provided by one of the following: (a) renewal of the existing policy; (b) an extended reporting period endorsement; or (c) replacement insurance with a retroactive date no later than the commencement of the Work.
6) Required Evidence of Insurance:
   (a) Certificate of Insurance.

2. Increase of Minimum Limits.
   a. Required minimum amounts of insurance may be increased should conditions of Work, in opinion of Owner, warrant such increase. Contractor shall increase required insurance amounts upon direction by Owner.
3. Standards for Insurance Companies.
   a. Insurers, other than the California State Compensation Insurance Fund, shall have an A.M. Best's rating of at least A:VII.
4. Documentation.
   a. The Certificate of Insurance shall include the following reference: 70-713-7 #1A.
   b. Contractor agrees to maintain current Evidence of Insurance on file with Owner for the periods of insurance specified above in Paragraphs 2.4.2.B.1.a through 2.4.2.B.1.e. Any requirement to maintain insurance after Final Completion of the Work, including providing Certificates evidencing required insurance, shall survive the Contract.
      1) Required Evidence of Insurance shall be submitted to Russian River County Sanitation District, c/o Sonoma County Water Agency, 404 Aviation Boulevard, Santa Rosa, CA 95403-9019.
      2) Required Evidence of Insurance shall be submitted for any renewal or replacement of a policy that already exists, at least ten (10) days before expiration or other termination of the existing policy.
      3) Contractor shall provide immediate written notice if: (a) any of the required insurance policies is terminated; (b) the limits of any of the required policies are reduced; or (c) the deductible or self-insured retention is increased.
      4) Upon written request, certified copies of required insurance policies must be provided within thirty (30) days.
5. Policy Obligations
   a. Contractor's indemnity and other obligations shall not be limited by the foregoing insurance requirements.
6. Material Breach.
   a. If Contractor fails to maintain Insurance which is required pursuant to the Contract Documents, it shall be deemed a material breach. Owner, at its sole option, may terminate the Contract for default and obtain damages from Contractor resulting from said breach. Alternatively, Owner may purchase

the required Insurance, and without further notice to Contractor, Owner may deduct from sums due to Contractor any premium costs advanced by Owner for such insurance. These remedies shall be in addition to any other remedies available to Owner under the Contract Documents or Law.

4.2.C. Subcontractors - Required Insurance.

1. With respect to their portion of the Work, Subcontractors of all tiers shall maintain the same insurance required to be maintained by Contractor with limits as follows:
   a. Minimum General Liability Limits for Framing, Mechanical, and Electrical Subcontractors.
      1) Projects under $1,000,000: $1,000,000 per Occurrence; $2,000,000 General Aggregate; $2,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
      2) Projects $1,000,000 and Over: $2,000,000 per Occurrence; $4,000,000 General Aggregate; $4,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
   b. Minimum General Liability Limits for all Subcontractors other than Framing, Mechanical, and Electrical Subcontractors.
      1) $1,000,000 per Occurrence; $2,000,000 General Aggregate; $2,000,000 Products/Completed Operations Aggregate. The General Aggregate shall apply separately to each Project.
   c. Minimum Automobile Liability Limits.
      1) $1,000,000 combined single limit per accident.
   d. Minimum Employers Liability Limits.
      1) $1,000,000 per Accident; $1,000,000 Disease per employee; $1,000,000 Disease per policy.
   e. Professional Liability/Errors & Omissions Insurance.
      1) Required for any architect, engineer, surveyor or other licensed professional engaged by Contractor to perform portions of the Work.
      2) Minimum Limit: $1,000,000.
      3) Any deductible or self-insured retention shall be shown on the Certificate of Insurance. If the deductible or self-insured retention exceeds $25,000 it must be approved in advance by Owner.
      4) If the insurance is on a Claims-Made basis, the retroactive date shall be no later than the commencement of the Work.
      5) Coverage applicable to the Work performed under the Contract shall be continued for two (2) years after completion of the Work. Such continuation coverage may be provided by one of the following: (a) renewal of the existing policy; (b) an extended reporting period endorsement; or (c) replacement insurance with a retroactive date no later than the commencement of the Work.
      6) Required Evidence of Insurance:
         (a) Certificate of Insurance.

4.2.D. Builder's Risk.

1. With respect to Work under this Contract, Owner shall maintain "All-Risk" Course of Construction insurance as follows:
   a. Insured Property shall include: (1) Real property in Course of Construction; (2) building materials and supplies intended to be in or on the completed

Work located at the Site, in storage or in transit, and whether or not owned or paid for by Owner; (3) fixtures and machinery intended to be in or on the completed Work; (4) scaffolding, cribbing, fencing, forms and temporary trailers, while located on the Site, in storage or in transit.

b. Limit of insurance shall be the full contract value.
c. Responsibility for paying deductibles is as follows:

Contract Value or Description	***Contractor's Responsibility for Deductible: Earthquake and Flood***	***Contractor's Responsibility for Deductible: Other Insured Perils***	***Owner's Responsibility for Deductible***
Full Contract Value under $1,000,000	First $10,000	First $5,000	Balance of Deductible
Full Contract Value: $1,000,000 - $9,999,999	First $20,000	First $10,000	Balance of Deductible
Full Contract Value: $10,000,000 - $19,999,999	First $50,000	First $25,000	Balance of Deductible
Full Contract Value: $20,000,000 and above	First $60,000	First $30,000	Balance of Deductible

d. Contractor and Subcontractors of all tiers shall be additional insureds.
e. Excluded property: Equipment, tools, and personal effects belonging to Contractor or Subcontractors of all tiers.
f. Insured perils: All Risks of Direct Physical Damage or Loss, including flood and, for scheduled locations, earthquake, except as excluded.
g. Exclusions may include, but are not limited to:
    1) Loss due to wear and tear, moth, vermin, termites, insects, latent defects, gradual deterioration, wet or dry rot, rust, corrosion, erosion or normal settling, shrinkage and/or expansion of buildings or foundations.
    2) Loss or damage due to contaminants and/or pollutants. However, fire losses arising directly or indirectly from pollutants or contaminants are covered.
    3) Loss of use or occupancy or consequential loss.
    4) Liquidated damages and/or penalties for delay or detention in connection with guarantees of performance or efficiency.
    5) Loss or damage caused by or resulting from infidelity or dishonesty on the part of any insured or the employees or agents of any insured.
    6) Inventory shortage or unexplained disappearance.
h. A copy of Owner's Course of Construction Insurance, including all policy coverages, conditions and exclusions, shall control in the event of any conflict with the language of this Document 00700. Upon request, Owner will provide a Certificate of Property Insurance.

END OF DOCUMENT

DOCUMENT 00910

ADDENDA

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL

[DOCUMENT TO BE COMPLETED AS ADDENDA DURING BID PERIOD]

END OF DOCUMENT

SPECIFICATIONS

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01100

SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Summary of Work and Work Restrictions including:
      a. Summary
      b. Work Covered By Contract Documents
      c. Bid Items, Allowances, and Alternates
      d. Work Under Other Contracts
      e. Future Work
      f. Work Sequence
      g. Work Days and Hours
      h. Shutdown for Discovery of Cultural Resources
      i. Cooperation of Contractor and Coordination with Other Work
      j. Partial Occupancy/Utilization Requirements
      k. Contractor Use of Site
      l. Air Quality Standards
      m. Construction Staking and Monument Protection
      n. Protection of Existing Structures and Underground Facilities
      o. Permits
      p. Actual Damages
      q. Work on Wastewater Treatment Facilities
      r. Rights-of-Way
      s. Document Tracking
      t. Products Ordered In Advance
      u. Owner-Furnished Products

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Work comprises construction of Owner's biological nutrient removal system at Owner's treatment plant, 18400 Neeley Road, near the community of Guerneville, Sonoma County, California, including without limitation baffle walls, pumping recirculation, micro diffuser aeration, blowers, mixers, motor control center, electrical panels, instruments, and controls. Contract Documents fully describe the Work.
B. The Work of this Contract comprises construction of all the Work indicated, described in the Specifications, or otherwise required by the Contract Documents.
C. Unless provided otherwise in the Contract Documents, all risk of loss to Work covered by Contract Documents shall rest with Contractor until Final Acceptance of the Work.
D. Cost of maintenance of systems and equipment prior to Final Acceptance will be considered as included in prices Bid and no direct or additional payment will be made therefor.

1.3 BID ITEMS, ALLOWANCES, AND ALTERNATES

A. Any Bid item may be deleted from the Work and Contract Sum, in total or in part, prior to or after award of Contract without compensation in any form or adjustment of other Bid items or prices therefore.

B. Payment of all items is subject to provisions of Contract Documents, including without limitation Section 01200 (Price and Payment Procedures).
C. For all Bid items, furnish and install all Work, including connections to existing systems, indicated and described in Specifications and all other Contract Documents. Work and requirements applicable to each individual Bid item, or unit of Work, shall be deemed incorporated into the description of each Bid item (whether Lump Sum or Unit Price).
D. Bid item descriptions (listed by Bid item number):
   1. Bonds. The lump sum price paid under this item shall be full payment for furnishing bonds as required by Document 00700 (General Conditions).
   2. Insurance. The lump sum price paid under this item shall be full payment for furnishing insurance as required by Document 00700 (General Conditions).
   3. Safety Program and Implementation. The lump sum price paid under this item shall be full payment for furnishing and implementing the Safety Program as required by Section 01540 (Site Security and Safety) and Document 00700 (General Conditions).
   4. Construction Material Waste Management Plan and Implementation. The lump sum price paid under this item shall be full payment for furnishing and implementing the Construction Material Waste Management Plan as required by Section 01741 (Construction Material Waste Management Plan).
   5. Installation, Operation, and Maintenance Manuals. The lump sum price paid under this item shall be full payment for furnishing installation, operation, and maintenance manuals as required by Section 01330 (Submittal Procedures).
   6. Mobilization/Demobilization. The lump sum price paid under this item shall be full payment for initial mobilization at Project commencement (50% to be paid then), and cleanup and demobilization at Final Completion (50% to be paid then).
   7. Biological Nutrient Removal System and Appurtenances. The lump sum price paid under this item shall be full payment for providing a complete and operational biological nutrient removal system, including appurtenances, as described in the Contract Documents.
   8. All Other Work. The lump sum price paid under this item shall be full payment for all Work of Contract Documents other than Work separately provided for under other Bid items.
E. Allowances: (N/A)
F. Alternates: (N/A)

1.4 WORK UNDER OTHER CONTRACTS

A. None expected.

1.5 FUTURE WORK

A. None expected.

1.6 WORK SEQUENCE

A. Construct Work in stages and at times to accommodate Owner operation requirements during the construction period; coordinate construction schedule and operations with Owner.
B. Milestone 1: Milestone 1 shall be achieved by the deadline defined in Article 3 of Document 00520 (Agreement). Milestone 1 is the successful completion of PCS-1, as defined and described in Section 01650 (Facility Startup). The date of Contractor's achievement of Milestone 1 will be memorialized in writing by Owner in accordance with Section 01650 (Facility Startup).

C. Special operational constraints include the following:
   1. General Process shutdowns: Notify Owner in writing at least 2 Business Days prior to the need for a shutdown of any of the existing process or system. Certify that all materials, equipment, and personnel are available to perform the Work requiring the shutdown. Owner may verify this certification. Owner forces will perform shutdowns of existing systems. Limit shutdowns to 10 hours maximum unless otherwise approved by Owner. Timing of shutdowns will be at Owner's discretion.
      a. The Contractor is limited to a total of five shutdowns each within the stated time limit. Only one shutdown is allowed in any seven day period.
      b. Limit number and length of shutdowns to minimal practicable extent.
   2. Notify Owner in writing at least 10 Business Days prior to the need for a "peak flow" of up to 1.75 mgd. Certify that all materials, equipment, electrical, instrumentation, controls, and personnel are available to perform the Work requiring the "peak flow." Owner may verify this certification. Limit "peak flow" to 6 hours maximum unless otherwise approved by Owner. Timing of "peak flow" will be at Owner's discretion.
   3. Special telemetry requirements:
      a. Any piece of equipment or system requiring an electronic analog or digital status signals for flow, pressure, level, chemical, or biological parameters, alarm, or status shall not be put in service until the following conditions are met:
         1) Notify Owner 72 hours prior to the equipment or system startup.
         2) If PLC and/or HMI is not required: The analog, alarm and status signals required under the Contract shall be terminated and labeled on a terminal strip in an area within 5 feet of the location indicated as Owner's RTU.
         3) If PLC and/or HMI is required: Provide PLC register addressing and HMI programming code to Owner as Contractor develops and establishes PLC and HMI functionality. Permit Owner to communicate with any PLC and/or HMI during the development or activation of the Project.
         4) Verify that the analog signals for the physical parameters are calibrated to the accuracy specified.
      b. Provide signal isolation devices as required by the Contract Documents or as desired by Contractor.
      c. Maintain the analog signal and signal accuracy for the duration of Work and during the warranty period.

D. Special Work sequence requirements include the following:
   1. Demolition, Step 1:
      a. Sequence:
         1) Demolish and remove existing blowers and support bases from blower locations 2, 3, and 4. Blower locations are indicated.
         2) Install isolation valve on low pressure aeration (LPA) piping interconnection.
         3) Demolish existing aeration system, piping, and appurtenances in Aeration Basin 1 (AB1).
         4) Install temporary LPA piping, isolation valves, and fittings as required to install and startup new blowers in AB1, while still delivering air to Aeration Basin 2 (AB2) with the existing blowers.
      b. Constraints:
         1) Blowers in locations 1, 5, and 6 shall remain operational during Step 1. Blowers in positions 1, 5, and 6 shall continuously provide air to AB2, excluding permitted LPA system shutdown.

2) LPA system shutdown for AB1 and AB2 shall be limited to two hours.

2. Construction in AB1 and Blower Building, Step 2:
   a. Sequence:
      1) Install new blowers in blower locations 2, 3, and 4.
      2) Route blower discharge LPA piping for new blowers (B-01, B-02, and B-03) to serve AB1. Provide temporary LPA piping, valving, and fittings as required.
      3) Construct aeration system, mixers, pumps, piping, and all other improvements in AB1.
      4) Startup, test, pre-commission, and commission AB1 aeration equipment, mixers, and all other equipment per the requirements in Section 01650 (Facility Startup).
   b. Constraints:
      1) Blowers in locations 1, 5, and 6 shall remain operational during Step 2 and shall continuously deliver air to AB2 during construction, startup, and commissioning of AB1.
      2) Shutdown of LPA system for AB1 and AB2 is limited to two hours.
3. Demolition, Step 3:
   a. Sequence:
      1) Perform demolition Work in AB2.
      2) Perform demolition of remaining existing blowers in locations 1, 5, and 6.
   b. Constraints:
      1) Successful operation of AB1 shall be at the discretion of the Owner, and is not anticipated to exceed 60 Days from the date Owner issues a Certificate of Completion for Milestone 1, as defined in Section 01650 (Facility Startup). Unless otherwise approved by Owner, AB2 will be available to Contractor 60 Days after Owner issues a Certificate of Completion of Milestone 1.
      2) All equipment, valves, and piping for Work in Aeration Basin 2 shall be on Site prior to Aeration Basin 2 shutdown.
      3) Shutdown of LPA system for AB1 and AB2 is limited to two hours.
4. Construction, Step 4:
   a. Sequence:
      1) Construct aeration system, mixers, piping and all other Work in AB2.
      2) Startup, test, and commission AB2 aeration equipment, mixers, and all other equipment.
      3) Install permanent LPA piping and valves from blowers (B-01, B-02, and B-03) to AB1 and AB2.
   b. Constraints:
      1) New blowers shall deliver air continuously to AB1 during construction and testing of AB2, excluding permitted LPA system shutdown.
      2) Shutdown of LPA system for AB1 and AB2 is limited to two hours.

1.7 WORK DAYS AND HOURS

A. Work Days and hours: Monday-Friday inclusive, 7:00 a.m. - 7:00 p.m. local time.
B. Work at the Site on weekends, holidays, or at night is not permitted, unless Contractor requests otherwise from Owner in writing at least 48 hours in advance and Owner approves in its sole discretion.
C. Contractor will not be permitted to schedule utility shutdowns on Fridays.

1.8 SHUTDOWN FOR DISCOVERY OF CULTURAL RESOURCES

A. If discovery is made of items of historical, archaeological, or paleontological interest, immediately cease all Work in the area of discovery. Archaeological indicators may include, but are not limited to, dwelling sites, locally darkened soils, stone implements or other artifacts, fragments of glass or ceramics, animal bones, human bones, and fossils. After cessation of excavation, immediately contact Owner. Do not resume Work until authorization is received from Owner. When resumed, excavation or other activities shall be as directed by Owner.

1.9 COOPERATION OF CONTRACTOR AND COORDINATION WITH OTHER WORK

A. Coordinate with Owner and any Owner forces, or other contractors and forces, as required by Document 00700 (General Conditions), Article 6.
B. Employ a full-time coordinator to constantly review Contract Documents, submittals, changes, and prepare overlay drawings as necessary to avoid conflicts, errors, omissions and untimely construction.

1.10 PARTIAL OCCUPANCY/UTILIZATION REQUIREMENTS

A. Allow Owner to take possession of and use any completed or partially completed portion of the Work during the progress of the Work as soon as is possible without interference to the Work.
B. Possession, use of Work, and placement and installation of equipment by Owner shall not in any way evidence the completion of the Work or any part of it.
C. Contractor shall not be held responsible for damage to the occupied part of the Work resulting from Owner occupancy.
D. Make available, in areas occupied, on a 24-hour per day and 7-day per week basis if required, any utility services, heating, and cooling in condition to be put in operation at the time of occupancy.
   1. Responsibility for operation and maintenance of said equipment shall remain with Contractor.
   2. Make, and Owner shall certify, an itemized list of each piece of equipment so operated with the date operation commences.
   3. Itemized list noted above shall be basis for commencement of warranty period for equipment.
   4. Owner shall pay for utility cost arising out of occupancy by Owner during construction.
E. Use and occupancy by Owner prior to acceptance of Work does not relieve Contractor of its responsibility to maintain insurance and bonds required under the Contract until entire Work is completed and accepted by Owner.
F. Prior to date of Final Acceptance of the Work by Owner, all necessary repairs or renewals in Work or part thereof so used, not due to ordinary wear and tear, but due to Defective materials or workmanship or to operations of Contractor, shall be made at expense of Contractor, as required in Document 00700 (General Conditions).
G. Use by Owner of Work or part thereof as contemplated by this Section 01100 shall in no case be construed as constituting acceptance of Work or any part thereof. Such use shall neither relieve Contractor of any responsibilities under Contract, nor act as waiver by Owner of any of the conditions thereof.
H. Owner may specify in the Contract Documents that portions of the Work, including electrical and mechanical systems or separate structures, shall be substantially completed on dates described in paragraph 1.6 of this Section 01100, if any, prior to Substantial

Completion of all of the Work. Notify Owner in writing when Contractor considers any such part of the Work ready for its intended use and Substantially Complete and request Owner to issue a Certificate of Substantial Completion for that part of the Work.

1.11 CONTRACTOR USE OF SITE

A. Confine operations at Site to areas permitted by Contract Documents, permits, ordinances, and laws.
B. Do not unreasonably encumber Site with materials or equipment.
C. Assume full responsibility for protection and safekeeping of products stored on premises.
D. Move any stored products that interfere with operations of Owner or other contractor.
E. Coordinate parking, storage, staging, and Work areas with Owner.
F. Owner will provide a storage area for Contractor's equipment and materials. Owner will not protect the storage area.
G. Do not store construction materials in the Drip line of any tree.
H. Access is available to the Site from Neeley Road along the route indicated.
I. Owner will provide a combination lock to Contractor. Insert lock in series and ensure that the entrance is locked at the end of each work day and at other times as may be necessary to control unauthorized entry.
J. Contractor shall contact Owner at least 2 Business Days prior to entering the building and performing Work to allow Owner to arrange access into the building.

1.12 AIR QUALITY STANDARDS

A. Ensure that idling time for all heavy equipment is minimized to reduce on-Site emissions.
B. Maintain equipment in good mechanical condition.
C. Cover trucks hauling dirt.
D. Limit dust emissions during periods of high winds (greater than 15 miles per hour).
E. Replace ground cover in disturbed areas as soon as possible.
F. Enclose, cover, water, or apply soil binders to exposed stockpiles.
G. Remove earth tracked onto neighboring paved roads at least once daily.
H. Limit equipment speed to 10 miles per hour in unpaved areas.

1.13 CONSTRUCTION STAKING AND MONUMENT PROTECTION

A. Owner will provide construction staking and other surveying, mapping, or computational activities that Owner deems necessary in its sole judgment, including that which may be used by the Owner to determine pay quantities, or other elements required by or provided for in the Contract Documents.
B. Contractor shall be responsible at its sole expense and direction for construction layout activities (as defined by Owner in its sole and exclusive judgment) and any surveying and/or mapping activities beyond that which will be performed by Owner in accordance with Paragraph A above, including that which may be required to establish and/or document as-built locations, alignments, elevations, grades or quantities required by or provided for in the Contract Documents.
C. Contractor shall be required to prepare and submit to Owner, not less than five Business Days before the Preconstruction Meeting, a Construction Staking Outline consisting of completed draft Construction Survey Request forms detailing the scope, extent, and anticipated schedule of the construction staking proposed by Contractor for each phase of the work and separate Construction Survey Request to be submitted by Contractor during the course of the contract. Owner will review Contractor's Construction Staking Outline and

notify Contractor of required changes, modifications, or deletions to the Construction Staking Outline prior to commencement of Work.

D. Construction staking will be provided in accordance with the approved Construction Staking Outline. Modifications and alterations to the Construction Staking Outline must be submitted and approved by Owner not less than five Business Days in advance of the requested date that construction survey activities are to begin (see Construction Survey Request: Requested Start Date). Owner reserves the right to reject, require modification and/or deletions to any such subsequent submittal prior to acceptance.

E. Contractor shall be responsible at its sole expense to ready the area required for construction survey activities prior to the arrival of Owner's survey crews on Site. For the purposes of construction surveying activities, readying includes clearing, grubbing and ensuring that the area required for construction surveys is clear of obstacles, debris, materials, equipment or hazards that would unreasonably interfere with or impede Owner's ability in Owner's reasonable judgment, to productively and effectively provide the construction survey requested, establish reliable, stable, survey points and stakes or markings on the ground. Owner reserves the right to delay, discontinue, or suspend construction surveys in areas and situations that in the sole judgment of Owner, are not sufficiently readied for such surveys. Owner is not responsible for delays resulting from the areas required for construction survey activities not being sufficiently readied prior to survey crew's arrival on Site.

F. Contractor is responsible at its sole expense to provide traffic control for construction surveying activities, and shall coordinate with Owner to ensure sufficient traffic control and or safety measures are in place, prior to the arrival of the survey crew on Site. Owner reserves the right to delay, discontinue or suspend construction surveys in areas and situations that in the sole judgment of Owner lack sufficient traffic control and/or safety measures to safely, productively and efficiently accommodate construction survey activities. Owner is not responsible for delays resulting from the areas required for construction survey activities lacking sufficient traffic control and/or safety measures in place prior to survey crew's arrival on Site.

G. Construction Survey Request(s) shall be submitted by Contractor not less than five Business Days prior to the date that the Site will be readied for construction surveying activities (hereafter referred to as the advanced notice period for Construction Survey Request(s)). Scheduling or time changes for a previously accepted Construction Survey Request shall be submitted to Owner not less than two Business Days in advance of the date that the Site will be readied. Requests submitted after 12:00 noon will be held over to the next Business Day for the purposes of beginning the advanced notice period for Construction Survey Requests.

H. Contractor is responsible to ensure that sufficient time is allowed to meet the advanced notice period for Construction Survey Request(s) requirements, to perform Site preparation requirements outlined above, to accommodate Owner's scheduling and resource availability, and for the Owner to complete construction survey activities. Contractor shall coordinate with Owner well in advance of the anticipated need, to ensure that sufficient resources are available to complete the construction surveys requested. No extension of time will be granted for delays resulting from construction survey activities.

I. Contractor shall not begin work on any element of construction until construction staking or related survey activity associated with a Construction Survey Request submitted by the Contractor has been completed. For the purposes of this section: Completion of construction staking or related survey activity shall be determined by Owner. Contractor will be notified by Owner.

J. Contractor shall protect and preserve stakes set by Owner in accordance with the above. Contractor shall be responsible at its sole expense for re-staking or verification of survey stakes, cut/fills or markings that are damaged, destroyed or otherwise made un-useful/reliable by activities within its control in the reasonable judgment of Owner. Owner will provide replacement stakes or verification surveys requested by Contractor at Contractor's expense in accordance with normal staff rates and charges associated with personnel, equipment and materials required to perform such activities.

K. Whenever Contractor knows or reasonably should know that any Work or construction-related activity required under this Contract may, or is likely to damage, destroy or cause <u>any</u> property or right of way monument(s), survey control point(s), or Bench Marks to become unusable, Contractor shall notify Owner a minimum of five Business Days in advance of such work or activity. Owner will reference property or right of way monument(s) and survey control point(s) by survey, swing ties, or other appropriate means prior to their disturbance or destruction. Owner will replace or restore as appropriate property or right of way monuments and survey control point(s) disturbed, destroyed or otherwise made un-useful by Contractor's activities upon completion of the construction activities.

L. Contractor shall protect and preserve property or right of way monuments and survey control points, and shall be responsible at its sole expense for the cost replacing or restoring damaged or destroyed property or right of way monuments and survey control points, including the cost of preparing and filing a Corner Record or Record of Survey when required under Sec. 8771(b) of the Business and Professions Code of the State of California where sufficient notification to Owner was not provided in accordance with the above. Owner will perform such Surveying and Mapping activities required in Owner's sole judgment, to restore or replace property or right of way monuments and survey control point(s) disturbed, destroyed or otherwise made un-useful by Contractor's activities and required to comply Sec. 8771(b) of the Business and Professions Code of the State of California, in accordance with staff rates and charges in effect for the associated personnel, equipment and materials required to perform such activities.

1.14 PROTECTION OF EXISTING STRUCTURES AND UNDERGROUND FACILITIES

A. The Drawings may indicate existing above- and below-grade structures, drainage lines, storm drains, sewers, water lines, gas lines, electrical lines, and other similar items and Underground Facilities that are known to Owner.

B. Where overhead service to a structure, known to receive service, does not exist, then underground service shall be assumed to exist.

C. In addition to reporting, if a utility is damaged, Contractor shall take appropriate action as provided in Document 00700 (General Conditions).

D. Additional compensation or extension of time on account of utilities not indicated or otherwise brought to Contractor's attention including reasonable action taken to protect or repair damage shall be determined as provided in Document 00700 (General Conditions).

1.15 PERMITS

A. No permits are known to apply to the Work.

1.16 ACTUAL DAMAGES

A. Owner may incur actual damages, including fines imposed by any regulatory agency, resulting from loss of use of the wastewater treatment system, or from violation of Owner's NPDES Permit (No.CA0024058), or from violation of legal or regulatory requirements

where the violations result from Contractor's activities or delay. Continuous operation of the wastewater treatment system in compliance with legal or regulatory requirements is essential to avoid discharges that would violate applicable regulations. Violations or threatened violations of regulations or permits may subject Owner to fines of more than $25,000 per Day or per occurrence and other costs or civil liabilities. Contractor shall be liable for and shall pay Owner the amount of any such actual losses in addition to liquidated damages and any other remedies provided by the Contract Documents. This paragraph shall not limit any other remedies Owner may have in law or equity.

1.17 WORK ON WASTEWATER TREATMENT FACILITIES

A. The Project includes modifications of or additions to existing wastewater treatment facilities that serve the public. It is imperative that existing facilities continue to operate, in compliance with permit requirements, throughout the duration of the Work. Contractor shall carry out construction activities in a manner that does not disrupt facility operations.

B. Schedule all construction activities that affect the operation of the facilities with Owner. Provide all labor, equipment, and materials required to maintain the permitted operation on a temporary basis whenever usual plant activities must be interrupted by construction activities. Any temporary operating arrangement shall comply with the facility's permit requirements. Any violation of these requirements may result in fines or other costs to Owner. Contractor shall be responsible for any and all costs, including attorneys' fees, incurred as a result of any violation or threatened violation of permit requirements where the violation or threatened violation arises out of or in connection with Contractor's construction activities. This remedy is in addition to any other remedy existing under this Contract.

C. See paragraph 1.16 of this Section 01100 for information about actual damages.

1.18 RIGHTS-OF-WAY

A. Owner owns the property as indicated.

1.19 DOCUMENT TRACKING

A. Owner will maintain a computerized document control system to monitor the generation, status, and filing of documents. Documents such as, but not limited to, Contracts, Cost Proposals, Change Orders (proposed and approved), Meeting Minutes, Schedules and Reports, Payment Applications, certificates of insurance, Safety Reports, Requests for Information, Requests for Substitutions, correspondence, communications, notices, Submittals, transmittals, and logs shall be submitted electronically for Owner to control the documents using the computerized system. Owner will use the computerized system to track and manage all documents on the Project, after Notice to Proceed, to the greatest extent possible.

B. Provide all Project documents to Owner in electronic format with a minimum of one hard copy, unless otherwise required by the Contract Documents. If file size prohibits electronic transmittal, submit to Owner on compact disk (CD).

C. Provide electronic format documents in searchable portable document format (PDF), unless otherwise required by the Contract Documents or directed in writing by Owner.

PART 2 PRODUCTS

2.1 PRODUCTS ORDERED IN ADVANCE

A. As provided in Section 01200 (Price and Payment Procedures), paragraph 1.5E, and subject to all other provisions of the Contract Documents, Owner will pay for the following materials and equipment prior to incorporation into the Work:
   1. Materials:
      a. None.
   2. Equipment:
      a. None.

2.2 OWNER-FURNISHED PRODUCTS

A. Owner-Furnished Products:
   1. None.
B. Owner's Responsibilities:
   1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples, to Contractor.
   2. Arrange and pay for delivery to Site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, Defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.
C. Contractor's Responsibilities:
   1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
   2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install, and finish products.
   4. Repair or replace items damaged after receipt.
   5. Install into Project per Contract Documents.

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01200

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Description of requirements and procedures for determining amount of Work performed and for obtaining payment for Work performed.

1.2 REFERENCES

A. California Public Contract Code
B. Code of Civil Procedure

1.3 SCOPE OF WORK

Work under Contract Documents, or under any Bid item, allowance, or Alternate, shall include all labor, materials, taxes, transport, handling, storage, supervision, administration, and all other items necessary for the satisfactory completion of Work, whether or not expressly specified or indicated.

1.4 DETERMINATION OF QUANTITIES

Quantity of Work to be paid for under any item for which a unit price is fixed in Contract Documents shall be number, as determined by Owner, of units of Work satisfactorily completed in accordance with Contract Documents or as directed by Owner. Unless otherwise provided, determination of number of units of Work so completed will be based, so far as practicable, on actual measurement or count within prescribed or ordered limits, and no payment will be made for Work done outside of limits. Measurements and computations will be made by methods set forth in Contract Documents, including without limitation this Section 01200. If methods are not so set forth, measurements shall be made in any manner which Owner considers appropriate for class of Work measured (e.g., pre-assigned values, percentage completion, units completed or incremental Milestones). Contractor must immediately inform Owner of any disputes regarding quantity measurements and shall immediately supply Owner with any documentation supporting the disputed measurements.

1.5 SCOPE OF PAYMENT

A. Except as otherwise expressly stated in Section 01100 (Summary), payment to Contractor at the unit price or other price fixed in Contract Documents for performing Work required under any item, or (if the Contract is on a single lump sum price basis) at the lump sum price fixed in the Contract Documents for performing all Work required under Contract Documents, and as either may be adjusted pursuant to any approved Change Order or Construction Change Directive, shall be full compensation for completing, in accordance with Contract Documents, all Work required under the item or under Contract Documents, and for all expense incurred by Contractor for any purpose in connection with the performance and completion of said Work, including all incidental Work necessary for completion of the Work.
B. The Contract Sum, whether lump sum, unit price or otherwise, shall be deemed to include all costs necessary to complete required Work, all costs (if any) for loss or damage arising from nature of Work or prosecution of the Work, and from action of elements. Unless

Contract Documents expressly provide otherwise, the Contract Sum shall be deemed to include:

1. Any and all costs arising from any unforeseen difficulties which may be encountered during, and all risks of any description connected with, prosecution of Work or prosecution of Bid item (whether lump sum or unit price) until acceptance by Owner;
2. All expenses incurred due to suspension, or discontinuance of Work or discontinuance of Bid item (whether lump sum or unit price) as provided in Contract Documents;
3. Escalation to allow for cost increases between time of Contract Award and completion of Work or completion of Bid item (whether lump sum or unit price).

C. Whenever it is specified herein that Contractor is to do Work or furnish materials of any class for which no price is fixed in Contract Documents, it shall be understood that Contractor is to do such Work or furnish such materials without extra charge or allowance or direct payment of any sort, and that cost of doing Work or furnishing materials is to be included in price Bid, unless it is expressly specified herein, in particular cases, that Work or material is to be paid for as extra Work.

D. Unit Prices shall apply to Work covered by unit prices so long as actual quantities performed on the Project are not less than 75 percent or greater than 125 percent of the estimated quantities contained in Document 00400 (Bid Form) or otherwise referenced in Section 01100 (Summary). If actual quantities exceed these parameters, then the unit price shall be adjusted by an amount to reflect the Contractor's incremental cost differential resulting from increased or decreased economies of scale. For quantities reduced to less than 75 percent of the estimated Bid quantity, the payment for the total pay quantity of such item of Work will in no case exceed the payment that would have been made for the performance of 75 percent of the estimated Bid quantity for such item at the original Contract unit price.

E. No payment shall be made for materials or equipment not yet incorporated into the Work, except as specified in Section 01100 (Summary).

F. For any materials and equipment referenced in Section 01100 (Summary) as subject to payment prior to incorporation into the Work, where Contractor requests payment on the basis of such materials and equipment not incorporated in the Work, Contractor must satisfy the following conditions:

1. The materials and/or equipment shall be delivered and suitably stored at the Site or at another local location agreed to in writing, for example, a mutually acceptable warehouse;
2. Full title to the materials and/or equipment shall vest in Owner at the time of delivery to the Site, warehouse or other storage location;
3. Obtain a negotiable warehouse receipt, endorsed over to Owner for materials and/or equipment stored in an Off Site warehouse. No payment will be made until such endorsed receipts are delivered to Owner;
4. Stockpiled materials and/or equipment shall be available for Owner inspection, but Owner shall have no obligation to inspect them and its inspection or failure to inspect shall not relieve Contractor of any obligations under the Contract Documents. Materials and/or equipment shall be segregated and labeled or tagged to identify these specific Contract Documents;
5. After delivery of materials and/or equipment, if any inherent or acquired defects are discovered, Defective materials and/or equipment shall be removed and replaced with suitable materials and/or equipment at Contractor's expense;

6. At Contractor's expense, insure the materials and/or equipment against theft, fire, flood, vandalism, and malicious mischief, as well as any other coverages required under the Contract Documents;
7. Contractor's Application for Payment shall be accompanied by a bill of sale, invoice or other documentation warranting that Owner has received the materials and equipment free and clear of all liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner. This documentation shall include, but not be limited to, conditional releases of mechanics' liens and stop notices from all those providing materials and equipment as to which the Application for Payment relates, as well as unconditional releases of the same from the same as to the previous Application for Payment for which they have not already been provided.

G. Amounts previously paid for materials and equipment prior to incorporation into the Work shall be deducted from amounts otherwise due Contractor as they are incorporated.

1.6 BASIS OF PAYMENT

A. Unit Price Quantities: When estimated quantity for specific portions of Work is listed in Document 00400 (Bid Form), quantity of Work to be paid for shall be actual number of units satisfactorily completed, as determined by Owner and certified by Contractor, in accordance with Contract Documents.
B. Lump Sum: When estimated quantity for specific portion of Work is not indicated and unit is designated as lump sum, payment will be on a lump sum basis for Work satisfactorily completed in accordance with Contract Documents.
C. Allowances: Allowance items (if any) will be paid for as provided in Section 01100 (Summary). Funds authorized for Allowance Work will not be released for Contract payments unless Owner has authorized Allowance Work in writing.
D. Owner does not expressly, or by implication, agree, warrant, or represent in any manner, that actual amount of Work will correspond with amount shown or estimated and reserves right to increase or decrease amount of any class or portion of Work, to leave out entire Bid item or items, or to add work not originally included in Bid or Contract Documents, when in its judgment such change is in best interest of Owner. No change in Work shall be considered a waiver of any other condition of Contract Documents. No claim shall be made for anticipated profit, for loss of profit, for damages, or for extra payment whatever, except as otherwise expressly provided for in Contract Documents, because of any differences between amount of Work actually done and estimated amount as set forth herein, or for elimination of Bid items.

1.7 PROGRESS PAYMENTS

A. Owner's General Manager is authorized to approve progress payments in conformance with Contract Documents and the Auditor/Controller of the County of Sonoma is authorized to process such payments upon their submission by the General Manager.
B. If requested by Contractor, progress payments will be made monthly.
C. Schedule of Values:
   1. Within the time set forth in Document 00700 (General Conditions), submit a detailed breakdown of Contractor's Bid by scheduled Work items and/or activities, including coordination responsibilities and Project Record Documents responsibilities. Where more than one Subcontractor comprises the work of a Work item or activity, the Schedule of Values shall show a separate line item for each subcontract. Furnish such breakdown of the total Contract Sum by assigning dollar values (cost estimates) to each

applicable Progress Schedule network activity, which cumulative sum equals the total Contract Sum. The format and detail of the breakdown shall be as directed by Owner to facilitate and clarify future progress payments to Contractor for direct Work under Contract Documents. This breakdown shall be referred to as the Schedule of Values.

2. Contractor's overhead, profit, insurance, cost of bonds (except to the extent expressly identified in a Bid item) and/or other financing, as well as "general conditions costs," (e.g., Site cleanup and maintenance, temporary roads and access, off-Site access roads, temporary power and lighting, security, and the like), shall be prorated through all activities so that the sum of all the Schedule of Values line items equals Contractor's total Contract Sum, less any allowances designated by Owner. Scheduling, record documents and quality assurance control shall be separate line items.
3. Owner will review the breakdown in conjunction with the Progress Schedule to ensure that the dollar amounts of this Schedule of Values are, in fact, fair market cost allocations for the Work items listed. Upon favorable review by Owner, Owner will accept this Schedule of Values for use. Owner shall be the sole judge of fair market cost allocations.
4. Owner will reject any attempt to increase the cost of early activities, i.e., "front loading," resulting in a complete reallocation of moneys until such "front loading" is corrected. Repeated attempts at "front loading" may result in suspension or termination of the Work for default, or refusal to process progress payments until such time as the Schedule of Values is acceptable to Owner.

D. Monthly Report Sheets and Applications for Payment: Contractor shall establish and maintain records of cost of the Work in accordance with generally accepted accounting practices; reconcile the amount of Work completed monthly with Owner, and sign Owner's monthly report sheet certifying to the Work done. Monthly report sheets shall be considered the true record of the Cost of the Work and Contractor shall submit in a form acceptable to Owner an itemized cost breakdown of Contractor's record of Cost of the Work together with supporting data and any certification required by Owner. In addition:

1. On or before the sooner of (a) the 20th Day of each month and (b) receipt of Owner's approval of the updated Schedule as required by Section 01320 (Progress Schedules and Reports), Owner and Contractor will reconcile any differences in the field, based on the reconciled monthly report sheets, and Contractor shall submit to Owner an Application for Payment for the cost of the Work put in place during the period from the 15th Day of the previous month to the 15th Day of the current month, along with the Owner-approved updated Schedule. Such Applications for Payment shall be for the total value of activities completed or partially completed, including approved activity costs, based upon Schedule of Values prices (or Bid item prices if unit price) of all labor and materials incorporated in the Work up until midnight of the last Day of that one month period, less the aggregate of previous payments. Accumulated retainage shall be shown as separate item in payment summary. If Contractor is late submitting its Application for Payment, that Application may be processed at any time during the succeeding one-month period, resulting in processing of Contractor's Application for Payment being delayed for more than a Day for Day basis.
2. Applications for Payment may include, but are not necessarily limited to the following:
   a. Material, equipment, and labor incorporated into the Work, less any previous payments for the same.
   b. Up to 75 percent of the cost of equipment identified in paragraph 1.5F of this Section 01200 (if any), if purchased and delivered to the Site or stored off Site, as may be approved by Owner.

c. Up to 50 percent of the cost of materials identified in paragraph 1.5F of this Section 01200 (if any), specifically fabricated for the Project that are not yet incorporated into the Work.

3. At the time any Application for Payment is submitted, certify in writing the accuracy of the Application and that Contractor has fulfilled all scheduling requirements of Document 00700 (General Conditions) and Section 01320 (Progress Schedules and Reports), including updates and revisions. A responsible officer of Contractor shall execute the certification.
4. No progress payment will be processed prior to Owner receiving all requested, acceptable schedule update information. Failure to submit a schedule update complying with Section 01320 justifies denying the entire Application for Payment, or in Owner's discretion withholding amounts as described in paragraph 1.7E.10 of this Section 01200.
5. Each Application for Payment shall list each Change Order and Construction Change Directive ("CCD") executed prior to date of submission, including the Change Order/CCD Number, and a description of the Work activities, consistent with the descriptions of original Work activities. Submit a monthly Change Order/CCD status log to Owner.
6. If Owner requires substantiating data, submit information requested by Owner, with cover letter identifying Project, Application for Payment number and date, and detailed list of enclosures.
7. If Contractor fails or refuses to participate in monthly Work reconciliations or other construction progress evaluation with Owner, Contractor shall not receive current payment until Contractor has participated fully in providing construction progress information and schedule update information to Owner.

E. Progress Payments

1. Owner will review Contractor's Application for Payment following receipt. If adjustments need to be made to percent of completion of each activity, Owner will make appropriate notations and return to Contractor. Contractor shall revise and resubmit. All parties shall update percentage of completion values in the same manner, i.e., express value of an accumulated percentage of completion to date.
2. Each Application for Payment may be reviewed by Owner and/or inspectors to determine whether the Application for Payment is proper, and shall be rejected, revised, or approved by Owner pursuant to the Schedule of Values prepared in accordance with paragraph 1.7C of this Section 01200.
3. If it is determined that the Application for Payment is not proper and suitable for payment, Owner will return it to the Contractor as soon as practicable, but no later than seven Days after receipt, together with a document setting forth in writing the reasons why the Application for Payment is not proper. If Owner determines that portions of the Application for Payment are not proper or not due under the Contract Documents, then Owner may approve the other portions of the Application for Payment, and in the case of disputed items or Defective Work not remedied, may withhold up to 150 percent of the disputed amount from the progress payment.
4. Pursuant to California Public Contract Code Section 20104.50, if Owner fails to make any progress payment within 30 Days after receipt of an undisputed and properly submitted Application for Payment from Contractor, Owner shall pay interest to the Contractor equivalent to the legal rates set forth in subdivision (a) of Section 685.010 of the Code of

Civil Procedure. The 30-Day period shall be reduced by the number of Days by which Owner exceeds the seven-Day return requirement set forth herein.

5. As soon as practicable after approval of each Application for Payment for progress payments, Owner will pay to Contractor in manner provided by law, an amount equal to 95 percent of the amounts otherwise due as provided in the Contract Documents, or a lesser amount if so provided in Contract Documents, provided that payments may at any time be withheld if, in judgment of Owner, Work is not proceeding in accordance with Contract, or Contractor is not complying with requirements of Contract, or to comply with stop notices or to offset liquidated damages accruing or expected.
6. Before any progress payment or final payment is due or made, Contractor shall submit satisfactory evidence that Contractor is not delinquent in payments to employees, Subcontractors, suppliers, or creditors for labor and materials incorporated into Work. This specifically includes, without limitation, conditional lien release forms for the current progress payment and unconditional release forms for past progress payments.
7. Owner reserves and shall have the right to withhold payment for any equipment and/or specifically fabricated materials that, in the sole judgment of Owner, are not adequately and properly protected against weather and/or damage prior to or following incorporation into the Work.
8. Granting of progress payment or payments by Owner, or receipt thereof by Contractor, shall not be understood as constituting in any sense acceptance of Work or of any portion thereof, and shall in no way lessen liability of Contractor to replace unsatisfactory Work or material, though unsatisfactory character of Work or material may have been apparent or detected at time payment was made.
9. When Owner shall charge sum of money against Contractor under any provision of Contract Documents, amount of charge shall be deducted and retained by Owner from amount of next succeeding progress payment or from any other moneys due or that may become due Contractor under Contract. If, on completion or termination of Contract, such moneys due Contractor are found insufficient to cover Owner's charges against it, Owner shall have right to recover balance from Contractor or Sureties.
10. If Contractor fails to submit an acceptable Progress Schedule update, or fails to bring an acceptable Project Record Drawings update to Progress Payment Meeting, Owner may retain 5% of each Progress Payment amount thereafter (in addition to any other retention) until Owner's acceptance of a Progress Schedule or Project Record Drawings update. This retention shall apply cumulatively.

1.8 FINAL PAYMENT

A. As soon as practicable after all required Work is completed in accordance with Contract Documents, including punchlist, testing, record documents and Contractor maintenance after Final Acceptance, Owner will pay to Contractor, in manner provided by law, unpaid balance of Contract Sum of Work (including without limitation retentions), or whole Contract Sum of Work if no progress payment has been made, determined in accordance with terms of Contract Documents, less sums as may be lawfully retained under any provisions of Contract Documents or by law.

B. Prior progress payments shall be subject to correction in the final payment. Owner's determination of amount due as final payment shall be final and conclusive evidence of amount of Work performed by Contractor under Contract Documents and shall be full measure of compensation to be received by Contractor.

C. Contractor and each assignee under an assignment in effect at time of final payment shall execute and deliver at time of final payment, and as a condition precedent to final payment, Document 00650 (Agreement and Release of Any and All Claims).

1.9 EFFECT OF PAYMENT

A. Payment will be made by Owner, based on Owner's observations at the Site and the data comprising the Application for Payment. Payment will not be a representation that Owner has:
   1. Made exhaustive or continuous on-Site inspections to check the quality or quantity of Work;
   2. Reviewed construction means, methods, techniques, sequences, or procedures;
   3. Reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by Owner to substantiate Contractor's right to payment; or
   4. Made examination to ascertain how or for what purpose Contractor has used money previously paid on account of the Contract Sum.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01250

MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Description of general procedural requirements for alterations, Modifications, and extras.

1.2 GENERAL

A. Any change in scope of Work or deviation from Contract Documents including, without limitation, extra Work, or alterations or additions to or deductions from the original Work, shall not invalidate the original Contract, and shall be performed under the terms of the Contract Documents.
B. Only Contractor or Owner may initiate changes in scope of Work or deviation from Contract Documents.
   1. Contractor may initiate changes by submitting RFIs, Notice of Differing Site Conditions, or Notice of Hazardous Waste or Materials Conditions.
      a. RFIs shall be submitted to seek clarification of or request changes in the Contract Documents.
      b. Notices of Differing Site Conditions shall be submitted in accordance with Document 00700 (General Conditions).
      c. Notices of Hazardous Waste or Materials Conditions shall be submitted in accordance with Document 00700 (General Conditions).
   2. Contractor shall be responsible for its costs to implement and administer RFIs throughout the Contract duration. Regardless of the number of RFIs submitted, Contractor shall not be entitled to additional compensation for administrative costs. Contractor shall be responsible for both Owner and its Engineer's administrative costs for answering RFIs where the answer could reasonably be found by reviewing the Contract Documents, as determined by Owner; at Owner's discretion, such costs may be deducted from progress payments or final payment.
   3. Owner may initiate changes by issuing a Supplemental Instruction, which may revise, add to or subtract from the Work.
   4. Owner may initiate changes in the Work or Contract Time by issuing RFPs to Contractor. Such RFPs will detail all proposed changes in the Work and request a quotation of changes in Contract Sum and Contract Time from Contractor.
   5. Owner may also, by Construction Change Directive ("CCD"), order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly. A CCD shall be used in the absence of total agreement on the terms of a Change Order and may, upon notice, consist of a Change Order executed by Owner only.

1.3 PROCEDURES

A. Cost Proposal and Procedures: Whenever Contractor is required in this Section 01250 to prepare a Cost Proposal, and whenever Contractor is entitled to submit a Cost Proposal and elects to do so, Contractor shall prepare and submit to Owner for consideration a Cost Proposal using the form attached to this Section 01250. All Cost Proposals must contain a

complete breakdown of costs of credits, deducts, and extras; and itemizing materials, labor, taxes, overhead and profit. All Subcontractor Work shall be so indicated. Individual entries on the Cost Proposal form shall be determined as provided in paragraphs 1.4 and 1.5 of this Section 01250. After receipt of a Cost Proposal with a detailed breakdown, Owner will act promptly thereon.

1. If Owner accepts a Cost Proposal, Owner will prepare Change Order for Owner and Contractor signatures.
2. If Cost Proposal is not acceptable to Owner because it does not agree with cost and/or time included in Cost Proposal, Owner will submit in a response what it believes to be a reasonable cost and/or adjustment, if any. Except as otherwise provided in this Section 01250, Contractor shall have seven Days in which to respond to Owner with a revised Cost Proposal.
3. When necessity to proceed with a change does not allow the Owner sufficient time to conduct a proper check of a Cost Proposal (or revised Cost Proposal), Owner may order Contractor to proceed on basis to be determined at earliest practical date. In this event, value of change, with corresponding equitable adjustment to Contract, shall not be more than increase or less than decrease proposed.

B. Request for Information (RFI): Whenever Contractor requires information regarding the Project or Contract Documents, or receives a request for information from a Subcontractor, Contractor may prepare and deliver an RFI to Owner, using the Contractor interface for Owner's project management software. Contractor must submit time critical RFIs at least 30 Days before scheduled start date of the affected Work activity. Contractor shall reference each RFI to an activity of Progress Schedule and shall note time criticality of the RFI, indicating time within which a response is required. Contractor's failure to reference RFI to an activity on the Progress Schedule and note time criticality on the RFI shall constitute Contractor's waiver of any claim for time delay or interruption to the Work resulting from any delay in responding to the RFI.

1. Owner will respond within 15 Days from receipt of RFI with a written response to Contractor. Contractor shall distribute response to all appropriate Subcontractors.
2. If Contractor is satisfied with the response and does not request change in Contract Sum or Contract Time, then the response shall be executed without a change.
3. If Contractor believes the response is incomplete, Contractor shall issue another RFI to Owner clarifying original RFI. Additionally, Owner may return RFI requesting additional information should original RFI be inadequate in describing condition.
4. If Contractor believes that the response results in change in Contract Sum or Contract Time, Contractor shall notify Owner in writing within 15 Days after receiving the response. If Owner disagrees with Contractor, then Contractor may give notice of intent to submit a Claim as described in Article 12 of Document 00700 (General Conditions), and submit its Claim within 30 Days. If Owner agrees with Contractor, then Contractor must submit a Cost Proposal within 21 Days of receiving the response to the RFI. Contractor's failure to deliver either the foregoing notice and Claim or Cost Proposal by the respective deadlines stated in the foregoing sentences shall result in waiver of the right to file a Cost Proposal or Claim.

C. Supplemental Instruction: Owner may issue Supplemental Instruction to Contractor.

1. If Contractor is satisfied with Supplemental Instruction and does not request change in Contract Sum or Contract Time, then Supplemental Instruction shall be executed without a Change Order.

2. If Contractor believes that Supplemental Instruction results in change in Contract Sum or Contract Time, then Contractor must submit a Cost Proposal to Owner within 21 Days of receiving the Supplemental Instruction.

D. Construction Change Directives: If at any time Owner believes in good faith that a timely Change Order will not be agreed upon using the foregoing procedures, Owner may issue a CCD with its estimated cost and/or time adjustment. Upon receipt of CCD, Contractor shall promptly proceed with the change of Work involved and concurrently respond to Owner's CCD within 10 Days.
   1. Contractor's response must be any one of following:
      a. Return CCD signed, thereby accepting Owner's response, time, and cost.
      b. Submit a (revised if applicable) Cost Proposal with supporting documentation (if applicable, reference original Cost Proposal number followed by letter A, B, etc. for each revision), if Owner so requests.
      c. Give notice of intent to submit a Claim as described in Article 12 of Document 00700 (General Conditions), and submit its Claim within 30 Days.
   2. If the CCD provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:
      a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
      b. Unit prices stated in the Contract Documents or subsequently agreed upon.
      c. Cost to be determined in a manner agreed.
   3. CCD signed by Contractor indicates the agreement of Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.
   4. If Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by Owner on the basis of reasonable expenditures and savings of those performing the Work attributable to the change including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. If the parties still do not agree on the price for a CCD, Contractor may file a Claim per Article 12 of Document 00700 (General Conditions). Contractor shall keep and present, in such form as Owner may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this paragraph shall be limited to those provided in paragraphs 1.4 and 1.5 of this Section 01250.
   5. Pending final determination of cost to Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by Contractor to Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by Owner. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

E. Owner Requested RFP: Contractor shall furnish a Cost Proposal within 21 Business Days of Owner's RFP. Upon approval of Cost Proposal, Owner will issue a Change Order directing Contractor to proceed with extra Work. If the parties do not agree on the price, Owner may either issue a CCD or decide the issue per Article 12 of Document 00700 (General Conditions). Contractor shall perform the changed Work notwithstanding any claims or disagreements of any nature.

F. Differing Site Conditions: Contractor shall submit Notices of Differing Site Conditions to resolve problems regarding differing underground Site conditions encountered in the

execution of the Work pursuant to paragraph 13.4 of Document 00700 (General Conditions), which shall govern. If Owner determines that a change in Contract Sum or Contract Time is justified, Owner will issue RFP or CCD.

G. Hazardous Waste Conditions: Contractor shall submit Notices of Hazardous Waste or Materials Conditions to resolve problems regarding hazardous materials encountered in the execution of the Work pursuant to paragraph 13.5 of Document 00700 (General Conditions), which shall govern. If Owner determines that a change in Contract Sum or Contract Time is justified, Owner will issue RFP or CCD.

H. All Changes:
   1. Documentation of Change in Contract Sum and Contract Time:
      a. Contractor shall maintain detailed records of Work performed on a time-and-material basis.
      b. Contractor shall document each proposal for a change in cost or time with sufficient data to allow evaluation of the proposal.
      c. Contractor shall, on request, provide additional data to support computations for:
         1) Quantities of products, materials, labor, and equipment.
         2) Taxes.
         3) Justification for any change in Contract Time and new Progress Schedule showing revision due, if any.
         4) Credit for deletions from Contract, similarly documented.
      d. Contractor shall support each claim for additional costs, and for Work performed on a cost-and-percentage basis, with additional information including:
         1) Credit for deletions from Contract, similarly documented.
         2) Origin and date of claim.
         3) Dates and times Work was performed and by whom.
         4) Time records and wage rates paid.
         5) Invoices and receipts for products, materials, equipment, and subcontracts, similarly documented.

I. Correlation of Other Items:
   1. Contractor shall revise Schedule of Values and Application for Payment forms to record each authorized Change Order or CCD as a separate line item and adjust the Contract Sum as shown thereon prior to the next monthly pay period.
   2. Contractor shall revise the Progress Schedules prior to the next monthly pay period.
   3. Contractor shall enter changes in Project Record Documents prior to the next monthly pay period.

J. Responses: For all responses for which the Contract Documents, including without limitation this Section 01250, do not provide a specific time period, recipients shall respond within a reasonable time.

1.4 COST DETERMINATION

A. Total cost of extra Work or of Work omitted shall be the sum of labor costs, material costs, equipment rental costs, and specialist costs as defined herein plus overhead and profit as allowed herein. This limit applies in all cases of claims for extra Work, whether calculating Cost Proposals, Change Orders or CCDs, or calculating claims of all types, and applies even in the event of fault, negligence, strict liability, or tort claims of all kinds, including strict liability or negligence. Contractor may recover no other costs arising out of or connected with the performance of extra Work, of any nature. No special, incidental or consequential damages may be claimed or recovered against Owner, its representatives or agents, whether

arising from breach of Contract, negligence, or strict liability, unless specifically authorized in the Contract Documents.

B. Markup for Overhead and Profit: (Overhead shall be as defined in paragraph 1.8 of this Section 01250)
   1. Markup for overhead and profit on labor for extra Work shall not exceed 15 percent.
   2. Markup for overhead and profit on materials for extra Work shall not exceed 15 percent.
   3. Markup for overhead and profit on owner-operated equipment for extra Work shall not exceed 15 percent.
   4. Markup for overhead and profit on equipment for extra Work shall not exceed 10 percent.
   5. When extra Work is performed by a first tier Subcontractor, Contractor shall receive a 5 percent markup on Subcontractors' total costs of extra Work. First tier Subcontractor's markup on its Work shall not exceed percentages listed in paragraphs 1.4B.1, 1.4B.2, 1.4B.3, and 1.4B.4 immediately above.
   6. When extra Work is performed by a lower tier Subcontractor, Contractor, first tier Subcontractors, and lower tier Subcontractors shall divide (as mutually agreed) a total of 5 percent markup on the lower tier Subcontractors' total costs of extra Work.
   7. Notwithstanding the foregoing, in no case shall the total markup on any extra Work exceed 20 percent of the direct cost, notwithstanding the actual number of Contract tiers.
   8. On proposals covering both increases and decreases in Contract Sum, markup for overhead and profit shall be included on the net amount as determined in this paragraph 1.4.
   9. The markup shall include profit, small tools, cleanup, engineering, supervision, warranties, cost of preparing the cost proposal, jobsite overhead, and home office overhead.

C. Taxes:
   1. All State sales tax, use tax, and Sonoma County and applicable City sales taxes shall be included.
   2. Federal and Excise tax shall not be included.

D. Owner-Operated Equipment: When owner-operated equipment is used to perform extra Work, Contractor will be paid as follows:
   1. Payment for cost of equipment will be made at no more than rates of such equipment established in paragraph 1.5C of this Section 01250.
   2. Payment for cost of labor will be made at no more than rates of such labor established by collective bargaining agreements for type of worker and location of Work, whether or not owner-operator is actually covered by such an agreement.
   3. Invoices for owner-operated equipment need not itemize labor and equipment costs, unless specifically requested by Owner. In any event, the total rate for owner-operated equipment shall not exceed the combined rates for labor and equipment listed in paragraphs 1.4D.1 and 1.4D.2 above.

E. Accord and Satisfaction: Every Change Order and accepted CCD shall constitute a full accord and satisfaction, and release, of all Contractor (and if applicable, Subcontractor) claims for additional time, money or other relief arising from or relating to the subject matter of the change including, without limitation, impacts of all types, cumulative impacts, inefficiency, overtime, delay, and any other type of claim. Contractor may elect to reserve its rights to disputed claims arising from or relating to the changed Work at the time it signs a Change Order or accepts a CCD, but must do so expressly in a writing delivered concurrently with the executed Change Order or approved CCD, and must also submit a

Claim for the reserved disputed items pursuant to Article 12 of Document 00700 (General Conditions) no later than 30 Days of Contractor's first written notice of its intent to reserve rights.

1.5 COST BREAKDOWN

A. Labor: Contractor will be paid cost of labor for workers (including forepersons when authorized by Owner) used in actual and direct performance of extra Work. Labor rate, whether employer is Contractor, Subcontractor or other forces, will be sum of following:
   1. Actual Wages: Actual wages paid shall include any employer payments to or on behalf of workers for health and welfare, pension, vacation, and similar purposes.
   2. Labor surcharge: Payments imposed by local, county, state, and federal laws and ordinances, and other payments made to, or on behalf of, workers, other than actual wages as defined in paragraph 1.5A.1 of this Section 01250, such as taxes and insurance. Labor surcharge shall be and shall not exceed that set forth in Caltrans official labor surcharges schedule which is in effect on date upon which extra Work is accomplished and which schedule is incorporated herein by reference as though fully set forth herein.

B. Material: Only materials furnished by Contractor and necessarily used in performance of extra Work will be paid for. Cost of such materials will be cost, including sales tax, to purchaser (Contractor, Subcontractor or other forces) from supplier thereof, except as the following are applicable:
   1. If cash or trade discount by actual supplier is offered or available to purchaser, it shall be credited to Owner notwithstanding fact that such discount may not have been taken.
   2. For materials salvaged upon completion of extra Work, salvage value of materials shall be deducted from cost, less discounts, of materials.
   3. If cost of a material is, in opinion of Owner, excessive, then cost of material shall be deemed to be lowest current wholesale price at which material is available in quantities concerned delivered to Site, less any discounts as provided in paragraph 1.5B.1 of this Section 01250.

C. Equipment: For Contractor- or Subcontractor-owned equipment, payment will be made at rental rates listed for equipment in Caltrans official equipment rental rate schedule which is in effect on date upon which extra Work is accomplished and which schedule is incorporated herein by reference as though fully set forth herein. If there is no applicable rate for an item of equipment, then payment shall be made for Contractor- or Subcontractor-owned equipment at rental rate listed in the most recent edition of the Association of Equipment Distributors (AED) book. For rented equipment, payment will be made based on actual rental invoices. Equipment used on extra Work shall be of proper size and type. If, however, equipment of unwarranted size or type and cost is used, cost of use of equipment shall be calculated at rental rate for equipment of proper size and type, as determined by Owner. Rates paid shall be deemed to cover cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals. Unless otherwise specified, manufacturer's ratings, and manufacturer-approved modifications, shall be used to classify equipment for determination of applicable rates. Individual pieces of equipment or tools not listed in said publication and having a replacement value of $100 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefor as payment is included in payment for labor. Payment will not be made for time in which equipment is inoperative due to breakdowns.

1. For Contractor or Subcontractor –owned equipment on Site, payment for equipment use will be for time equipment is in operation on extra Work being performed or on standby as approved by Owner.
2. For rented equipment on Site, the following shall be used in computing rental time of equipment:
   a. When hourly rates are listed, less than 30 minutes of operation shall be considered to be ½ hour of operation.
   b. When daily rates are listed, less than four hours of operation shall be considered to be ½ Day of operation.
3. For equipment that must be brought to Site to be used exclusively on extra Work, cost of transporting equipment to Site and its return to its original location shall be determined as follows:
   a. Owner will pay for costs of loading and unloading equipment.
   b. Cost of transporting equipment in low bed trailers shall not exceed hourly rates charged by established haulers.
   c. Cost of transporting equipment shall not exceed applicable minimum established rates of California Public Utilities Commission.
   d. Owner will not make any payment for transporting and loading and unloading equipment if equipment is used on Work in any other way than upon extra Work.
4. For rented equipment, rental period may begin at time equipment is unloaded at Site of extra Work and terminate at end of the performance of the extra Work or Day on which Owner directs Contractor to discontinue use of equipment, whichever first occurs. Excluding Saturdays, Sundays, and Owner's legal holidays, unless equipment is used to perform extra Work on such Days, rental time to be paid per Day shall be four hours for zero hours of operation, six hours for four hours of operation and eight hours for eight hours of operation, time being prorated between these parameters. Hours to be paid for equipment that is operated less than eight hours due to breakdowns, shall not exceed eight less number of hours equipment is inoperative due to breakdowns.

D. Work Performed by Special Forces or Other Special Services: When Owner and Contractor, by agreement, determine that special service or item of extra Work cannot be performed by forces of Contractor or those of any Subcontractors, service or extra Work item may be performed by specialist. Invoices for service or item of extra Work on basis of current market price thereof may be accepted without complete itemization of labor, material, and equipment rental costs when it is impracticable and not in accordance with established practice of special service industry to provide complete itemization. In those instances wherein Contractor is required to perform extra Work necessitating a fabrication or machining process in a fabrication or machine shop facility away from Site, charges for that portion of extra Work performed in such facility may, by agreement, be accepted as a specialist billing. Owner must be notified in advance of all off-Site Work. In lieu of overhead and profit provided in paragraph 1.4B of this Section 01250, 15 percent will be added to specialist invoice price, after deduction of any cash or trade discount offered or available, whether or not such discount may have been taken.

1.6 FORCE-ACCOUNT WORK

A. If it is impracticable because of nature of Work, or for any other reason, to fix an increase or decrease in price definitely in advance, the Contractor may be directed to proceed at a not-to-exceed (NTE) maximum price which shall not under any circumstances be exceeded. Subject to such limitation, such extra Work shall be paid for at actual necessary cost for

Force-Account Work or at the negotiated cost, as determined by Owner. The cost for Force-Account Work shall be determined pursuant to paragraphs 1.4 and 1.5 of this Section 01250.

B. Force-Account Work shall be used when it is not possible or practical to price out the changed Work prior to the start of that Work. In these cases, Force-Account Work will be utilized during the pricing and negotiation phase of the change. Once negotiations have been concluded and a bilateral agreement has been reached, the tracking of the Work under Force-Account is no longer necessary. Force-Account Work shall also be used when negotiations between Owner and Contractor have broken apart and a bilateral agreement on the value of the changed Work cannot be reached. Owner may approve other uses of Force-Account Work.

C. Whenever any Force-Account Work is in progress, definite price for which has not been agreed on in advance, Contractor shall report to Owner each Business Day in writing in detail amount and cost of labor and material used, and any other expense incurred in Force-Account Work on preceding Day, by using the Cost Proposal form attached hereto. No claim for compensation for Force-Account Work will be allowed unless report shall have been made.

D. Whenever Force-Account Work is in progress, definite price for which has not been agreed on in advance, Contractor shall report to Owner when 75 percent of the NTE amount has been expended.

E. Force-Account Work shall be paid as extra Work under this Section 01250. Methods of determining payment for Work and materials provided in this paragraph 1.6 shall not apply to performance of Work or furnishings of material that, in judgment of Owner, may properly be classified under items for which prices are otherwise established in Contract Documents.

1.7 OWNER-FURNISHED MATERIALS

A. Owner reserves right to furnish materials as it deems advisable, and Contractor shall have no claims for costs and overhead and profit on such materials.

1.8 OVERHEAD DEFINED FOR MODIFICATIONS

A. The following constitutes charges that are deemed included in overhead for all Contract Modifications, including Force-Account Work or CCD Work, whether incurred by Contractor, Subcontractors, or suppliers, and Contractor shall not invoice or receive payment for these costs separately:

1. Drawings: field drawings, Shop Drawings, as-builts, etc., including submissions of drawings
2. Routine field inspection of Work proposed
3. General superintendence
4. General administration and preparation of cost proposals, schedule analysis, Change Orders, and other supporting documentation as necessary
5. Computer services
6. Reproduction services
7. Salaries of project engineer, superintendent, timekeeper, storekeeper, and secretaries
8. Janitorial services
9. Temporary on-Site facilities:
   a. Offices
   b. Telephones
   c. Plumbing
   d. Electrical: Power, lighting

e. Platforms
f. Fencing, etc.
g. Water
h. Sanitation

10. Home office expenses
11. Insurance and Bond premiums
12. Procurement and use of vehicles and fuel used coincidentally in Work otherwise included in the Contract Documents
13. Surveying
14. Estimating
15. Protection of Work
16. Handling and disposal fees
17. Permit fees
18. Final cleanup
19. Other incidental Work

1.9 RECORDS AND CERTIFICATION

A. Force-Account (cost reimbursement) charges shall be recorded daily and summarized in Cost Proposal form attached hereto. Contractor or authorized representative shall complete and sign form each Day. Contractor shall also provide with the form: the names and classifications of workers and hours worked by each; an itemization of all materials used; a list by size, type, and identification number of equipment and hours operated; and an indication of all Work performed by specialists.

B. No payment for Force-Account Work shall be made until Contractor submits original invoices substantiating materials and specialists charges.

C. Owner shall have the right to audit all records in possession of Contractor relating to activities covered by Contractor's claims for Modification of Contract, including Force-Account Work and CCD Work.

D. Further, Owner will have right to audit, inspect, or copy all records maintained in connection with this Contract, including financial records and Escrow Bid Documents, in possession of Contractor relating to any transaction or activity occurring or arising out of, or by virtue of, the Contract. If Contractor is a joint venture, right of Owner shall apply collaterally to same extent to records of joint venture sponsor, and of each individual joint venture member. This right shall be specifically enforceable, and any failure of Contractor to voluntarily comply shall be deemed an irrevocable waiver and release of all claims then pending that were or could have been subject to the Article 12 of Document 00700 (General Conditions).

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

COST PROPOSAL FORM FOLLOWS ON NEXT PAGE

COST PROPOSAL (CP)

Russian River County Sanitation District Treatment Plant Biological Nutrient Removal
Contract Number 70-713-7 #1A

CP Number: _____
Date: _____
In Response To _____
RFP #, etc.

To: **Russian River County Sanitation District**
Attention: Contract Administration/Inspection
c/o Sonoma County Water Agency
404 Aviation Boulevard, Santa Rosa, CA 95403-9019

Subject Ref. No: _____
(for Project Manager use only)
Phone: (707) 547-1913
Fax: (707) 524-3791

From: [Insert Contractor's Name/Address]
_____
_____

This Cost Proposal is in response to the above-referenced _____ [insert RFP, etc. as applicable].
Brief description of change(s): _____
_____

ITEM DESCRIPTION	PRIME CONTR.	SUB 1	SUB 2	SUB 3	SUB 4	TOTAL
MATERIAL						
DIRECT LABOR COST						
EQUIPMENT						
Other (Specify)						
Total Cost						
Subcontractor's Markup for Overhead and Profit 15 percent						
Contractor's Markup for Overhead and Profit 15 percent (Labor and Materials)						
Contractor's Markup for Overhead and Profit 10 percent (Equipment Rental)						
Markup for Overhead and Profit to Contractor for Subcontractor's Work 5 percent						
GRAND TOTAL						
(percent of Total Cost above not including any Markup for Overhead and Profit) [Grand Total divided by Total Cost]						
REQUESTED CHANGE IN CONTRACT TIME (DAYS)						

By Contractor: _____ Signature: _____ Date: _____

SECTION 01315

PROJECT MEETINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Descriptions of the required Project meetings for the Work. These meetings include:
      a. Post-Notice of Award Meeting
      b. Schedule Review Meetings
      c. Preconstruction Conference
      d. Monthly Progress Meetings
      e. Progress Payment Meetings
      f. Optional Submittal Review Meeting
      g. Special Meetings
      h. Safety Meetings

1.2 POST-NOTICE OF AWARD MEETING

A. Owner will call for and administer a Post-Notice of Award Meeting at time and place to be announced.
B. Contractor's general superintendent, Contractor's foreman, preparer of Safety Program, preparer of SWPPP, if applicable, and all major Subcontractors shall attend this meeting.
C. Agenda will include, but not be limited to, discussion of requirements for the following items:
   1. Insurance
   2. Bonds
   3. Notice to Proceed
   4. Commencement of Contract Time
   5. Start of Work at Site
   6. Contractor's Initial and Original Schedule
   7. Contractor's Schedule of Values
   8. Contractor's Schedule of Submittals
   9. Submittal and RFI procedures
   10. Safety Program
   11. SWPPP, if applicable
   12. Permits
   13. Name of Owner's Representative
   14. Other items as appropriate
D. Owner will distribute minutes of Post-Notice of Award Meeting to attendees. Attendees shall have 5 Days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of Post-Notice of Award Meeting.

1.3 SCHEDULE REVIEW MEETINGS

A. Within 30 Days of issuance of Notice to Proceed, meet with Owner and conduct initial review of Contractor's draft Schedule of Submittals, draft Schedule of Values, and Initial Schedule.

B. Authorized representative in Contractor's organization, designated in writing, who will be responsible for working and coordinating with Owner relative to preparation and maintenance of Progress Schedule shall attend the initial schedule review meeting.
C. Contractor shall, within 30 Days from the commencement of Contract Time and prior to commencement of Work at the Site, meet with Owner to review the Original Progress Schedule and construction schedule submittals.
   1. Contractor shall have its manager, superintendent, scheduler, and key Subcontractor representatives, as required by Owner, in attendance. The meeting will take place over a continuous one-Day period.
   2. Owner's review will be limited to submittals' conformance to Contract Documents requirements including, but not limited to, coordination requirements. Owner's review may also include:
      a. Clarifications of Contract Requirements
      b. Directions to include activities and information missing from submittals
      c. Requests to Contractor to clarify its schedule
   3. Within 5 Days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by Owner at the meeting.
D. Owner will administer Schedule Review Meetings and shall distribute minutes of Schedule Review Meetings to attendees. Attendees shall have 5 Days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of Schedule Review Meetings.

1.4 PRECONSTRUCTION CONFERENCE

A. Owner will call for and administer Preconstruction Conference at time and place to be announced.
B. Contractor, all major Subcontractors, and major suppliers shall attend Preconstruction Conference.
C. Agenda will include, but not be limited to, the following items.
   1. Revised/updated schedules
   2. Personnel and vehicle permit procedures
   3. Use of premises
   4. Location of the Contractor's on-Site facilities
   5. Security
   6. Housekeeping
   7. Inspection and testing procedures, on-Site and off-Site
   8. Utility shutdown procedures
   9. Control and reference point survey procedures
   10. Safety Program
   11. Jurisdictional agency requirements
   12. Other items as appropriate
D. Owner will distribute copies of minutes to attendees. Attendees shall have 7 Days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of Preconstruction Conference.

1.5 MONTHLY PROGRESS MEETINGS

A. Owner will schedule and administer monthly progress meetings throughout duration of Work. Progress meetings will be held monthly on approximately the 20th of each month.
   1. Meetings shall be held at Contractor's on-Site office unless otherwise directed by Owner.

2. An Owner Representative will prepare agenda and distribute it at the meeting to Contractor.
3. Contractor's general superintendent shall attend these meetings.
4. Owner will record. Approximately 7 Days after meeting, Owner will distribute minutes to Contractor, who will distribute to those affected by decisions made at meeting. Attendees can either submit comments or additions to minutes prior to the next progress meeting, or may attend the next progress meeting and submit comments or additions there. Minutes will constitute final memorialization of results of meeting.

B. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. Contractor's job superintendent, major Subcontractors and suppliers, Owner, and others as appropriate shall attend progress meetings.

C. Agenda will contain the following items, as appropriate:
1. Review, revise as necessary, and approve previous meeting minutes
2. Review of Work progress since last meeting, including percent complete of each activity
3. Review of the schedule update submittal
   a. Time impact evaluations for Change Orders and Time Extension Request
   b. Actual and anticipated activity sequence changes
   c. Actual and anticipated duration changes
   d. Actual and anticipated Contractor delays
4. Review the Application for Payment
5. Status of Construction Work Schedule, delivery schedules, adjustments
6. Submittal, RFI, and Change Order status
7. Review of the Contractor's safety program activities and results, including report on all serious injury and/or damage accidents
8. Other items affecting progress of Work

1.6 PROGRESS PAYMENT MEETINGS

A. Prior to official application for Payment submission, a meeting will be held on approximately the 20th of each month to review the Application for Payment.
1. At this meeting, the following items will be reviewed:
   a. Percent complete of each activity
   b. Project Schedule
   c. Hard-copy updates of the Project Record Drawings (Field Set)
2. Contractor's general superintendent shall attend these meetings.

1.7 OPTIONAL SUBMITTAL REVIEW MEETING

A. At Owner or Contractor's request, in order to facilitate the timeliness of the review process, Owner may schedule a meeting to review the materials submitted.
1. Request a meeting date with Owner at least 10 Business Days in advance.
2. Provide complete package of Submittals at least 10 Business Days in advance of the meeting.
3. The meeting shall take place at Owner's office. Owner will provide the authorized staff to review Submittals during the meeting.
4. Make available for this meeting the job superintendent and/or foreman, Contractor's safety officer, protective coating manufacturer's representative (if applicable), and someone knowledgeable of all Submittals and authorized to make substitutions or changes.

1.8 SPECIAL MEETINGS

A. Owner or Contractor may call special meetings by notifying all desired participants and Owner 5 Days in advance, giving reason for meeting. Special meetings may be held without advance notice in emergency situations.
B. At any time during the progress of Work, Owner shall have authority to require Contractor to attend meeting of any or all of the Subcontractors engaged in Work or in other work, and notice of such meeting shall be duly observed and complied with by Contractor.
C. Contractor shall schedule and conduct coordination meetings as necessary to discharge coordination responsibilities in Document 00700 (General Conditions). Contractor shall give Owner 5 Days written notice of coordination meetings. Contractor shall maintain minutes of coordination meetings. Attendees shall have 7 Days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of coordination meetings.

1.9 SAFETY MEETINGS

A. Conduct monthly Contractor Safety Committee meetings.
B. Conduct weekly toolbox safety talks.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01320

PROGRESS SCHEDULES AND REPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Perform scheduling of Work under this Contract in accordance with requirements of this Section 01320.
   1. Development of schedule, cost, and resource loading of the Progress Schedule, monthly payment requests, and Project status reporting requirements of the Contract Documents shall employ scheduling as required in this Section 01320.
   2. The Schedule shall be cost-loaded based on Schedule of Values as approved by Owner.
   3. Submit schedules and reports as specified in Document 00700 (General Conditions).

B. Upon Award of Contract, immediately commence development of Initial Schedule to ensure compliance with schedule submittal requirements.

C. Contractor's obligations under this Section 01320 are hereby deemed material obligations justifying Owner's remedies for default if Contractor fails to perform. Nothing in this paragraph 1.1.C of this Document 01320 or the lack of an express statement that any other Contract Documents provision is or is not material shall be considered in determining whether any such other provision is material.

D. Employ competent scheduling personnel or a schedule consultant with experience performing scheduling required herein on two prior, similar projects.

1.2 GENERAL

A. Progress Schedule shall be based on and incorporate Milestone and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each Milestone shown on Progress Schedule shall adhere to times in Document 00520 (Agreement), unless an earlier (advanced) time of completion is requested by Contractor and agreed to by Owner. A Change Order shall formalize any such agreement.
   1. Owner is not required to accept an earlier (advanced) schedule, i.e., one that shows early completion date(s) for the Contract Time.
   2. Contractor is not entitled to extra compensation in event agreement is reached on an earlier (advanced) schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in earlier (advanced) schedule but within the Contract Time.
   3. A schedule showing the Work completed in less than the Contract Time, which has been accepted by Owner, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the Work and Contract Substantial Completion. Project Float is a resource available to both Owner and Contractor.
   4. Project Float Ownership: Neither Owner nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of any Substantial Completion date rests with the party whose actions, last in time, actually cause delay to a Substantial Completion date.
      a. For example, in the event of unexcused delay by Party A and Party B, and if Party A uses some, but not all of the Project Float and Party B later uses remainder of the

Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Substantial Completion date.

b. Under this scenario, Party A would not be responsible for the time since it did not consume all of the Project Float and additional Project Float remained; therefore, the Substantial Completion Date was unaffected.

C. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.

D. Failure of Progress Schedule to include any element of the Work or any inaccuracy in Progress Schedule will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. Owner's acceptance of Schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests, and shall not, in any manner, impose a duty of care upon Owner, or act to relieve Contractor of its responsibility for means and methods of construction.

E. Transmit each item using form approved by Owner or following Section 01330 (Submittal Procedures).

1. Identify Project with the Owner Contract number, and name of Contractor.
2. Provide space for Contractor's approval stamp and Owner's review stamps.
3. Submittals received from sources other than Contractor will be returned to Contractor without Owner's review.

1.3 INITIAL AND ORIGINAL PROGRESS SCHEDULE

A. Initial Schedule submitted within 21 Days after issuance of Notice to Proceed for review at the initial Schedule Review Meeting shall serve as Contractor's schedule for up to 30 Days after the commencement of Contract Time.

1. Initial Schedule must indicate detailed plan for the Work to be completed in first 30 Days after commencement of Contract Time of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; and procurement of materials and equipment. Show Work beyond 30 Days in summary form.

B. Contractor shall submit its Original Schedule for review no later than first Application for Payment and prior to commencement of Work at the Site. Original Schedule and all updates shall comply with all standards herein.

C. All Schedules shall be time-scaled.

D. Except as otherwise expressly provided in this Section 01320, meet with Owner to review and discuss each Schedule (i.e., Initial, Original and updates) within seven Days after each Schedule has been submitted to Owner.

1. Owner's review and comment on any Schedule shall be limited to Contract conformance (with sequencing, coordination, and Milestone requirements).
2. Contractor shall make corrections to Schedule necessary to comply with Contract requirements and shall adjust Schedule to incorporate any missing information requested by Owner. Resubmit Initial Schedule if requested by Owner.

E. If Contractor is of the opinion that any of the Work included on its Schedule has been impacted, submit to Owner a written TIE in accordance with paragraph 1.8 of this Section 01320. The TIE shall be based on the most current update of the Schedule.

1.4 SCHEDULE FORMAT AND LEVEL OF DETAIL

A. Each Schedule (Initial, Original, and updates) shall indicate all separate submittals, fabrication, procurement and field construction activities required for completion of the Work, including but not limited to the following:

1. All Contractor, Subcontractor, and assigned Contractor Work shall be shown in a logical Work sequence that demonstrates a coordinated plan of Work for all contractors. The intent is to provide a common basis of acceptance, understanding, and communication, as well as interface with other contractors.
2. Incorporate Schedule of Submittals into each Schedule.
3. Activities related to the delivery of Contractor- and Owner-furnished equipment to be Contractor-installed per Contract shall be shown.
4. All activities shall be identified through codes or other identification to indicate the building (i.e. buildings, Site Work) and Contractor/Subcontractor responsibility to which they pertain.
5. Break up the Work schedule into activities of durations of approximately 21 Days or less each, except for non-field construction activities or as otherwise deemed acceptable by Owner.
6. Show the critical path in red. For each activity, show early start, late start, early finish, late finish, durations measured in Days, Project Float, resources, predecessor and successor activities, planned workday/week for the activity, manpower loading, and scheduled/actual progress payments.

B. Seasonal weather conditions (which do not constitute a delay as defined herein) shall be considered in the planning and scheduling of all Work influenced by high or low ambient temperatures or presence of high moisture for the completion of the Work within the allotted Contract Time.

C. Failure by Contractor to include any element of Work required for performance of the Work on the detailed construction schedule shall not excuse Contractor from completing all Work required within the Contract Time.

D. A two-week "look ahead," detailed daily bar chart schedule shall be updated and issued weekly.

E. Prepare schedule using Microsoft® Office Project 2007 software for all scheduling, including schedule updates.

1.5 MONTHLY SCHEDULE UPDATE SUBMITTALS

A. Following acceptance of Contractor's Initial Schedule, monitor progress of Work and adjust Schedule each month to reflect actual progress and any anticipated changes to planned activities.
   1. Each Schedule update submitted shall be complete, including all information requested for the Initial Schedule and Original Schedule submittal.
   2. Each update shall continue to show all Work activities including those already completed. Completed activities (shown in blue) shall accurately reflect "as built" information by indicating when activities were actually started and completed, and Contractor warrants the accuracy of as-built information as shown.

B. A meeting will be held in accordance with Section 01315 (Project Meetings) to review the Schedule update submittal. Submit Schedule updates monthly, 7 Days prior to the Monthly Progress Meeting.

C. Within five Days after monthly Schedule update meeting, submit the updated Schedule.

D. Within five Days of receipt of above-noted revised submittals, Owner will either accept or reject monthly schedule update submittal.
   1. If accepted, percent complete shown in monthly update will be basis for Application for Payment by Contractor. The schedule update shall be submitted as part of Contractor's Application for Payment.

2. If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.

E. Updating, changing or revising of any report, curve, schedule or narrative submitted to Owner by Contractor under this Contract, nor Owner's review or acceptance of any such report, curve, schedule or narrative shall not have the effect of amending or modifying, in any way, the Contract Substantial Completion date or Milestone dates or of modifying or limiting, in any way, Contractor's obligations under this Contract.

1.6 SCHEDULE REVISIONS

A. Updating the Schedule (Initial and Original) to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, however, revisions to activity durations and sequences are expected on a monthly basis.

B. To reflect revisions to the Schedule, provide Owner with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of Work, provide a schedule diagram that compares the original sequence to the revised sequence of Work. Provide the written narrative and schedule diagram for revisions three Days in advance of the monthly schedule update meeting. Clearly show and discuss any changes in the critical path.

C. Schedule revisions shall not be incorporated into any schedule update until Owner has reviewed the revisions. Owner may request further information and justification for schedule revisions and, within three Days, provide Owner with a complete written narrative response to Owner's request.

D. If Owner does not accept Contractor's revision, and Contractor disagrees with Owner's position, Contractor has seven Days from receipt of Owner's letter rejecting the revision, to provide a written narrative providing full justification and explanation for the revision. Contractor's failure to respond in writing within seven Days of Owner's written rejection of a schedule revision shall be contractually interpreted as acceptance of Owner's position, and Contractor waives its rights to subsequently dispute or file a claim regarding Owner's position. If Contractor files a timely response as provided in this paragraph, and the parties are still unable to agree, Contractor's sole right shall be to file a claim as provided in Document 00700 (General Conditions), Article 12.

E. At Owner's discretion, Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.7 RECOVERY SCHEDULE

A. If a Schedule update shows a Substantial Completion date 21 Days beyond any Contract Substantial Completion date, or individual Milestone completion dates, submit to Owner within seven Days the proposed revisions to recover the lost time. As part of this submittal, provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, provide a schedule diagram comparing the original sequence to the revised sequence of Work. If Owner reasonably requests, show the intended critical path; secure appropriate Subcontractor and supplier consent to the recovery Schedule; submit a narrative explaining trade flow and construction flow changes, duration changes, added/deleted activities, critical path changes and identify all near critical paths and man-hour loading assumptions for major Subcontractors.

B. The revisions shall not be incorporated into any Schedule update until Owner has reviewed the revisions.

C. If Owner does not accept Contractor's revisions, Owner and Contractor shall follow the procedures in paragraphs 1.6C, 1.6D, and 1.6E of this Section 01320.

D. At Owner's discretion, Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

1.8 TIME IMPACT EVALUATION (TIE) FOR CHANGE ORDERS AND OTHER DELAYS

A. When Contractor is directed to proceed with changed Work, prepare and submit, within 14 Days from the direction to proceed, a TIE that includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how Contractor proposes to incorporate the changed Work in the schedule, and how it impacts the current Schedule update critical path or otherwise. Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram shall be tied to the main sequence of scheduled activities to enable Owner to evaluate the impact of changed Work to the scheduled critical path.
B. Comply with the requirements of paragraph 1.8A of this Section 01320 for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.
C. Contractor is responsible for all costs associated with the preparation of TIEs, and the process of incorporating TIEs into the current schedule update.
D. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Time may be extended in an amount Owner allows, and Contractor may submit a claim for additional time claimed by Contractor as provided in Document 00700 (General Conditions).

1.9 TIME EXTENSIONS

A. Contractor is responsible for requesting time extensions for time impacts that, in the opinion of Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accordance with Document 00700 (General Conditions).
B. Where an event for which Owner is responsible impacts the projected Substantial Completion date, provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. Also include a detailed cost breakdown of the labor, equipment, and material Contractor would expend to mitigate Owner-caused time impact. Submit mitigation plan to Owner within 14 Days from the date of discovery of said impact. Contractor is responsible for the cost to prepare the mitigation plan.
C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.
D. No time will be granted under the Contract Documents for cumulative effect of changes.
E. Owner will not be obligated to consider any time extension request unless requirements of Contract Documents are complied with.
F. Failure of Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.
G. Notwithstanding any other provision of this Section 01320, if Contractor does not submit a TIE within the required 14 Days for any issue, Contractor hereby agrees that Contractor does not require a time extension for that issue.

1.10 PROJECT STATUS REPORTING

A. In addition to submittal requirements for scheduling identified in this Section 01320, provide a monthly Project status report (i.e., written narrative report) to be submitted in conjunction with each Schedule as specified herein. Status reporting shall be in form specified in this paragraph 1.10 below.

B. Prepare monthly written narrative reports of status of Project for submission to Owner. Written status reports shall include:
   1. Status of major Project components (percent complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
   2. Progress made on critical activities indicated on each Schedule, including inspections.
   3. Explanations for any lack of Work on critical path activities planned to be performed during last month.
   4. Explanations for any schedule changes, including changes to logic or to activity durations.
   5. List of critical activities scheduled to be performed during the next month.
   6. Status of major material and equipment procurement.
   7. Any delays encountered during reporting period.
   8. Description or list of any required permit reports prepared or submitted.
   9. Provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.
      a. Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in monthly and weekly printed reports.
      b. Explain all variances and mitigation measures.
   10. Contractor may include any other information pertinent to status of Project. Include additional status information requested by Owner at no additional cost.
   11. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Description of general requirements for Submittals for the Work, as applicable:
      a. Procedures
      b. Schedule of Submittals
      c. Construction Material Waste Management Plan
      d. Safety Program
      e. Progress Schedule
      f. Product Data
      g. Shop Drawings
      h. Samples
      i. Coordination Drawings (If Applicable)
      j. Quality Assurance/Control Submittals
         1) Design Data
         2) Test Reports
         3) Certificates
         4) Manufacturers' Instructions
         5) Work Plans
      k. Installation, Operation, and Maintenance Manual
      l. Project Record Documents
      m. Storm Water Pollution Prevention Program
      n. Delay of Submittals

1.2 PROCEDURES

A. Submit at Contractor's expense the Submittals required by the Contract Documents.
B. Submit Submittals to Owner in accordance with accepted Schedule of Submittals. If no such schedule is agreed upon, then all Submittals shall be submitted within 35 Days after receipt of Notice of Award from Owner.
C. Transmit each item with the appropriate Submittal transmittal form (included at the end of this Section 01330). Where manufacturer's standard drawings or data sheets are used, they shall be marked clearly to show those portions of the data that are applicable to this Project. Inapplicable portions shall be marked out. Organize Submittals by Specification Section. Submittals containing information about more than one Specification Section will be returned for resubmittal. Submittals shall include all information requested by each Specification Section. Incomplete Submittals will be returned not reviewed by Owner.
D. The data shown on the Submittals shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Owner the materials and equipment Contractor proposes to provide and to enable Owner to review the information for the limited purposes specified in this Section 01330. Submittals shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which it is intended and otherwise as Owner may require to enable Owner to review the Submittal.

E. At the time of each submission, give Owner specific written notice of all variations, if any, that the Submittal may have from the requirements of the Contract Documents, and the reasons therefore. This written notice shall be in a written communication attached to the Submittal transmittal form. In addition, cause a specific notation to be made on each Submittal submitted to Owner for review and approval of each such variation. If Owner accepts deviation, Owner will note its acceptance on the returned Submittal transmittal form and, if necessary, issue appropriate Contract Modification.

F. Submittal coordination and verification is the responsibility of Contractor; this responsibility shall not be delegated in whole or in part to Subcontractors or suppliers. Before submitting each Submittal, review and coordinate each Submittal with other Submittals and with the requirements of the Work and the Contract Documents, and determine and verify:
   1. All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
   2. All materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
   3. All information relative to Contractor's sole responsibility for means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto.

G. Contractor's submission to Owner of a Submittal shall constitute Contractor's representation that it has satisfied its obligations under the Contract Documents, and as set forth immediately above in this paragraph 1.2 of this Section 01330, with respect to Contractor's review and approval of that Submittal.

H. Designation of Work "by others," if shown in Submittals, shall mean that Work will be responsibility of Contractor rather than Subcontractor or supplier who has prepared Submittals.

I. After review by Owner of each Submittal, an electronic copy of each Submittal will be returned to Contractor with actions defined as follows:
   1. NO EXCEPTIONS TAKEN - Accepted subject to its compatibility with future Submittals and additional partial Submittals for portions of the Work not covered in this Submittal. Does not constitute approval or deletion of specified or required items not shown on the Submittal.
   2. MAKE CORRECTIONS NOTED (NO RESUBMISSIONS REQUIRED) - Same as item 1 above, except that minor corrections as noted shall be made by Contractor.
   3. REVISE AS NOTED AND RESUBMIT - Rejected because of major inconsistencies or errors that shall be resolved or corrected by Contractor prior to subsequent review by Owner.
   4. REJECTED - RESUBMIT - Submitted material does not conform to Drawings and/or Specifications in major respect, i.e.: wrong size, model, capacity, or material.

J. Make a complete and acceptable Submittal at least by second submission. Owner reserves the right to deduct monies from payments due Contractor to cover additional costs of review beyond the second submission per paragraph 1.2T. Illegible Submittals will be rejected and returned to Contractor for resubmission. Contractor shall be in breach of the Contract if Contractor's first resubmittal, following a Submittal which Owner determines falls within categories 3 or 4 above, does not fall within categories 1 or 2 above.

K. Favorable review will not constitute acceptance by Owner of any responsibility for the accuracy, coordination, or completeness of the Submittals. Accuracy, coordination, and

completeness of Submittals shall be sole responsibility of Contractor, including responsibility to back-check comments, corrections, and modifications from Owner's review before fabrication. Contractor, Subcontractors, or suppliers may prepare Submittals, but Contractor shall ascertain that Submittals meet requirements of Contract Documents, while conforming to structural space and access conditions at point of installation. Owner's review will be only to assess if the items covered by the Submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as indicated by the Contract Documents. Favorable review of Submittal, method of Work, or information regarding materials and equipment Contractor proposes to furnish shall not relieve Contractor of responsibility for errors therein and shall not be regarded as assumption of risks or liability by Owner, or any officer or employee thereof, and Contractor shall have no claim under Contract Documents on account of failure or partial failure or inefficiency or insufficiency of any plan or method of Work or material and equipment so accepted. Favorable review shall be considered to mean merely that Owner has no objection to Contractor using, upon Contractor's own full responsibility, plan or method of Work proposed, or furnishing materials and equipment proposed.

L. Unless otherwise specified, Owner's review will not extend to the means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

M. Submit complete initial Submittal for those items where required by individual Specification Sections. Complete Submittal shall contain sufficient data to demonstrate that items comply with Specifications, shall meet minimum requirements for submissions cited in Specification Sections, shall include motor data and seismic anchorage certifications, where required, and shall include necessary revisions required for equipment other than first named. If Contractor submits incomplete initial Submittal when complete Submittal is required, Submittal may be returned to Contractor without review.

N. Copy, conform, and distribute reviewed Submittals in sufficient numbers for Contractor's files, Subcontractors, and vendors.

O. After Owner's review of Submittal, revise as noted and resubmit as required. Identify changes made since previous Submittal.
   1. Begin no fabrication or Work that requires Submittals until return of Submittals not requiring resubmittal. Do not extrapolate from Submittals covering similar Work.
   2. Normally, Submittals will be processed and returned to Contractor within 30 Days of receipt.

P. Distribute reviewed Submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

Q. All Submittals shall be number-identified by Contractor, prior to submission to Owner, in accordance with Owner's numbering format. Owner will provide Contractor with sample numbering format.

R. Submission Requirements:
   1. Deliver Submittals to Owner at least 30 Days before dates reviewed Submittals will be needed.
   2. Initial Submittal of Installation, Operation, and Maintenance Manual shall be:
      a. 45 Days after the date Submittal(s) that pertain to the item are favorably reviewed; and
      b. Prior to start-up and testing of the applicable product or equipment.

3. The following table lists the number of initial Submittals required from Contractor for each type of submission and to whom Contractor shall distribute the information. Submittals requiring resubmission will require the same quantity and distribution as an initial Submittal.

Submittal	**Contractor Submittal**	
	# of Hard copies/ Prints/ Samples	Electronic copy
Items Go To →	Owner	Owner
Schedule of Submittals	1	✓
Construction Material Waste Management Plan	1	✓
Monthly Progress Reports for Construction Material Waste Management Plan	1	✓
Safety Program	1	✓
Fire Protection Plan	1	✓
Progress Schedule	1	✓
Product Data	1	✓
MSDSs	1	✓
Shop Drawings	1	✓
Drawings or any documents larger than 11″ x 17″	2	✓
Samples	4	-
Coordination Drawings	1	✓
Quality Assurance/Control Submittals:		
Design Data	1	✓
Test Reports	1	✓
Certificates	1	✓
Manufacturers' Instructions	1	✓
Work Plans	1	✓
Installation, Operation, and Maintenance Manuals (initial submittal)	1	✓
Installation, Operation, and Maintenance Manuals (final submittal)	4	✓
Major Products List	1	✓
Storm Water Pollution Prevention Program	1	✓
Other Documents	1	✓

4. Accompany each copy of the Submittal(s) with a Submittal transmittal form, containing:
   a. Date, revision date, and Submittal identification number.
   b. Project name and Owner's Contract number.
   c. Contractor's name, address, and job number.
   d. Specification Section number clearly identified.
   e. The quantity of Shop Drawings, Product Data, or Samples submitted.
   f. Notification of deviations from Contract Documents.

g. MSDS for each item complying with OSHA's Hazard Communication Standard 29 CFR 1910.1200.
h. Other pertinent data.

5. Submittal shall include:
   a. Date and revision dates.
   b. Revisions, if any, identified.
   c. Project Name and Contract number.
   d. The names of:
      1) Contractor, Subcontractor, Supplier, Manufacturer, and separate detailer, when pertinent.
   e. Identification of product material by location within the Project.
   f. Relation to adjacent structure or materials.
   g. Field dimensions, clearly identified as such.
   h. Specification Section number and applicable detail reference number and Drawing number.
   i. Applicable reference standards, such as ASTM, ANSI, FS, NEMA, SMACNA or ACI.
   j. A blank space, on the first sheet of each Submittal set, 5" x 4" for the Owner's stamp.
   k. Identification of deviations from Contract Documents.

S. Resubmission requirements:
   1. Shop Drawings:
      a. Revise initial Shop Drawings as required and resubmit as specified for initial Submittals.
      b. Indicate on Shop Drawings any changes that have been made other than those requested by Owner.
   2. Product Data and Samples:
      a. Submit new Product Data and Samples as required for initial Submittals.
   3. Installation, Operation, and Maintenance Manual:
      a. Revise initial Installation, Operation, and Maintenance Manual(s) as required and resubmit as specified for initial Submittals.

T. Charge for resubmissions:
   1. One re-examination of Contractor's Submittals that have been returned for correction or replacement will be included in Owner's budget. Any additional re-examination of Contractor's Submittals will be considered additional scope services to be paid by Contractor through Owner. Contractor shall pay Owner (or Owner may deduct from any progress or final payment), for engineering personnel, on an hourly basis at 2.5 times direct payroll expenses, and for consultant personnel time at 1.25 times the amount billed Owner.

1.3 SCHEDULE OF SUBMITTALS

A. Submit a preliminary Schedule of Submittals as required herein and by Document 00700 (General Conditions). Utilize Owner's Submittal Log form to prepare Schedule of Submittals. Owner's Submittal Log form will be provided to Contractor in electronic media format compatible with Microsoft® Excel 2000.

B. Schedule of Submittals will be used by Owner to schedule its activities relating to review of Submittals. Schedule of Submittals shall indicate a spreading out of Submittals and early Submittals of long-lead-time items and of items that require extensive review.

C. Schedule of Submittals will be reviewed by Owner and shall be revised and resubmitted until accepted by Owner.

D. Unless otherwise specified, transmit Submittals for associated items simultaneously to ensure that information is available for checking each item when it is received. Identify on the Submittal transmittal form that such Submittals should be reviewed together.

1.4 CONSTRUCTION MATERIAL WASTE MANAGEMENT PLAN

A. Submit Construction Material Waste Management Plan specific to these Contract Documents as required by Section 01741 (Construction Material Waste Management Plan).

1.5 SAFETY PROGRAM

A. Submit Safety Program specific to these Contract Documents as required by Section 01540 (Site Security and Safety).

1.6 PROGRESS SCHEDULE

A. See Section 01320 (Progress Schedules and Reports) for schedule and report requirements. Section 01320 (Progress Schedules and Reports) shall control in any conflict with this Section 01330.
B. Progress schedules, schedule updates, and reports shall be submitted using software described Section 01320 (Progress Schedules and Reports). Electronic files shall be complete copies, including all programs and electronic coding.

1.7 PRODUCT DATA

A. Within ten Days after Contract Time commences to run, submit complete list of major products proposed for use (included at the end of this Section 01330), with name of manufacturer, telephone number, trade name, and model number of each product. Tabulate data by Specification Section.
B. Product or Catalog Data:
   1. Manufacturers' standard drawings shall be modified to delete non-applicable data or include applicable data.
   2. Manufacturers' catalog sheets, brochures, diagrams, schedules, charts, illustrations, and other standard descriptive data:
      a. Mark each copy to identify pertinent materials, products, or models.
      b. Show dimensions and clearances required, performance characteristics and capacities, wiring diagrams and controls.
   3. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
   4. Material Safety Data Sheets:
      a. In addition to MSDSs otherwise required by the Contract Documents, submit MSDSs for any products containing a hazardous substance such as paints, solvents, thinners, varnish, lacquer, glues and adhesives, mastics, sealants, equipment fuel, equipment lubricant, or other materials needed for the Project as required by the individual Specification Sections or as otherwise specified in the Contract Documents.
      b. MSDSs must be submitted with Product Data Submittal in order for the Submittal to be reviewed.
C. Supplemental Data:
   1. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to Project.

1.8 SHOP DRAWINGS

A. Minimum Sheet Size: 8½ inches by 11 inches. All others: Multiples of 8½ inches by 11 inches, 34 inches by 44 inches maximum.
B. Provide electrical Shop Drawings in AutoCAD drawing format (.dwg) or PDF format.
C. The electronic copy will be marked with Owner's review comments and returned to Contractor.
D. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturers' standard data to provide information unique to Work.
E. Include manufacturers' installation instructions when required by Specification Section.
F. If Contractor submits Shop Drawings for items that Shop Drawings are not specified, Owner will not be obliged to review them.
G. Contractor is responsible for procuring copies of Shop Drawings for its own use as it may require for the progress of the Work.
H. Shop Drawings shall be drawn to scale and completely dimensioned, showing plan view together with such sectional views as are necessary to clearly show construction detail, materials, and methods.

1.9 SAMPLES

A. Submit full range of manufacturers' standard colors, textures, and patterns for Owner's selection.
B. Submit Samples to illustrate functional and aesthetic characteristics of product, with integral parts and attachment devices. Coordinate Submittal of different categories for interfacing Work.
C. Include identification on each Sample, giving full information.
D. Sizes: Unless otherwise specified, provide the following:
   1. Paint Chips: Manufacturers' standard
   2. Flat or Sheet Products: Minimum 6 inches square, maximum 12 inches square
   3. Linear Products: Minimum 6 inches, maximum 12 inches long
   4. Bulk Products: Minimum 1 pint, maximum 1 gallon
E. Full size Samples may be used in Work upon approval by Owner.
F. Field Samples and Mock-ups (if applicable):
   1. Erect field Samples and mock-ups at Site in accordance with requirements of Specification Sections. If testing is conducted, record and certify results and full Contract compliance.
   2. Modify or make additional field Samples and mock-ups as required to provide appearance and finishes approved by Owner.
   3. Approved field Samples and mock-ups may be used in Work upon approval by Owner.
   4. Construct or prepare as many additional Samples as may be required, as directed by the Owner, until desired textures, finishes, and/or colors are obtained.
   5. Accepted Samples and mock-up shall serve as the standard of quality for the various units of Work.
G. No review of a Sample shall be taken in itself to change or modify the requirements in the Contract Documents.
H. Finishes, materials, and workmanship in the completed Work shall match accepted Samples.
I. Samples will not be returned to Contractor.

1.10 COORDINATION DRAWINGS (IF APPLICABLE)

A. Layout Drawings: As soon as practical and in no case starting later than 30 Days after issuance of Notice to Proceed, Contractor shall prepare layout drawings of all equipment and piping at not less than ¼" scale. The layout drawings shall show the location of all equipment as well as locations of all valves, piping, fittings, and other items requiring access for service and maintenance. The layout drawings shall also show beams, ceiling heights, walls, floor-to-floor dimensions, columns, doors and other major architectural and structural drawings.
   1. At Contractor's option, the layout drawings may be produced using computer-aided drafting.

B. Coordination with Subcontractors: Within 30 Days after the date of the Notice to Proceed, send one reproducible and two prints of the layout drawings to Subcontractors who shall then make on the reproducible their own routings, etc., as required to determine interrelationship and possible interferences with mechanical equipment, piping and architectural or structural features. The marked-up reproducibles shall then be returned to Contractor no less than 30 Days after receipt by the Subcontractors.

C. Composite Drawings: Contractor shall prepare preliminary composite drawings of such layout drawings, incorporating all the information and routings provided by the Subcontractors. (At Contractor's option, a group of transparent overlays may be substituted, provided that they clearly show the relationship of all proposed installations and they are pin-registered/aligned.)
   1. The preliminary composite drawings or the overlays shall be reviewed during a series of meetings called by Contractor and attended by Owner, at which all Subcontractors and trades shall be represented in order to review and resolve any real or apparent interferences or conflicts.

D. Agreement by Subcontractors: After all conflicts or interferences are resolved, Contractor shall develop a final set of composite drawings showing the agreed-upon routing, layout and juxtaposition of all , piping, major conduit, valves, panels, controls, lighting fixtures and all major mechanical and electrical installations. In areas where no mechanical and electrical installations are installed, each Subcontractor shall be responsible for its own Work and pay its own costs in connection therewith. In preparation of all the final composite drawings, large scale details as well as cross and longitudinal sections shall be prepared as required to fully delineate all conditions. Particular attention shall be given to the locations, size, and clearance dimensions of equipment items, shafts, and similar features. These final composite drawings shall then be signed off by Subcontractors and Contractor, indicating their awareness of and agreement with the indicated routings and layouts and their interrelationship with the adjoining or contiguous Work. Thereafter, no unauthorized deviations will be permitted and, if made without knowledge or agreement of Owner, such unauthorized Work will be subject to removal and correction at no additional cost to Owner.

E. Minor Changes: In preparing the composite drawings, minor changes in duct, pipe or conduit routings that do not affect the intended function may be made as required to avoid space conflicts, when mutually agreed, but items may not be resized or exposed items relocated without Owner's written approval. No changes shall be made in any wall or chase locations, ceiling heights, door swings or locations, window or other openings or other features affecting the function or aesthetic effect of the building. If conflicts or interferences cannot be satisfactorily resolved, Owner shall be notified and Owner's decision obtained.

F. Distribution of Composite Drawings: After the final composite drawings have been agreed upon and signed by all Subcontractors, provide and distribute four prints and one electronic copy to each of the Subcontractors for reference and record purposes. Make similar distribution of all supplementary composite drawings, initiated by other Subcontractors. Also provide final composite drawings to Owner. All Subcontractors desiring additional prints of such drawings, beyond the basic distribution indicated above in this paragraph 1.10F, shall arrange for and pay the cost of same.

G. Record Composite Drawings: The record copies of the final composite drawings shall be retained by Owner, Contractor, and each Subcontractor as a working reference. All Shop Drawings, prior to their Submittal to Owner, shall be compared with the composite drawings and developed accordingly by Contractor and the responsible Subcontractor. Any revisions to the composite drawings that may become necessary during the progress of the Work shall be noted by Contractor and all Subcontractors and shall be neatly and accurately recorded on the record copies. Contractor and each Subcontractor shall be responsible for the up-to-date maintenance of Subcontractor record copies of the composite drawings and for keeping two copies available at the Site. Contractor and each Subcontractor shall utilize the composite drawings, and any subsequent changes thereto, in the development of Subcontractor "Project Record Documents" drawings.

H. Timely Submission: The composite drawings need not be submitted as a whole, but shall be submitted in all cases in ample time to avoid construction delay. The coordination drawings may lack complete data in certain instances pending receipt of Shop Drawings, but sufficient space shall be allotted for the items affected. When final information is received, such data shall be promptly inserted on the composite drawings.

I. Improperly Coordinated Work: No extra compensation will be paid for relocating any duct, pipe, conduit, or other material that has been installed without proper coordination between Contractor and all Subcontractors involved. If any improperly coordinated Work or Work installed that is not in accordance with the approved composite drawings, necessitates additional Work by Contractor or other Subcontractors, the costs of all such Work shall be borne solely by Contractor or the Subcontractor responsible for the Work.

J. Incorporation of Changes: All changes in the scope of Work due to revisions formally issued and approved shall be shown on the composite drawings.

K. Quality Draftsmanship: All Work on Shop Drawings, layout drawings, coordination drawings, and composite drawings shall be performed by competent drafters and shall be clear and fully legible. Owner shall be the sole judge of the acceptability of the drawings.

L. Structural Cutting: Obtain specific positive written instructions from Owner before cutting beams or other structural members, walls, arches, or lintel, and comply with such instructions.

1.11 QUALITY ASSURANCE/CONTROL SUBMITTALS

A. Design Data:
   1. Indicate that material or product conforms to or exceeds specified requirements.

B. Test Reports:
   1. Indicate that material or product conforms to or exceeds specified requirements.
   2. Reports may be from recent or previous tests on material or product, but shall be acceptable to Owner. Comply with requirements of each individual Specification Section.

C. Certificates:
   1. Indicate that material or product conforms to or exceeds specified requirements.

2. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or from previous test results on material or product, but shall be acceptable to Owner.

D. Manufacturers' Instructions:
1. Include manufacturers' printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing.
2. Identify conflicts between manufacturers' instructions and Contract Documents.

E. Work Plans:
1. Submit work plans with sufficient detail to clearly indicate compliance with Specification requirements and to clearly describe by what means and methods Contractor intends to execute the subject Work.

1.12 INSTALLATION, OPERATION, AND MAINTENANCE MANUAL (IF APPLICABLE)

A. Sheet Size: 8½ x 11 inch

B. Drawing Size: Reduce drawings or diagrams to an 8½ x 11 inch or 11 x 17 inch size. However, where reduction is not practical to ensure readability, fold larger drawings separately and place in vinyl envelopes bound into the binder. Identify vinyl envelopes with drawing numbers.

C. Binding: Bind in heavy-duty white vinyl D-ring binders (locking rings), not more than 3" thick, with standard three-hole punch, two inside pockets, and a clear overlay (front pocket). Binder shall be no more than 80% full.

D. Multiple Items: Multiple items may be combined into one binder; tab each section with plastic-coated dividers.

E. Volumes: create volumes, numbered sequentially, as appropriate.

F. Page Protectors: Provide plastic sheet lifters prior to first page and following last page.

G. Binder title: Include the following title on front and spine of binder(s):

RUSSIAN RIVER COUNTY SANITATION DISTRICT TREATMENT PLANT
BIOLOGICAL NUTRIENT REMOVAL
INSTALLATION, OPERATION, AND MAINTENANCE MANUAL, [YEAR]
VOLUME [__(number) of __(total number of volumes)]

H. Contents:
1. Introductory Information:
   a. Title page providing the same information as paragraph 1.12G above
   b. Contractor's name, address, and telephone number
   c. Table of Contents: include a complete table of contents in each volume, if applicable
2. Include, at a minimum, the following detailed information for each item as applicable and as required by individual Specification Sections:
   a. Bill of materials: include manufacturer, complete model number, quantity, and equipment location.
   b. Operational information:
      1) Equipment function, normal operating characteristics, limiting operations.
      2) Operating instructions for startup, routine and normal operation, regulation and control, shutdown, and emergency conditions.
      3) A list of recommended spare parts with a price list, predicted life of parts subject to wear, and a list of spare parts provided under this Contract.
      4) Instrumentation or tag numbers relating the equipment back to the Contract Documents.

c. Maintenance information:
   1) Assembly, disassembly, installation, alignment, adjustment, and checking instructions.
   2) Lubrication and maintenance instructions including specific type and amount of lubricant and recommended lubrication interval.
   3) Outline, cross-section, and assembly drawings; engineering data; and electrical diagrams, including elementary diagrams, labeled wiring diagrams, connection diagrams, word description of wiring diagrams and interconnection diagrams.
   4) Test data and performance curves.
   5) Parts lists or other documents packed with equipment when delivered.
   6) Instrumentation or tag numbers relating the equipment back to the Contract Documents.
   7) Include a filled-out Maintenance Summary form (included at the end of this Section 01330) as the first page(s) of each manual. Complete maintenance requirements in detail. Reference to the manual will not be accepted. For equipment items involving components or sub-units, a Maintenance Summary for each operating component or sub-unit is required.

d. Troubleshooting guide.

e. Delete information that is not pertinent to the Project.

3. Index: alphabetical by keyword

I. Final Submittal: Upon favorable review of Installation, Operation, and Maintenance Manual(s) by Owner, deliver the final approved, Installation, Operation, and Maintenance Manual(s). Electronic media format copy shall be searchable and include all tables, charts, drawings, codes and all other matters reflected in hard copies.

1.13 PROJECT RECORD DOCUMENTS

A. Submit Project Record Documents as required by Section 01780 (Project Record Documents).

1.14 STORM WATER POLLUTION PREVENTION PROGRAM (IF APPLICABLE)

A. Submit Storm Water Pollution Prevention Program if required by Section 01500 (Temporary Facilities and Controls).

1.15 DELAY OF SUBMITTALS

A. Delay of Submittals by Contractor is considered avoidable delay. Liquidated damages incurred because of late Submittals will be assessed to Contractor.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

MAJOR PRODUCTS LIST, TRANSMITTAL FORMS, AND MAINTENANCE SUMMARY FORM FOLLOW THIS PAGE

MAJOR PRODUCTS LIST

	Specification Section Number	Product	Name of Manufacturer, Trade Name, Model Number	Telephone number
1.	06610	Fiberglass Reinforced Plastic Baffle Wall System		
2.	11081	High Speed Turbo Aeration Blower		
3.	11084	Submersible Propeller Pumps		
4.	11088	Fine Bubble Diffusers		
5.	11373	Submersible Mixers		

SUBMITTAL, TRANSMITTAL NO. _____

Project Name: Russian River County Sanitation District Treatment Plant Biological Nutrient Removal	Date Received:
Owner: Russian River County Sanitation District Attention: Construction Management Section 404 Aviation Boulevard Santa Rosa, CA 95403-9019	Checked By:
Contractor: Address: Attention:	Log Page: Specification Section Number: 1st Submittal ☐ Resubmittal ☐

By Date

Contractor's signature above shall constitute Contractor's representation that it has satisfied its obligations under the Contract Documents with respect to Contractor's review and approval of Submittals.

Date Transmitted:	Previous Transmittal Date:

No. Copies	Description	Manufacturer	Dwg. or Data No.	Action Taken*

Remarks:

* The action designated above is in accordance with the following legend:

A – No Exceptions Taken
B – Make Corrections Noted (No Resubmission Required)
C – Revise as Noted and Resubmit
D – Rejected - Resubmit
1. Not enough information for review
2. No reproducibles submitted
3. Copies illegible
4. Not enough copies submitted
5. Wrong sequence number
6. Wrong resubmittal number
7. Wrong Specification section number
8. Wrong form used
9. See comments

Comments:

By Date

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL, TRANSMITTAL NO. _____

Project Name: Russian River County Sanitation District Treatment Plant Biological Nutrient Removal		Date Received:	
Owner: Russian River County Sanitation District 404 Aviation Boulevard Santa Rosa, CA 95403-9019		Attention: Construction Management Section	
Contractor: Address: Attention:		Log Page: Specification Section Number:	
		1st Submittal ☐	Resubmittal ☐

By Date

Contractor's signature above shall constitute Contractor's representation that it has satisfied its obligations under the Contract Documents with respect to Contractor's review and approval of Submittals.

Date Transmitted:	Previous Transmittal Date:

No. Copies	Description	Manufacturer	Dwg. or Data No.	Action Taken*

Remarks:

* The action designated above is in accordance with the following legend:

A – No Exceptions Taken
B – Make Corrections Noted (No Resubmission Required)
C – Revise as Noted and Resubmit
D – Rejected - Resubmit– this manual Submittal is deficient in the following area:

1. Equipment record sheets
2. Functional description
3. Assembly, disassembly, installation, alignment, adjustment, and checkout instructions
4. Operating instructions

D – (continued)

5. Lubrication and maintenance instructions
6. Troubleshooting guide
7. Parts list and ordering instructions
8. Organization (indexing and tabbing)
9. Wiring diagrams and schematics specific to installation
10. Outline, cross section, and assembly diagrams
11. Test data and performance curves
12. Tag or equipment identification numbers
13. See comments

Comments:

By Date

MAINTENANCE SUMMARY

1. EQUIPMENT ITEM:_____
2. MANUFACTURER:_____
3. MODEL NUMBER:_____
4. SERIAL NO. (IF APPLICABLE):_____
5. NAMEPLATE DATE (HP, VOLTAGE, SPEED, ETC.):_____
6. MANUFACTURER'S LOCAL REPRESENTATIVE
   NAME:_____
   ADDRESS: _____
   TELEPHONE NUMBER: _____ FAX NUMBER: _____
7. MAINTENANCE REQUIREMENTS:

MAINTENANCE OPERATION

List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. _____

FREQUENCY

List required frequency of each maintenance operation. _____

LUBRICANT (IF APPLICABLE)

Refer by symbol to lubricant list as required. _____

COMMENTS

8. LUBRICANT LIST: REFERENCE SYMBOL
   (A-) (B-) (C-) (D-)

List symbols used. List equivalent lubricants as distributed and recommended by manufacturer’s representative listed in item 6 above.

9. SPARE PARTS:

Include your recommendations regarding what spare parts, if any, should be kept on the job.

SECTION 01410

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes: regulatory requirements that may be applicable to Contract Documents.
B. Specific reference in the Specifications to codes and regulations or requirements of regulatory agencies shall mean the latest printed edition of each adopted by the regulatory agency in effect at the time of the opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
C. Should any conditions develop not covered by the Contract Documents wherein the finished Work will not comply with current codes, a Change Order detailing and specifying the required Work shall be submitted to and approved by Owner before proceeding with the Work.

1.2 REFERENCES TO REGULATORY REQUIREMENTS

A. Codes, laws, ordinances, rules and regulations referred to shall have full force and effect as though printed in full in these Specifications. Code, laws, ordinances, rules and regulations are not furnished to Contractor, because Contractor is assumed to be familiar with these requirements. The listing of applicable codes, laws, and regulations for hazardous waste abatement Work in the Contract Documents is supplied to Contractor as a courtesy and shall not limit Contractor's responsibility for complying with all applicable laws, regulations, or ordinances having application to the Work. Where conflict among the requirements or with these Specifications occurs, the most stringent requirements shall be used.
B. Conform to referenced codes, laws, ordinances, rules and regulations.

1.3 CODES

A. Codes that apply to Contract Documents include, but are not limited to, the following:
   1. CBC (Part 2, Title 24, CCR, including, without means of limitation, Sections 16A, 102A.23, 308, 420A, 504-506, 904.2.6, 1019 and 1604)
   2. CEC (Part 3, Title 24, CCR)
   3. CMC (Part 4, Title 24, CCR)
   4. CPC (Part 5, Title 24, CCR),
   5. State Elevator Safety Regulations (Part 7, Title 24, CCR)
   6. UPC
   7. UMC
   8. NEC
   9. Sonoma County Code

1.4 LAWS, ORDINANCES, RULES, AND REGULATIONS

A. During prosecution of Work to be done under Contract Documents, comply with applicable laws, ordinances, rules and regulations, including, but not limited to, the following:
   1. Federal:
      a. Americans With Disabilities Act of 1990
      b. 29 CFR, Section 1910.1001, Asbestos
      c. 40 CFR, Subpart M, National Emission Standards for Asbestos

   d. Executive Order 11246
   e. Federal Endangered Species Act
   f. Clean Water Act
2. State of California:
   a. California Code of Regulations, Titles 5, 8, 19, 21, 22, 24 and 25
   b. California Public Contract Code
   c. California Health and Safety Code
   d. California Government Code
   e. California Labor Code
   f. California Civil Code
   g. California Code of Civil Procedure
   h. CPUC General Order 95, Rules for Overhead Electric Line Construction
   i. CPUC General Order 128, Rules for Construction of Underground Electric Supply and Communications Systems
   j. Cal/OSHA
   k. OSHA: Hazard Communications Standards
   l. California Endangered Species Act
   m. Water Code
   n. Fish and Game Code
3. State of California Agencies:
   a. State and Consumer Services Agency
   b. Office of the State Fire Marshall
   c. Office of Statewide Health Planning and Development
   d. Department of Fish and Game
   e. Bay Area Air Quality Management District
   f. San Francisco Bay Regional Water Quality Control Board
   g. North Coast Regional Water Quality Control Board
      1) Order No. 93-61
      2) Order No. 81-73
      3) Clean Water Act Section 401
4. County of Sonoma:
   a. Ordinance 3836R
   b. Building permit
   c. Electrical permit
   d. Grading permit
   e. Encroachment permit
   f. Valley Oak Protection Ordinance
5. Local Agencies:
   a. Applicable City Ordinances
   b. Northern Sonoma County Air Pollution Control District
6. Other Requirements:
   a. National Fire Protection Association (NFPA): Pamphlet 101, Life Safety.
   b. References on Drawings or in Specifications to "code" or "building code" not otherwise identified shall mean the codes specified in this Section 01410, together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction.

B. Have access to all of the foregoing within 24 hours.

C. Other Applicable Laws, Ordinances and Regulations:

1. Work shall be accomplished in conformance with all applicable laws, ordinances, rules and regulations of federal, state, and local governmental agencies and jurisdictions having authority over the Project.
2. Work shall be accomplished in conformance with all rules and regulations of public utilities and utility districts.
3. Where such laws, ordinances rules, and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of products, Work shall be accomplished in conformance to such requirements with no change to the Contract Time and Contract Sum, except where changes in laws, ordinances, rules, and regulations occur subsequent to the time of opening of the Bids.

D. Change Orders and Claims. The California Public Contract Code (including but not limited to Section 7105 (d)(2)) applies to all contract procedures for changes, time extensions, change orders (time and money), and claims, and per California Government Code Section 930.2, et seq., Contractor's timely compliance with these procedures is a mandatory prerequisite to filing a Government Code Claim. Any change, alteration, modifications, waiver, or omission to implement these procedures, shall have no legal effect unless approved in advance in a fully executed Change Order approved by the Board. Federal construction law (U.S. v. Holspuch 326 U.S. 234) and the jurisprudence of the Federal District of Columbia Circuit shall supplement (but not supersede) California law on construction claims topics including but not limited to, termination claims, home office overhead claims, and delay/disruption claims.

1.5 PRECEDENCE

A. Where Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, Drawings and Specifications shall take precedence so long as such increase is legal.
B. Where no requirements are identified on Drawings or in Specifications, comply with all requirements of applicable codes, ordinances and standards of governing authorities having jurisdiction.
C. Conflicts between referenced regulatory requirements: Comply with the one establishing the more stringent requirement.
D. Conflicts between referenced regulatory requirements and Contract Documents: Comply with the one establishing the more stringent requirement.

1.6 REQUIRED PROVISIONS ON CONTRACT CLAIM RESOLUTION

A. The California Public Contract Code specifies required provisions on resolving contract claims less than $375,000, which are set forth below, and constitute a part of this Contract.
   1. For the purposes of this section, "Claim" means a separate demand by Contractor of $375,000 or less for (1) a time extension, (2) payment or money or damages arising from Work done by or on behalf of Contractor arising under the Contract Documents and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) an amount the payment of which is disputed by Owner. In order to qualify as a Claim, the written demand must state that it is a Claim submitted under Article 12 of Document 00700 (General Conditions) and be submitted in compliance with all requirements of Document 00700 (General Conditions), Article 12. Separate Claims which total more than $375,000 do not qualify as a "separate demand of $375,000 or less," as referenced above, and are not subject to this section.

2. A voucher, invoice, payment application, or other routine or authorized form of request for payment is not a Claim for purposes of this section. If such request is disputed as to liability or amount, then the disputed portion of the submission may be converted to a Claim under this section by submitting a separate claim in compliance with Contract Documents claim submission requirements.
3. Caution: This section does not apply to tort claims and nothing in this section is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 and Chapter 2 of Part 3 of Division 3.6 of Title 1 of the California Government Code.

B. Procedure:
1. The Claim must be in writing, submitted in compliance with all requirements of Document 00700 (General Conditions), Article 12, including, but not limited to, the time prescribed by and including the documents necessary to substantiate the Claim, pursuant to Document 00700 (General Conditions), paragraph 12.3. Claims must be filed on or before the day of final payment. Nothing in this section is intended to extend the time limit or supersede notice requirements for the filing of claims as set forth in Document 00700 (General Conditions), Article 12 or elsewhere in the Contract Documents.
2. For Claims of fifty thousand dollars ($50,000) or less
   a. Owner shall respond in writing within 45 days of receipt of the Claim, or
   b. Owner may request in writing within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims Owner may have against Claimant.
      1) If additional information is thereafter required, it shall be requested and provided in accordance with this section, upon mutual agreement of Owner and Claimant.
      2) Owner's written response to the Claim, as further documented, shall be submitted to Claimant within 15 days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.
3. For Claims over Fifty Thousand Dollars ($50,000) and less than or equal to $375,000:
   a. Owner shall respond in writing within 60 days of receipt of the Claim, or
   b. Owner may request in writing within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims Owner may have against Claimant.
      1) If additional information is thereafter required, it shall be requested and provided in accordance with this section, upon mutual agreement of Owner and Claimant;
      2) Owner's written response to the Claim, as further documented, shall be submitted to Claimant within 30 days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.
4. Meet and Confer:
   a. If Claimant disputes Owner's written response, or Owner fails to respond within the time prescribed above, Claimant shall notify Owner, in writing, either within 15 days of receipt of Owner's response or within 15 days of Owner's failure to timely respond, and demand an informal conference to meet and confer for settlement of

the issues in dispute. Upon demand Owner will schedule a meet and confer conference within 30 days for settlement of the dispute.

b. Following the meet and confer conference, if the Claim or any portion remains in dispute, Claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the California Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time Claimant submits its written claim as set forth in paragraph 12.2.B of Document 00700 (General Conditions), until the time that Claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

1.7 COMPLIANCE WITH AMERICANS WITH DISABILITIES ACT

A. Contractor acknowledges that, pursuant to the Americans with Disabilities Act (ADA), programs, services, and other activities provided by a public entity to the public, whether directly or through a contractor, must be accessible to the disabled public. Contractor shall provide the services specified in the Contract Documents in a manner that complies with the ADA and any and all other applicable federal, state, and local disability rights legislation. Contractor agrees not to discriminate against disabled persons in the provision of services, benefits, or activities provided under this Agreement and further agrees that any violation of this prohibition on the part of Contractor, its employees, agents, or assigns shall constitute a material breach of the Contract Documents.

1.8 SUBSTITUTION OF SECURITIES IN LIEU OF RETENTION

A. In accordance with the provisions of Public Contract Code Section 22300, substitution of securities for any moneys withheld under Contract Documents to ensure performance is permitted under following conditions:

1. At request and expense of Contractor, securities listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by Contractor and Owner which are equivalent to the amount withheld under retention provisions of Contract shall be deposited with Controller or with a state or federally chartered bank in California, as the escrow agent, who shall then pay such moneys to Contractor. Upon satisfactory completion of Contract, securities shall be returned to Contractor.
2. Alternatively, Contractor may request and Owner shall make payment of retentions earned directly to the escrow agent at the expense of Contractor. At the expense of Contractor, Contractor may direct the investment of the payments into securities and receive the interest earned on the investments upon the same terms provided for in this Section 01410 for securities deposited by Contractor. Upon satisfactory completion of Contract Documents, Contractor shall receive from escrow agent all securities, interest, and payments received by the escrow agent from Owner, pursuant to the terms of this Section 01410. Pay to each Subcontractor, not later than 20 Days after receipt of the payment, the respective amount of interest earned, net of costs attributed to retention withheld from each Subcontractor, on the amount of retention withheld to insure the performance of Contractor.
3. Contractor shall be beneficial owner of securities substituted for moneys withheld and shall receive any interest thereon.

4. Enter into escrow agreement with Controller according to Document 00680 (Escrow Agreement for Security Deposits in Lieu of Retention), as authorized under Public Contract Code Section 22300, specifying amount of securities to be deposited, terms and conditions of conversion to cash in case of default of Contractor, and termination of escrow upon completion of Contract Documents.
5. Public Contract Code Section 22300 is hereby incorporated in full by this reference.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01420

REFERENCES AND DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Reference standards, abbreviations, symbols, definitions, and terminology used in Contract Documents.
B. Full titles are given in this Section for standards cited in other Sections of Specifications.
C. Material and workmanship specified by reference to number, symbol, or title of specific standard such as state standard, commercial standard, federal specifications, technical society, or trade association standard, or other similar standard, shall comply with requirements of standards except when more rigid requirements are specified or required by applicable codes.
D. Standards referred to, except as modified herein, shall have full force and effect as though printed in the Contract Documents. Standards are not furnished to Contractor because manufacturers and trades involved are assumed to be familiar with their requirements.

1.2 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES; REPORTING AND RESOLVING DISCREPANCIES

A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code, or laws or regulations (including all amendments, changes, errata, addenda, and supplements) in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
   1. When an edition or effective date of a reference is not given, it shall be understood to be the current edition or latest revision published as of the date of opening Bids.
      a. Exception: Comply with issues in effect as listed in governing legal requirements.
B. If during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such law or regulation applicable to the performance of the Work or of any such standard, specification, manual, or code, or of any instruction of any supplier, report it in writing at once by submitting a RFI to Owner, and do not proceed with the Work affected thereby until consent to do so is given by Owner.
C. Except as otherwise specifically stated in the Contract Documents or as may be provided by Change Order, CCD, or Supplemental Instruction, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
   1. The provisions of any such standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
   2. The provisions of any such laws or regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such law or regulation).
D. No provision of any such standard, specification, manual, code, or instruction shall be effective to change the duties and responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the

Contract Documents, nor shall it be effective to assign to Owner, Engineer, or any of their consultants, agents, representatives or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

E. Comply with the applicable portions of standards and specifications published by the technical societies, institutions, associations, and governmental agencies referred to in Specifications.

F. Referenced Grades, Classes, and Types: Where an alternative or optional grade, class, or type of product or execution is included in a reference but is not identified in Drawings or in Specifications, provide the highest, best, and greatest of the alternatives or options for the intended use and prevailing conditions.

G. Jobsite Copies:
   1. Obtain and maintain at the Site copies of reference standards identified on Drawings and in Specifications in order to properly execute the Work.
   2. At a minimum, the following shall be readily available at the Site:
      a. Safety Codes: State of California, Division of Industrial Safety regulations.

H. ASTM and ANSI References: Specifications and Standards of the American Society for Testing and Materials International (ASTM International) and the American National Standards Institute (ANSI) are identified in the Drawings and Specifications by abbreviation and number only and may not be further identified by title, date, revision, or amendment. It is presumed that Contractor is familiar with and has access to these nationally- and industry-recognized specifications and standards.

1.3 ABBREVIATIONS

A. Listed hereinafter are the various organizations or references which may appear in the Contract Documents, along with their respective acronyms and/or abbreviations:

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AAP	Affirmative Action Program
AASHTO	American Association of State Highway and Transportation Officials
AB	Aggregate Base
ABMA	American Bearing Manufacturers Association
ABPA	American Board Products Association
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AED	Association of Equipment Distributors
AFBMA	Anti-friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute (formerly American Standards Association)
APA	American Plywood Association

API	American Petroleum Institute
ARI	Air-Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
AWCI	Association of the Wall and Ceiling Industries
AWG	American Wire Gauge
AWPA	American Wood-Preservers' Association
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIL	Basic Insulation Level
BOD	Biological Oxygen Demand
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	State of California, Department of Transportation
CBC	California Building Code
CCD	Construction Change Directive
CCR	California Code of Regulations
CEC	California Electric Code or California Energy Commission
CF	Cubic Foot or Cubic Feet
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
CGA	Common Ground Alliance
CI	Chlorine Institute, Inc.
CISPI	Cast Iron Soil Pipe Institute
CL	Center Line
CLMFI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America, Inc.
CMC	California Mechanical Code
CO	Change Order
COE	United States Army Corps of Engineers
CPC	California Plumbing Code
CPM	Critical Path Method
CPUC	California Public Utilities Commission
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CSA	Canadian Standards Association
CY	Cubic Yard or Cubic Yards
DFPA	Douglas Fir Plywood Institute
DFT	Dry Film Thickness
DHI	Door and Hardware Institute
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories

FGMA	Flat Glass Marketing Association
FPS	Feet per Second or Fluid Power Society
FS	Federal Specifications
GA	Gypsum Association
GPM	Gallons Per Minute
Greenbook	Standard Specifications for Public Works Construction
HI	Hydraulic Institute
HMI	Hoist Manufacturer's Institute
HMMA	Hollow Metal Manufacturer's Association
HP	Horse Power
HPMA	Hardwood Plywood Manufacturers Association
HVAC	Heating, Ventilating and Air Conditioning
IACS	International Annealed Copper Standards
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
ID	Identification or Inside Diameter
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
ISA	International Society of Arboriculture
ISAS	Instrumentation, Systems, and Automation Society
ISO	International Organization for Standardization
JATC	Joint Apprenticeship Training Committee
JV	Joint Venture
LBE	Local Business Enterprise
LLC	Limited Liability Corporation or Company
LS	Lump Sum
M.I.	Middle Initial
M/WBE	Minority and/or Woman-Owned Business Enterprise
MBE	Minority Business Enterprise
MGD	Million Gallons per Day
MIA	Masonry Institute of America
MIA	Marble Institute of America
MLSFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSDS	Material Safety Data Sheet
MSS	Manufacturers Standardization Society of the Valve & Fitting Industry
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electric Manufacturers Association
NESC	National Electrical Safety Code
NFoPA	National Forest Products Association
NFPA	National Fire Protection Association
NIC	Not In Contract
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology

NPT	National Pipe Thread
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NTS	Not to Scale
NWWDA	National Wood Windows and Doors Association
OC	On Center
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
OSHPD	Office of Statewide Health Planning and Department
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PG&E	Pacific Gas and Electric Company
PL	Property Line
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PPM	Parts per Million
PR	Proposal Request
PRMD	Permits and Resource Management Department, County of Sonoma
PS	Product Standard, U. S. Department of Commerce
PSF or psf	Pounds per Square Foot
PSI or psi	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
PVC	Polyvinyl chloride
RC	Relative Compaction
RFI	Request for Information
RFP	Request for Proposals
RFS	Request for Substitution
RIS	Redwood Inspection Service
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
SDeI	Steel Deck Institute
SDoI	Steel Door Institute
SDR	Standard Dimension Ratio
SF	Square Foot or Square Feet
SFM	State of California, Office of State Fire Marshal
SIDR	Standard Inside Dimension Ratio
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joint Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SSPC	Society for Protective Coating (formerly Steel Structures Painting Council)
SWI	Steel Window Institute
TCA	Tile Council of America
TIE	Time Impact Evaluation
TMS	The Masonry Society
TPI	Truss Plate Institute Inc.
UFC	Uniform Fire Code

UL	Underwriters' Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
USA	Underground Service Alert
USACE	United States Army Corps of Engineers
USC	United States Code
VOC	Volatile Organic Compounds
WBE	Women's Business Enterprise
WCLIB	West Coast Lumber Inspection Bureau
WHI	Warnock Hersey International
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association
WWPI	Western Wood Preservers Institute

B. Abbreviations in Specifications:

cm	centimeter (centimeters)
Co.	Company
Corp.	Corporation
cu	Cubic
Deg	degree
dia/DIA	diameter
Div	Division
ft/FT	foot (feet)
g	gram (grams) or Standard Acceleration of Gravity
gal	gallon (gallons)
gpd	gallons per Day
hr	hour
In/IN	inch (inches)
Inc.	Incorporated
kg	kilogram (kilograms)
km	kilometer (kilometers)
kVAR	kilovolts amperes reactive
kW	kilowatt
l	liter (liters)
lb(s)	Pound(s)
m	meter (meters)
mfr	manufacturer
mg	milligram (milligrams)
ml/mls	milliliter (milliliters)
mm	millimeter (millimeters)
No	number
sq/SQ	square
Sta	Station
T & G	tongue and groove
Typ	typical
US	United States
yd	yard (yards)

C. Abbreviations on Drawings:
   1. As listed for Specifications above.
   2. Additional abbreviations, used only on Drawings, are indicated thereon.

1.4 SYMBOLS

A. Symbols in Specifications:

:	"shall be" or "shall" - where used within sentences or paragraphs
#1	number
1#	pound
&	and
%	percent
C	Centigrade
F	Fahrenheit
°	degree
/	"per," except where used to combine words; example: power/fuel, and in that case it means "and"
"	inch (inches)
'	foot (feet)
@	at

B. Symbols on Drawings:
   1. As listed for Specifications above.
   2. Symbols, used only on Drawings, are indicated thereon.

1.5 DEFINITIONS

A. Wherever any of the words or phrases defined below, or a pronoun used in place thereof, is used in any part of the Contract Documents, it shall have the meaning here set forth. In the Contract Documents, the neuter gender includes the feminine and masculine, and the singular number includes the plural.
B. The following definitions shall apply regardless of capitalization unless the context otherwise requires:
   1. Wherever words "as directed," "as required," "as permitted," or words of like effect are used, it shall be understood that direction, requirements, or permission of Owner is intended. Words "sufficient," "necessary," "proper," and the like shall mean sufficient, necessary, or proper in judgment of Owner. Words "approved," "acceptable," "satisfactory," "favorably reviewed," or words of like import, shall mean approved by, or acceptable to, or satisfactory to, or favorably reviewed by Owner.
   2. Wherever the word "may" or "ought" is used, the action to which it refers is discretionary. Wherever the word "shall" or "will" is used, the action to which it refers is mandatory.
   3. Addenda: Written or graphic instruments issued prior to the opening of Bids, which clarify, correct, or change the bidding requirements or the Contract Documents. Addenda shall not include the minutes of the Pre-Bid Conference, if any, or Site Visit.

4. Agency: The Sonoma County Water Agency (SCWA), a public agency of the State of California, acting under and by virtue of the authority vested in the Owner by the laws of the State of California as an agent of District.
5. Agreement (Document 00520): Agreement is the basic Contract Document that binds the parties to construction Work. Agreement defines relationships and obligations between Owner and Contractor and by reference incorporates Conditions of Contract, Drawings, and Specifications and contains Addenda and all Modifications subsequent to execution of Contract Documents.
6. Alternate: Work added to or deducted from the base Bid, if accepted by Owner.
7. Application for Payment: Written application for monthly or periodic progress or final payment made by Contractor complying with the Contract Documents.
8. Approved Equal: Approved in writing by Owner as being of equivalent quality, utility and appearance.
9. Asbestos: Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by OSHA or Cal/OSHA.
10. Bid: The offer or proposal of the Bidder submitted on the prescribed form(s) setting forth the prices for the Work to be performed.
11. Bidder: One who submits a Bid.
12. Bidding Documents: All documents comprising the Project Manual (including all documents and Specification Sections listed in Document 00010 [Table of Contents]), including documents supplied for bidding purposes only and Contract Documents.
13. Board: The Board of Directors of the Owner.
14. Business Day: Any Day other than Saturday, Sunday, and the following days that have been designated as holidays by Owner. If a holiday falls on a Saturday, the preceding Friday will be the holiday. If a holiday falls on a Sunday, the following Monday will be the holiday.
    a. New Year's Day, January 1;
    b. Martin Luther King Jr.'s Birthday, third Monday in January;
    c. Lincoln's Birthday, February 12;
    d. Presidents' Day, third Monday in February;
    e. Memorial Day, last Monday in May;
    f. Independence Day, July 4;
    g. Labor Day, first Monday in September;
    h. Veterans' Day, November 11;
    i. Thanksgiving Day, as designated by the President;
    j. The Day following Thanksgiving Day;
    k. Christmas Day, December 25; and
    l. Each day appointed by the Governor of California and formally recognized by the Sonoma County Board of Supervisors as a day of mourning, thanksgiving, or special observance.
15. By Owner: Work that will be performed by Owner or its agents at the Owner's expense.

16. By Others: Work that is outside scope of Work to be performed by Contractor under this Contract, which will be performed by Owner, other contractors, or other means.
17. Change Order: A written instrument prepared by Owner and signed by Owner and Contractor, stating their agreement upon all of the following:
    a. a change in the Work;
    b. the amount of the adjustment in the Contract Sum, if any; and
    c. the amount of the adjustment in the Contract Time, if any.
18. Code Inspector: A local or state agency responsible for the enforcement of applicable codes and regulations.
19. Concealed: Work not exposed to view in the finished Work, including within or behind various construction elements.
20. Construction Change Directive ("CCD"): A written order prepared and signed by Owner, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both.
21. Contract Conditions or Conditions of the Contract: Consists of two parts: General Conditions and Supplementary Conditions.
    a. General Conditions are general clauses that are common to the Owner Contracts, including Document 00700 (General Conditions).
    b. Supplementary Conditions modify or supplement General Conditions to meet specific requirements for these Contract Documents, including Document 00800 (Supplementary Conditions).
22. Contract Documents and Contract: Contract Documents and Contract shall consist of the documents identified as the Contract Documents in Document 00520 (Agreement), plus all changes, Addenda, and Modifications thereto.
23. Contract Modification: Either:
    a. a written amendment to Contract signed by Contractor and Owner; or
    b. a Change Order; or
    c. a Construction Change Directive; or
    d. a written directive for a minor change in the Work issued by Owner.
24. Contract Sum: The sum stated in the Agreement and, including authorized adjustments, the total amount payable by Owner to Contractor for performance of the Work and the Contract Documents. The Contract Sum is also sometimes referred to as the Contract Price or the Contract Amount.
25. Contract Time: The number or numbers of Days or the dates stated in the Agreement:
    a. to achieve Substantial Completion of the Work or designated Milestones; and/or
    b. to complete the Work so that it is ready for final payment and is accepted.
26. Contractor: The person or entity identified as such in the Agreement and referred to throughout the Contract Documents as if singular in number and neutral in gender. The term "Contractor" means the Contractor or its authorized representative.
27. Contractor's Employees: Persons engaged in execution of Work under Contract as direct employees of Contractor, as Subcontractors, or as employees of Subcontractors.
28. Day: One calendar day of 24 hours measured from midnight to the next midnight, unless the word "day" is specifically modified to the contrary.

29. Defective: An adjective which, when modifying the word "Work," refers to Work that is unsatisfactory or unsuited for the use intended, faulty, or deficient, that does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents (including but not limited to approval of Samples and "or equal" items), or has been damaged prior to final payment (unless responsibility for the protection thereof has been assumed by Owner). Owner is the judge of whether Work is Defective.
30. District: The Russian River County Sanitation District, a local district of the State of California, acting by and through its Board of Directors.
31. Drawings: The graphic and pictorial portions of Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
32. Engineer: If used elsewhere in the Contract Documents, "Engineer" shall mean a person holding a valid California State Architect's or Engineer's license representing the Owner in the administration of the Contract Documents. Engineer may be an employee of or an independent consultant to Owner. When Engineer is referred to within the Contract Documents and no Engineer has in fact been designated, then the matter shall be referred to Owner. The term Engineer shall be construed to include employees of Engineer and/or employees that Engineer supervises. When the designated Engineer is an employee of Owner, his or her authorized representatives on the Project will be included under the term Engineer. If Engineer is an employee of Owner, or Agency, Engineer is the beneficiary of all Contractor obligations to Owner, including without limitation, all releases and indemnities.
33. Equal: Equal in opinion of Owner. Burden of proof of equality is responsibility of Contractor.
34. Exposed: Work exposed to view in the finished Work, including behind louvers, grilles, registers and various other construction elements.
35. Final Acceptance or Final Completion: Owner's acceptance of the Work as satisfactorily completed in accordance with Contract Documents. Requirements for Final Acceptance/Final Completion include, but are not limited to:
    a. All systems having been tested and accepted as having met requirements of Contract Documents.
    b. All required instructions and training sessions having been given by Contractor.
    c. All required permitting reports.
    d. All Project Record Documents having been submitted by Contractor, reviewed by Owner, and accepted by Owner.
    e. All punch list Work, as directed by Owner, having been completed by Contractor.
    f. Generally all Work, except Contractor maintenance after Final Acceptance/Final Completion, having been completed to satisfaction of Owner.
36. Force Account: Work directed to be performed without prior agreement as to lump sum or unit price cost thereof, and which is to be billed at cost for labor, materials, equipment, taxes, and other costs, plus a specified percentage for overhead and profit.
37. Furnish: Supply only, do not install.
38. Indicated: Shown or noted on the Drawings.
39. Install: Install or apply only, do not furnish.

40. Latent: Not apparent by reasonable inspection, including but not limited to, the inspections and research required as a condition to bidding under Document 00700 (General Conditions).
41. Law: Unless otherwise limited, all applicable laws including without limitation all federal, state, and local laws, statutes, standards, rules, regulations, ordinances, and judicial and administrative decisions.
42. Material: This word shall be construed to embrace machinery, manufactured articles, materials of construction (fabricated or otherwise), and any other classes of material to be furnished in connection with Contract, except where a more limited meaning is indicated by context.
43. Milestone: A principal event specified in Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all Work.
44. Modification: Same as Contract Modification.
45. Not in Contract: Work that is outside the scope of Work to be performed by Contractor under Contract Documents.
46. Notice of Completion: Shall have the meaning provided in California Civil Code Section 9204, and any successor statute.
47. Off Site: Outside geographical location of the Project.
48. Owner: The District.
49. Owner-Furnished, Contractor-Installed: Items furnished by Owner at its cost for installation by Contractor at its cost under Contract Documents.
50. Owner's Representative(s): See Document 00520 (Agreement).
51. Partial Utilization: Use by Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all of the Work.
52. PCBs: Polyclorinated byphenyls.
53. Phase: A specified portion of the Work (if any) specifically identified as a Phase in Document 00520 (Agreement) or Document 01100 (Summary).
54. Product Data: That information (brochures, catalog sheets, manufacturer's cut sheets, etc.) supplied by vendors having technical and commercial characteristics of the supplied equipment or materials and accompanying commercial terms such as warranties, instructions, and manuals.
55. Progress Report: A periodic report submitted by Contractor to Owner with progress payment invoices accompanying progress schedule. See Section 01320 (Progress Schedules and Reports) and Document 00700 (General Conditions).
56. Project: Total construction of which Work performed under Contract Documents may be whole or part.
57. Project Float: As defined in paragraph 1.2.B.3, Section 01320 (Progress Schedules and Reports).
58. Project Manual: Project Manual consists of Bidding Requirements, Agreement, Bonds, Certificates, Contract Conditions, Drawings, and Specifications.
59. Project Record Documents: All Project deliverables required under Sections 01700 et seq., including without limitation, as-built drawings; Project Record Specifications; Installation, Operation, and Maintenance Manuals; and Machine Inventory Sheets.

60. Provide: Furnish and install.
61. Request for Information ("RFI"): A document prepared by Contractor requesting information regarding the Project or Contract Documents as provided in Section 01250 (Modification Procedures). The RFI system is also a means for Owner to submit Contract Document clarifications or supplements to Contractor.
62. Request for Proposals ("RFP"): A document issued by Owner to Contractor whereby Owner may initiate changes in the Work or Contract Time as provided in Contract Documents. See Section 01250 (Modification Procedures).
63. Request for Substitution ("RFS"): A document prepared by Contractor requesting substitution of materials as permitted and to the extent permitted in Contract Documents. See Section 01600 (Product Requirements).
64. RFI-Reply: A document consisting of supplementary details, instructions, or information issued by Owner that clarifies or supplements Contract Documents, and with which Contractor shall comply. RFI-Replies do not constitute changes in Contract Sum or Contract Time except as otherwise agreed in writing by Owner. RFI-Replies will be issued through the RFI administrative system.
65. Samples: Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
66. Sanitation Standards: The Sonoma County Water Agency Design and Construction Standards for Sanitation Facilities.
67. Shop Drawings: All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
68. Shown: As indicated on Drawings.
69. Site: The particular geographical location of Work performed pursuant to Contract Documents.
70. Specifications: The written portion of the Contract Documents consisting of requirements for materials, equipment, construction systems, standards, and workmanship for the Work; performance of related services; and are contained in Divisions 1 through 16.
71. Specified: As written in Specifications.
72. Subcontractor: A person or entity that has a direct contract with Contractor to perform a portion of the Work at the Site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and neutral in gender and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.
73. Substantial Completion: The Work (or a specified part thereof) has progressed to the point where, in the opinion of Owner as evidenced by a Certificate of Substantial Completion, the Work is sufficiently complete, in accordance with Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work (or specified part) is complete and ready for final payment as evidenced by written recommendation of

Owner for final payment. The terms "Substantially Complete" and "Substantially Completed" as applied to all or part of the Work refer to Substantial Completion thereof.

74. Superintendence: Executive oversight and charge of the main aspects of construction, including scheduling, sequence of subcontractor Work, and quality control.
75. Supplemental Instruction: A written directive from Owner to Contractor ordering alterations or Modifications that do not result in change in Contract Sum or Contract Time, and do not substantially change Drawings or Specifications. See Section 01250 (Modification Procedures).
76. Testing and special inspection agency: An independent entity engaged by Owner to inspect and/or test the workmanship, materials, or manner of construction of buildings or portions of buildings, to determine if such construction complies with the Contract Documents and applicable codes.
77. Underground Facilities: All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities that have been installed underground to furnish any of the following services or materials: Electricity, gases, chemicals, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, or water.
78. Unit Price Work: Shall be the portions of the Work for which a unit price is provided in Document 00520 (Agreement) or Section 01100 (Summary).
79. Work: The entire completed construction, or the various separately identifiable parts thereof, required to be furnished under the Contract Documents within the Contract Time. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents including everything shown in the Drawings and set forth in the Specifications. Wherever the word "work" is used, rather than the word "Work," it shall be understood to have its ordinary and customary meaning.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01450

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contractor's Quality Control
B. Quality of the Work
C. Inspections and Tests by Governing Authorities
D. Inspections and Tests by Serving Utilities
E. Inspections and Tests by Manufacturer's Representatives
F. Tests and Inspections by Owner or Owner's Independent Testing and Inspection Agency
G. Additional Testing and Inspection

1.2 CONTRACTOR'S QUALITY CONTROL

A. Contractor's Quality Control: Ensure that products, services, workmanship, and Site conditions comply with requirements of Drawings and Specifications by coordinating, supervising, testing, and inspecting the Work and by utilizing only suitably qualified and appropriately audited, licensed, or trained personnel.
B. Quality Requirements: Work shall be accomplished in accordance with quality requirements of Drawings and Specifications, including, by reference, all codes, laws, rules, regulations, and standards. When no quality basis is prescribed, the quality and testing procedures shall be in accordance with the best-accepted practices of the construction industry for the locale of the Project, for projects of this type, or standards set by engineering or technical societies (e.g., ASTM or ASHRAE), whichever is more stringent.
C. Quality Control Personnel: Employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.
D. At Contractor's expense, Contractor may employ a certified independent testing agency to perform compaction tests where there is disagreement. Owner may consider such tests, but will have the authority to make the final determination of relative compaction.
E. At Contractor's expense, Contractor may employ a certified independent welding inspection agency to perform welding inspections. Owner may consider such tests, but will have the authority to make the final determination of welding quality.

1.3 QUALITY OF THE WORK

A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects, and fit for the intended use.
B. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements, as indicated or required by Contract Documents.
C. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling, and staining, until acceptance by Owner.
D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.

E. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Secure Owner's advance written consent. Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

F. Verification of Quality: Work shall be subject to verification of quality by Owner in accordance with provisions of the Contract Documents.
   1. Cooperate by making Work available for inspection.
   2. Such verification may include mill, plant, shop, or field inspection as required.
   3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
   4. Provide all information and assistance as required, including that by and from subcontractors, fabricators, materials suppliers and manufacturers, for verification of quality by Owner.
   5. Applicable provisions of the Contract Documents shall govern Contract Modifications, if any, resulting from such verification activities.

G. Observations by Owner's Consultants: Periodic and occasional observations of Work in progress will be made by Owner and Owner's consultants as deemed necessary to review progress of Work and general conformance with design intent.

H. Limitations on Inspection, Test, and Observation: Neither employment of independent testing and inspection agency nor observations or tests by Owner and Owner's consultants shall in any manner relieve Contractor of obligation to perform Work in full conformance to all requirements of Contract Documents.

I. Owner's Acceptance and Rejection of Work: Owner reserves the right to reject all Work not in conformance with the requirements of the Drawings and Specifications, or otherwise Defective.

J. Correction of Defective Work: Defective Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time.

K. Acceptance of Defective Work: Acceptance of Defective Work, without specific written acknowledgement and approval of Owner, shall not relieve the Contractor of the obligation to correct such Work.

L. Contract Adjustment for Defective Work: Should Owner determine that it is not feasible or in Owner's interest to require Defective Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between Owner and Contractor. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with applicable provisions of Document 00700 (General Conditions).

M. Non-Responsibility for Defective Work: Owner and Owner's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications.

N. Responsibility for Defective Work: Contractor shall have full responsibility for all consequences resulting from Defective Work, including without limitation all delays, disruptions, extra inspection and correction costs by Contractor and Owner and re-Work, and extra time and costs of all types. Contractor waives excuses for Defective Work relating to Owner's prior review of Submittals and/or prior failure to notice Defective Work in place on inspection.

1.4 INSPECTIONS AND TESTS BY GOVERNING AUTHORITIES

A. Regulatory Requirements for Testing and Inspection: Comply with CBC requirements and all other requirements of governing authorities having jurisdiction.
B. Inspections and Tests by Governing Authorities: Cause all tests and inspections required by governing authorities having jurisdiction to be made for Work under this Contract.
   1. Such authorities may include, but are not limited to PRMD, Fire Department, and similar agencies.
   2. Except as specifically noted, scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.

1.5 INSPECTIONS AND TESTS BY SERVING UTILITIES

A. Inspections and Tests by Serving Utilities: Cause all tests and inspections required by serving utilities to be made for Work under this Contract. Scheduling, conducting, and paying for such inspections shall be solely the Contractor's responsibility.

1.6 INSPECTIONS AND TESTS BY MANUFACTURER'S REPRESENTATIVES

A. Inspections and Tests by Manufacturer's Representatives: Cause all tests and inspections specified to be conducted by materials or systems manufacturers to be made. Additionally, all tests and inspections required by materials or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contract Sum.

1.7 TESTS AND INSPECTIONS BY OWNER OR OWNER'S INDEPENDENT TESTING AND INSPECTION AGENCY

A. Owner may conduct or Owner may select an independent testing and inspection agency or agencies to conduct tests and inspections as indicated on Drawings, in Specifications, and as required by governing authorities having jurisdiction.
B. Responsibility for payment for such tests and inspections shall be as indicated in paragraph 1.7D below. All time and costs for Contractor's service related to such tests and inspections shall be included in Contract Time and Contract Sum.
C. Contractor shall pay for all additional charges by testing and inspection agencies and governing authorities having jurisdiction due to the following:
   1. Contractor's failure to properly schedule or notify testing and inspection agency or authorities having jurisdiction.
   2. Changes in sources, lots, or suppliers of products after original tests or inspections.
   3. Changes in means, methods, techniques, sequences, and procedures of construction that necessitate additional testing, inspection, and related services.
   4. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.
   5. Contractor-submitted requests to change materials or products, which are accepted, but require testing and/or reinspection beyond original design.
D. In addition to tests to be performed by Contractor (and to be paid by Contractor) as required elsewhere in Contract Documents, tests and special inspections that may be performed by Owner or Owner's independent testing and inspection agency or agencies and paid by Owner include, but are not limited to, the following:

SECTION	TESTS
03002	Concrete slump
"	Concrete compressive strength
"	Grout compressive strength

E. Owner may perform tests at any time at its discretion.

F. California Test Method No. 216 (Relative Compaction of Untreated and Treated Soils and Aggregates) and 231 (Relative Compaction of Untreated/Treated Soils and Aggregates [Area Concept Utilizing Nuclear Gauges]) may be modified as follows:
   1. In lieu of the specified 10-pound hammer, a Test Lab Model No. F-590 Mechanical Compactor (or equal) with a 10-pound hammer will be used.
   2. In lieu of the specified split cylindrical mold, a non-split cylindrical mold of the same diameter and wall thickness will be used.
   3. Any of the provisions of Test Method No. 216 which conflict with the use of such equipment described in (1) and (2) are considered void to the extent they preclude the use of such equipment.
   4. In lieu of the specified test form, an Owner standard form will be used.
   5. Correction for oversize material may be obtained from a table based upon the given equations and the coefficient for +3/4-inch aggregate will be computed from the following formulae:

      $Y = 1.0$ for $P = 10$ to 20
      $Y = 1.0 - .002 (P - 20)$ for $P = 20$ to 50

      where:

      Y = coefficient for 3/4" aggregate
      P = percent retained on 3/4" screen

   6. In lieu of the sand cone method of determination of in-place density, the method described in Part 1 of California Test Method 231 will be used except that the mode of operation and the probe depth will be determined by Owner.
   7. In-place density and relative compaction will be determined on the basis of individual test sites in lieu of the area concept.

G. Test and Inspection Reports: After each inspection and test by an independent testing and inspection agency or agencies, one copy of report shall be promptly submitted to Owner, who will distribute copies to Contractor and any agency having jurisdiction (if required by Code).
   1. Reports shall clearly identify the following:
      a. Date issued.
      b. Project name and number.
      c. Identification of product and Specifications Section in which Work is specified.
      d. Name of inspector.
      e. Date and time of sampling or inspection.
      f. Location in Project where sampling or inspection was conducted.
      g. Type of inspection or test.
      h. Date of test.
      i. Results of tests.
      j. Comments concerning conformance with Contract Documents and other requirements.

2. Test reports shall indicate specified or required values and shall include statement whether test results indicate satisfactory performance of products.
3. Samples taken but not tested shall be reported.
4. Test reports shall confirm that methods used for sampling and testing conform to specified test procedures.
5. When requested, testing and inspection agency shall provide interpretations of test results.

H. Contractor Responsibilities for Inspections and Tests:
1. Unless specified otherwise, notify Owner and testing agency 72 hours in advance of expected time of each test and inspection, and for all other operations requiring inspection and testing services, by submitting Contractor's inspection request in writing (or, if Owner provides a specific form, on that form).
   a. When tests or inspections cannot be performed after such notice, due to Contractor's negligence, reimburse Owner for testing and inspection agency personnel and travel expenses incurred.
2. Deliver to laboratory or designated location, adequate samples of materials proposed to be used that require advance testing, together with proposed mix designs.
3. Cooperate with testing and inspection agency personnel, Owner, and Owner's consultants. Provide access to Work areas and off-Site fabrication and assembly locations, including during weekends and after normal Work hours.
4. Provide incidental labor and facilities to provide safe access to Work to be tested and inspected, to obtain and handle Samples at the Site or at source of products to be tested, and to store and cure test Samples.
5. Provide, at least 15 Days in advance of first test or inspection of each type, a schedule of tests or inspections indicating types of tests or inspections and their scheduled dates.

1.8 ADDITIONAL TESTING AND INSPECTION

A. If initial tests or inspections made by Owner or the testing and inspection agency reveal that materials do not comply with Contract Documents, or if Owner has reasonable doubt that materials do not comply with Contract Documents, additional tests and inspections shall be made as directed.
1. If additional tests and inspections establish that materials comply with Contract Documents, Owner shall pay all costs for such tests and inspections.
2. If additional tests and inspections establish that materials do not comply with Contract Documents, all costs of such tests and inspections shall be deducted from Contract Sum.
3. If Work requiring inspection is covered by follow-on or follow-up Work before it is inspected, uncover Work so proper inspections can be performed. All costs of such tests and inspections shall be deducted from Contract Sum.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 TEMPORARY ELECTRICITY

A. Contractor may make arrangements with Owner to use the 120-VAC convenience power receptacles at the aeration basins and blower building, if needed. If voltages other than 120-VAC (or higher loads than the existing circuits can provide) are required, make separate arrangements for such service with Pacific Gas and Electric Company.

1.2 TEMPORARY TELEPHONE

A. Provide, maintain, and pay for telephone service to field office at time of Project mobilization.

1.3 TEMPORARY WATER

A. Provide, maintain, and pay for suitable quality water service required for construction operations.
B. Contractor may use Owner-provided tertiary treated water from the hose bibb near the aeration basin for use on this Project. Contact Owner three Days prior to commencement of Work to coordinate using Owner's water. Owner will provide and install a backflow prevention device and water meter if Owner determines it to be necessary. Should Owner determine, in its sole discretion, that Contractor's use of Owner's water is excessive, Owner may terminate water delivery. Water used by Contractor shall not be permitted to discharge to the river in any manner that would erode the topsoil or banks, or silt or roil the river. No other Owner-provided water will be made available to Contractor for this Project.

1.4 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required temporary buildings with sanitary toilets for use of all workers.
B. Comply with all minimum requirements of the Health Department or other public agency having jurisdiction; maintain in a sanitary condition at all times.

1.5 TEMPORARY BARRIERS AND ENCLOSURES

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations.
B. Provide barricades required by governing authorities to control public access to existing buildings.
C. Protect vehicular traffic, stored materials, Site, and structures from damage.

1.6 TREE AND PLANT PROTECTION

A. Root protection:
   1. No storage of materials or equipment will be allowed within the dripline of any tree.
   2. Whenever possible, excavation shall be on a radial line, diverging from the tree trunk.
B. Exposure to harmful substances: No storage or dumping of any substances that may be harmful to trees shall occur at any location on the Site.

C. Where construction is to be performed in the vicinity of trees and shrubbery, the Work shall be carried on in a manner that will cause minimum damage. Owner will designate trees that are to be removed. Under no circumstances are additional trees to be removed without written permission from Owner. Trees and shrubbery that are not to be removed shall be protected from injury or damage resulting from Contractor's operations.
D. All damage shall be immediately reported to Owner, who will file a report so that penalties may be determined.
E. Any tree that is removed without Owner's permission or is irreparably damaged, in the opinion of Owner, shall cost Contractor $27.00 per square inch of cross section, measured at 4 ½ feet above ground, but not less than $250.00, such cost to be deducted from monies due or to become due under the Contract. If tree protection is not performed or is not performed adequately, and Owner determines that a tree has been irreparably damaged, Owner will impose the same penalty as for unauthorized removal of a tree.

1.7 WATER CONTROL

A. Protect Site from puddling or running water.

1.8 TRAFFIC CONTROL

A. Notification:
   1. Coordinate vehicular access with Owner at least 14 Days prior to starting Work that affects the access road.
   2. At least 7 Days prior to starting Work that affects the access road, Owner will notify residents along Neeley Road, in writing, that traffic flows will be subject to detours or delays and that access to individual driveways may be disrupted during working hours.

1.9 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to final inspection.
B. Clean and repair damage caused by installation or use of temporary Work.
C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01540

SITE SECURITY AND SAFETY

PART 1 GENERAL

1.1 SUBMITTALS

A. Safety Program.
B. Fire Protection Plan.

1.2 PROTECTION

A. Continuously maintain protection as necessary to protect the Work, as a whole and in part, and adjacent property and improvements from accidents, injuries or damage.
B. Properly protect the Work:
   1. With lights, guard rails, temporary covers and barricades.
   2. Enclose excavations with proper barricades.
   3. Brace and secure all parts of the Work against storm and accident.
   4. Provide such additional forms of protection that may be necessary under existing circumstances.
C. Provide and maintain in good condition all protective measures required to adequately protect the public from hazards resulting from the Work and to exclude unauthorized persons from the Work. When regulated by Building Code, Cal OSHA, or other authority, such legal requirements for protection shall be considered as minimum requirements. Be responsible for the protection in excess of such minimum requirements as required.

1.3 CONTROL OF SITE

A. Ensure that no alcohol, firearms, weapons, or controlled substance enters or is used at the Site. Immediately remove from the Site and terminate the employment of any employee found in violation of this provision.

1.4 SAFETY PROGRAM

A. Prior to starting any Work at the Site, submit a Safety Program that has been reviewed and approved by an Industrial Hygienist certified by the American Board of Industrial Hygiene or by a Certified Safety Professional. The Safety Program shall include the name, certification number, and certification seal of the Industrial Hygienist or Certified Safety Professional. Comply with the Safety Program and all applicable federal, state, and local regulation codes, rules, law and ordinances.
B. Receipt and/or review of the Safety Program by Owner, Engineer or Owner's Representative shall not relieve Contractor of any responsibility for complying with all applicable safety regulations.
C. It is essential that Contractor and each Subcontractor implement an effective and vigorous Safety and Health Program to cover their respective portions of the Work. Subject to Contractor's overall responsibility for Project safety, it shall be understood that the full responsibility for providing a safe place to work with respect to their respective portions of the Work rests with each individual Contractor and Subcontractor.
D. Safety Program components:
   1. Injury and Illness Prevention Program (IIPP): Conforming to the General Industrial Safety Orders (CCR Title 8, Division 1, Chapter 4, Subchapter 7, Section 3203), and the California Labor Code (Section 6401.7).

2. Site-Specific Safety and Health Plan (SSHP): Describing health and safety procedures that shall be implemented during the Work in order to ensure safety of the public and those performing the Work. Follow the guidelines for a SSHP listed in CCR Title 8, Division 1, Chapter 4, Subchapter 7, Section 5192, Item (b)(4) f.
3. Confined Space Program:
   a. The Site contains permit- and non-permit-confined spaces. Owner will provide Contractor with any available information regarding existing permit space hazards, entry operations, and safety information relating to Work in the existing permit spaces as set forth in the General Industrial Safety Orders (CCR Title 8, Division 1, Chapter 4, Subchapter 7, Section 5157).
   b. Permit space entry is allowed only through compliance with a permit space program meeting the requirements of Section 5157 of the General Industrial Safety Orders. During entry operations, or at the conclusion of entry operations, verbally notify Owner of the permit space program followed and of any hazards confronted or created in permit spaces during entry operations.

E. The wearing of hard hats shall be mandatory at all times for personnel on Site. Supply sufficient hard hats to equip properly all employees and visitors.
F. Whenever an exposure exists, appropriate personal protective equipment (PPE) shall be used by all affected personnel. Supply PPE to all personnel under Contractor's direction.

1.5 SAFETY REQUIREMENTS

A. Standards: Maintain the Project in accordance with state and local safety and insurance standards.
B. Hazards Control:
   1. Store volatile wastes in covered metal containers and remove from premises daily.
   2. Prevent accumulation of wastes that create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.
C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish or waste material on the Site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into streams or waterways.
D. Provide accident information on the forms provided by Contractor. This information shall be provided on the same Day as the occurrence of said incident.

1.6 SITE SAFETY OFFICER

A. Designate one of Contractor's staff as "Site Safety Officer" whose duties shall include the responsibility for enforcing the environmental protection provisions of the Contract Documents including safety and health, the requirements of the Occupational Safety and Health Act, and other applicable federal, state and local standards. Submit for review by Owner Contractor's intended traffic flow plan, security plan, program for temporary structures, housecleaning plan, demolition program, and environmental safety and health plan. After review by Owner, the implementation and enforcement of these plans shall become the responsibility of the Site Safety Officer. Any changes in the plans shall be requested by Contractor through the Site Safety Officer for written concurrence by Owner.
B. Owner's risk management representative(s) shall be allowed access to accident/injury and illness reports, inspection reports, scheduling and construction meetings, and safety meetings.

1.7 FIRE PROTECTION PLAN

A. Prior to starting any Work at the Site, submit a fire protection plan that has been reviewed and approved by the Guerneville Fire District. It is recommended that the plan include, but not be limited to, a discussion of the following items:
   1. Equipment spark arresters
   2. Fire-extinguishing equipment on hand
   3. Method of operation in case of fire
   4. Notification to authorities of any fire
   5. Access available during performance of Work
   6. Educating workers of fire protection plan

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products
B. Product Options and Substitutions
C. Product Delivery Requirements
D. Product Storage and Handling

1.2 PRODUCTS

A. Products: New material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components required for reuse.
B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
C. For similar components, provide interchangeable components of the same manufacturer.

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Summary:
   1. This paragraph 1.3 describes procedures for selecting products and requesting substitutions of unlisted materials in lieu of materials named in the Specifications or approved for use in Addenda that were not already the subject of a Document 00660 (Substitution Request Form) submittal as provided in Document 00200 (Instructions to Bidders).
B. For products specified by naming one manufacturer only, Owner believes that the manufacturer listed is capable of producing equipment or products that will satisfy the requirements of the associated Specification. This statement, however, shall not be construed as an endorsement of a particular manufacturer's product, nor shall it be construed that a named manufacturer's standard product will comply with the requirements of the associated Specification. In such cases, the Owner is not aware of an equal manufacturer.
C. Contractor's Options:
   1. For products specified only by reference standard: Select any product meeting that standard.
   2. For products specified by naming one or more products or manufacturers:
      a. Select products of any named manufacturer meeting Specifications.
      b. If product becomes unavailable due to no fault of Contractor or if the product specified no longer complies with local regulations or laws, submit Request for Substitution (RFS), including all information contained in this Section 01600 and a fully executed Document 00660 (Substitution Request Form), but using the term "Contractor" each place the term "Bidder" appears in that form.
D. Substitutions:
   1. Except as provided in Document 00200 (Instructions to Bidders) with respect to "or Approved Equal" items, Owner will consider Contractor's substitution requests only when product becomes unavailable due to no fault of Contractor or if the product

specified no longer complies with local regulations or laws. Requests for review of proposed substitute items will not be accepted from anyone other than Contractor. The RFS shall state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice Contractor's achievement of Substantial Completion on time, and whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for work on the Project).

2. Submit separate RFS for each product and support each request with:
   a. Product identification.
   b. Manufacturer's literature.
   c. Samples, as applicable.
   d. Name and address of similar projects on which product has been used, and dates of installation.
   e. Name, address, and telephone number of manufacturer's representative or sales engineer.
   f. For construction methods: Detailed description of proposed method; drawings illustrating methods.
3. Where required, itemize a comparison of the proposed substitution with product specified and list significant variations including, but not limited to dimensions, weights, service requirements, and functional differences. If variation from product specified is not pointed out in submittal, variation will be rejected even though submittal was favorably reviewed. Identify all variations of the proposed substitute from that specified in the RFS and indicate available maintenance, repair, and replacement service.
4. State whether the substitute will require a change in any of the Contract Documents (or provisions of any other direct contract with Owner for work on the Project) to adapt the design of the proposed substitute, and whether or not incorporation or use of the substitute in connection with Work is subject to payment of any license fee or royalty. Submit data relating to changes in construction schedule.
5. Include accurate cost data comparing proposed substitution with product and amount of net change in Contract Sum including, but not limited to, an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by Owner in evaluating the proposed substitute. Owner may require Contractor to furnish additional data about the proposed substitute.
6. Owner will not consider substitutions for acceptance (or, in Owner's sole discretion, Owner may make Contractor solely responsible for all resulting costs, expenses and other consequences) when a substitution:
   a. Results in delay meeting construction Milestones or completion dates.
   b. Is indicated or implied on submittals without formal request from Contractor.
   c. Is requested directly by Subcontractor or supplier.
   d. Acceptance will require substantial revision of Contract Documents.
   e. Disrupts Contractor's job rhythm or ability to perform efficiently.
7. Substitute products shall not be ordered without written acceptance of Owner.
8. Owner will determine acceptability of proposed substitutions and reserve right to reject proposals due to insufficient information.
9. Accepted substitutions will be evidenced by a Change Order or a CCD. All Contract Document requirements apply to Work involving substitutions.

E. Contractor's Representation and Warranty:
   1. Contractor's RFS constitutes a representation and warranty that Contractor:
      a. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
      b. Will provide the same warranty for substitution as for specified product.
      c. Will coordinate installation and make other changes that may be required for Work to be complete in all respects.
      d. Waives claims for additional costs which may subsequently become apparent.
      e. Will compensate Owner for additional redesign costs associated with substitution.
      f. Will be responsible for Construction Schedule slippage due to substitution.
      g. Will be responsible for Construction Schedule delay due to late ordering of available specified products caused by requests for substitution that are subsequently rejected by Owner.
      h. Will compensate Owner for all costs; including extra costs of performing Work under Contract Documents, extra cost to other contractors, and any claims brought against Owner, caused by late requests for substitutions or late ordering of products.
F. Owner's Duties:
   1. Review Contractor's RFS with reasonable promptness.
   2. Notify Contractor in writing of decision to accept or reject requested substitution.
G. Administrative Requirements:
   1. Specified products, materials, or systems for Project may include engineering or on-file standards required by the regulatory agency. Contractor's substitution of products, materials or systems may require additional engineering, testing, reviews, approvals, assurances, or other information for compliance with regulatory agency requirements or both. Provide all agency approvals or other additional information required and pay additional costs for required Owner services made necessary by the substitution at no increase in Contract Sum or Contract Time, and as a part of substitution proposal.

1.4 PRODUCT DELIVERY REQUIREMENTS

A. Deliver products in accordance with manufacturer's instructions.
B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.5 PRODUCT STORAGE AND HANDLING

A. Store products only in staging area per provisions of Section 01100 (Summary).
B. Handle, store, and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
C. For exterior storage of fabricated products, place on appropriate supports, above ground.
D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
E. Store loose granular materials on solid flat surfaces in a well-drained area.
F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01650

FACILITY START-UP

PART 1 GENERAL

1.1 DEFINITIONS

A. PCS-1: Construction of Blower Building improvements and improvements in Aeration Basin No. 1 including successful completion of pre-commissioning and commissioning Work. "PCS-1" and "Milestone 1" are synonymous.
B. PCS-2: Construction of improvements in Aeration Basin No. 2 including successful completion of pre-commissioning and commissioning Work.
C. Project Classified System (PCS): A defined part of the Project, consisting of an arrangement of items, such as equipment, structures, components, piping, wiring, materials, or incidentals, so related or connected to form an identifiable, unified, functional, operational, safe, and independent system.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Facility Start-up includes successful completion of pre-commissioning and commissioning for each PCS.

3.2 PRE-COMMISSIONING PERIOD

A. Completion of Construction Work:
   1. Complete Work for the PCS.
B. Equipment Start-up:
   1. Requirements for individual items of equipment are included in Division 02 through Division 16 Specification Sections.
   2. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Commissioning Period.
   3. Perform Equipment Start-up without introducing flow.
   4. Introduce treated effluent water to complete Equipment Start-up for the following equipment:
      a. Submersible Propeller Pumps.
      b. Submersible Mixers.
      c. High Speed Turbo Aeration Blower.
      d. Aeration Equipment: Fine Bubble Type.
      e. Aeration Equipment: Coarse Bubble Type.
   5. Procedures include but are not limited to the following:
      a. Test or check and correct deficiencies of:
         1) Power, control, and monitoring circuits for continuity prior to connection to power source.
         2) Voltage of all circuits.
         3) Phase sequence.
         4) Cleanliness of connecting piping systems.

5) Alignment of connected machinery.
6) Vacuum and pressure of all closed systems.
7) Lubrication.
8) Valve orientation and position status for manual operating mode.
9) Tankage for integrity using treated effluent.
10) Pumping equipment using treated effluent.
11) Instrumentation and control signal generation, transmission, reception, and response.
    (a) See Specification Section 13440.
12) Tagging and identification systems.
13) All equipment: Proper connections, alignment, calibration and adjustment.

b. Calibrate all safety equipment.
c. Manually rotate or move moving parts to assure freedom of movement.
d. "Bump" start electric motors to verify proper rotation.
e. Perform other tests, checks, and activities required to make the equipment ready for Commissioning Period.
f. Documentation:
    1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Start-up.
    2) Provide a place for the Contractor to record date and person accomplishing required Work.

6. Submit the following certifications, without restrictions or qualifications:
    a. Manufacturer's equipment installation check letters.
    b. Instrumentation Supplier's Instrumentation Installation Certificate.

C. Personnel Training:
1. See individual equipment Specification Sections.
2. Complete equipment training prior to commissioning period.
    a. In the on-Site training sessions, cover the information required in the Installation, Operation, and Maintenance Manuals and the following areas as applicable to PCSs.
        1) Operation of equipment.
        2) Lubrication of equipment.
        3) Maintenance and repair of equipment.
        4) Troubleshooting of equipment.
        5) Preventive maintenance procedures.
        6) Adjustments to equipment.
        7) Inventory of spare parts.
        8) Optimizing equipment performance.
        9) Capabilities.
        10) Operational safety.
        11) Emergency situation response.
        12) Takedown procedures (disassembly and assembly).

D. Contractor may proceed to commissioning period upon approval by Owner.

3.3 COMMISSIONING PERIOD

A. General:
1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the PCS, using raw waste water provided by Owner.

2. Duration of Commissioning Period: 168 hours.
3. If, during the Commissioning Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the Commissioning Period, the demonstration of functional integrity will be deemed to have failed.
   a. In the event of failure, a new Commissioning Period will recommence after correction of the cause of failure.
   b. The new Commissioning Period shall have the same requirements and duration as the original Commissioning Period.
4. Conduct the demonstration of functional integrity under full operational conditions.
5. Owner will provide operational personnel to provide process decisions affecting plant performance.
   a. Owner's assistance will be available only for process decisions.
   b. Contractor will perform all other functions including but not limited to equipment operation and maintenance until successful completion of the Commissioning Period.
6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
7. Time of beginning of Commissioning Period shall be agreed upon by Contractor and Owner in advance of initiating Commissioning Period.
8. Throughout the Commissioning Period, provide knowledgeable personnel to answer Owner's questions, provide final field instruction on select systems and to respond to any system problems or failures which may occur.
9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

3.4 PCS-1 (MILESTONE 1) ACCEPTANCE

A. Owner will issue a Certificate of Completion for Milestone 1 when, in Owner's opinion, PCS-1 (Milestone 1) has been achieved.

END OF SECTION

SECTION 01740

CLEANING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Progress Cleaning
   2. Final Cleaning

1.2 PROGRESS CLEANING

A. Perform periodic cleaning to ensure that any streets and other Owner and public properties are maintained free from accumulation of waste materials, dust, mud, and debris.
B. Where required, wet down surfaces to lay dust and prevent the blowing of dust to nearby residences or public properties.
C. Keep all paved roads clean and free of dust, mud, and debris resulting from Contractor's operations. Daily cleanup throughout the job will be necessary as Contractor progresses with its Work, but extra attention to cleanup shall be made prior to weekends and holidays. Without limiting the foregoing, remove trench spoil along traveled ways daily; grade and vacuum broom surfaces initially where applicable and later water flush with high-pressure sprays, being careful to avoid downstream contamination.
D. All dust, mud, spoils, and construction debris shall be removed daily from all roadways, ditches, shoulders, and private property (fills or spoils placed on private property at private property owner's written request excepted).
E. Disposal of Materials:
   1. All waste materials, debris, and rubbish shall be disposed of at sites to be chosen by Contractor in accordance with applicable local, state, and federal regulations.
   2. Contractor is cautioned that the County of Sonoma and cities within the county have regulations governing the disposal of rubble, broken pavement, and similar materials.
   3. Become familiar with the requirements of the agency having jurisdiction over any contemplated disposal site and comply with all such requirements.
F. If Contractor does not properly clean the Site, in the opinion of Owner, then Owner shall have the option of using outside equipment to perform the cleanup and such cost will be withheld from the Contract Sum.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final inspection, using only properly skilled workers.
B. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from exposed interior and exterior finished surfaces.
C. Repair, patch, and touch up marred surfaces to match adjacent finishes.
D. Clean interior and exterior surfaces exposed to view: remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
E. Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment operated during construction, clean ducts, blowers and coils of units operated without filters during construction.
F. Clean Site.
G. Mechanically sweep paved areas.

H. Remove waste and surplus materials, rubbish, and construction facilities from Site.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01741

CONSTRUCTION MATERIAL WASTE MANAGEMENT PLAN

PART 1 GENERAL

1.1 CONSTRUCTION MATERIAL WASTE MANAGEMENT PLAN

A. Submit Construction Material Waste Management Plan that includes, but is not limited to:
   1. Management monitoring program that includes, at a minimum, multiple recyclables containers. Goal is to divert 75 percent of materials waste to recycling instead of landfill. This applies only to materials that would typically be disposed via dumpster.
   2. Current recycling program used by each material supplier for materials listed in Divisions 1-16.
   3. Estimate of on-Site material reuse (native fill) in tons.
   4. Completed Self-Certification of Compliance for Contractor and each listed Subcontractor. Self-Certification of Compliance form is included at the end of this Section 01741.

B. Submit monthly progress reports updated with waste management log that includes which material containers have been removed, how many have been removed, and the weight of those containers.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SELF-CERTIFICATION OF COMPLIANCE WITH CONSTRUCTION MATERIAL WASTE PLAN

Firm Name: _____ Phone: _____

Address: _____

Principal Service or Product: _____

☐ Prime Contractor ☐ Supplier of Material/Service

☐ Subcontractor ☐ Broker

☐ Sole Ownership ☐ Corporation

☐ Partnership ☐ Joint Venture

I, Contractor/Subcontractor, hereby certify that I have read and understood, and agree to adopt and implement, the approved Construction Waste Management Plan for the Russian River County Sanitation District Treatment Plant Biological Nutrient Removal.

Certified by:

Name:_____ Title:_____

Signature:_____ Date:_____

SECTION 01770

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Description of Contract closeout procedures including:
      a. Removal of Temporary Construction Facilities
      b. Substantial Completion
      c. Final Completion
      d. Project Record Documents
      e. Project Guarantee
      f. Warranties
      g. Turn-In
      h. Computer Programs
      i. Release of Claims
      j. Fire Inspection Coordination
      k. Building Inspection Coordination

1.2 REMOVAL OF TEMPORARY CONSTRUCTION FACILITIES

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.
B. Clean and repair damage caused by installation or use of temporary facilities.
C. Restore permanent facilities used during construction to specified condition.
D. Comply with paragraph 1.9 of Section 01500 (Temporary Facilities and Controls).

1.3 SUBSTANTIAL COMPLETION

A. When Contractor considers Work or designated portion of the Work as Substantially Complete, submit timely written notice to Owner, with list of items remaining to be completed or corrected.
B. Within reasonable time, Owner will inspect to determine status of completion.
C. Should Owner determine that Work is not Substantially Complete, Owner will promptly notify Contractor in writing, listing all defects and omissions.
D. Remedy deficiencies and send a second written notice of Substantial Completion. Owner will reinspect the Work. If deficiencies previously noted are not corrected on reinspection, then Contractor shall pay the cost of the reinspection.
E. When Owner concurs that Work is Substantially Complete, Owner will issue a Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified by Owner.
F. Before a Certificate of Substantial Completion will be issued, Contractor must accomplish:
   1. Submittal of PLC and HMI programming software, licensing, and HMI screen shots.
   2. Pre-commissioning, training, and commissioning of PCS-2, per Section 01650 (Facility Startup).
   3. Submittal of final Installation, Operation, and Maintenance Manuals.
G. A punch list examination will be performed upon Substantial Completion. One follow-up review of punch list items for each discipline will be provided. If further Site visits are

required to review punch list items due to incompleteness of the Work by Contractor, Contractor shall reimburse Owner for costs associated with these visits.

1.4 FINAL COMPLETION

A. Final Completion occurs when Work meets requirements for Owner's Final Acceptance. When Contractor considers Work is Finally Complete, submit written certification that:
   1. Contractor has inspected Work for compliance with Contract Documents, and all requirements for Final Acceptance have been met.
   2. Except for Contractor maintenance after Final Acceptance, Work has been completed in accordance with Contract Documents and deficiencies listed with Certificate of Substantial Completion have been corrected. Equipment and systems have been tested in the presence of Owner, and are operative.
   3. Work is complete and ready for final inspection.

B. In addition to submittals required by Contract Documents, provide submittals required by governing authorities and submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

C. When Owner finds Work is acceptable and final closeout submittals are complete, Owner will issue final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order. Should Owner determine that Work is incomplete or Defective:
   1. Owner promptly will so notify Contractor, in writing, listing the incomplete or Defective items.
   2. Promptly remedy the deficiencies and notify the Owner when it is ready for reinspection.
   3. When Owner determines that the Work is acceptable under the Contract Documents, Owner will request Contractor to make closeout submittals.

D. Final adjustments of accounts:
   1. Submit a final statement of accounting to Owner, showing all adjustments to the Contract Sum and complete and execute Document 00650 (Agreement and Release of Any and All Claims).
   2. If so required, Owner shall prepare a final Change Order for submittal to Contractor, showing adjustments to the Contract Sum that were not previously made into a Contract Modification.

1.5 PROJECT RECORD DOCUMENTS

A. Contract Documents will not be closed out and final payment will not be made until completion and submittal of Project Record Documents described in Section 01780 (Project Record Documents).

1.6 PROJECT GUARANTEE

A. Requirements for Contractor's guarantee of completed Work are included in Article 9 of Document 00700 (General Conditions). Guarantee Work done under Contract against failures, leaks, or breaks or other unsatisfactory conditions due to defective equipment, materials, or workmanship, and perform repair work or replacement required, at Contractor's sole expense, for period of one year from date of Final Acceptance.

B. Neither recordation of Final Acceptance nor final certificate for payment nor provision of the Contract nor partial or entire use or occupancy of premises by Owner shall constitute acceptance of Work not done in accordance with Contract Documents nor relieve Contractor

of liability in respect to express warranties or responsibility for faulty materials or workmanship.

C. Owner may make repairs to Defective Work as set forth in Document 00700 (General Conditions), paragraph 9.3.

D. If, after installation, operation, or use of materials or equipment to be provided under Contract proves to be unsatisfactory to Owner, Owner shall have right to operate and use materials or equipment until said materials and equipment can, without damage to Owner, be taken out of service for correction or replacement. Period of use of Defective materials or equipment pending correction or replacement shall in no way decrease guarantee period required for acceptable corrected or replaced items of materials or equipment.

E. Nothing in this Section 01770 shall be construed to limit, relieve, or release Contractor's, Subcontractors', and equipment suppliers' liability to Owner for damages sustained as result of latent defects in equipment caused by negligence of suppliers' agents, employees, or Subcontractors. Stated in another manner, warranty contained in the Contract Documents shall not amount to, nor shall it be deemed to be, waiver by Owner of any rights or remedies (or time limits in which to enforce such rights or remedies) it may have for Defective workmanship or Defective materials under laws of this State pertaining to acts of negligence.

1.7 WARRANTIES

A. Execute Contractor's Submittals and assemble warranty documents and operation and maintenance manuals executed or supplied by Subcontractors, suppliers, and manufacturers.
   1. Provide table of contents and assemble in 8½ inches by 11 inches three-ring binder with durable plastic cover, appropriately separated and organized.
   2. Assemble in Specification Section order.

B. Submit material prior to final Application for Payment.
   1. For equipment put into use with Owner's permission during construction, submit within 14 Days after first operation.
   2. For items of Work delayed materially beyond Date of Substantial Completion, provide updated Submittal within 14 Days after acceptance, listing date of acceptance as start of warranty period.

C. Warranties are intended to protect Owner against failure of Work and against deficient, Defective, and faulty materials and workmanship, regardless of sources.

D. Limitations: Warranties are not intended to cover failures that result from the following:
   1. Unusual or abnormal phenomena of the elements
   2. Vandalism after Substantial Completion
   3. Insurrection or acts of aggression including war

E. Related Damages and Losses: Remove and replace Work which is damaged as result of Defective Work, or which must be removed and replaced to provide access for correction of warranted Work.

F. Warranty Reinstatement: After correction of warranted Work, reinstate warranty for corrected Work to date of original warranty expiration or to a date not less than one year after corrected Work was done, whichever is later.

G. Replacement Cost: Replace or restore failing warranted items without regard to anticipated useful service lives.

H. Warranty Forms: Submit drafts to Owner for approval prior to execution. Forms shall not detract from or confuse requirements or interpretations of Contract Documents.

1. Warranty shall be countersigned by manufacturers.
2. Where specified, warranty shall be countersigned by Subcontractors and installers.

I. Rejection of Warranties: Owner reserves right to reject unsolicited and coincidental product warranties that detract from or confuse requirements or interpretations of Contract Documents.

J. Term of Warranties: For materials, equipment, systems, and workmanship, warranty period shall be one year minimum from date of Final Completion of entire Work except where:
1. Detailed Specifications for certain materials, equipment or systems require longer warranty periods.
2. Materials, equipment or systems are put into beneficial use of Owner prior to Final Completion as agreed to in writing by Owner.

K. Transfer of Warranties: Any warranty shall automatically transfer, without charge, to a subsequent owner who acquires the Project. Any transfer of the Project shall not extend the duration of any warranty.

L. Warranty of Title: No material, supplies, or equipment for Work under Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver premises, together with improvements and appurtenances constructed or placed thereon by Contractor, to Owner free from any claim, liens, security interest, or charges, and further agrees that neither Contractor nor any person, firm, or corporation furnishing any materials or labor for any Work covered by Contract shall have right to lien upon premises or improvement or appurtenances thereon. Nothing contained in this paragraph, however, shall defeat or impair right of persons furnishing materials or labor under bond given by Contractor for their protection or any rights under law permitting persons to look to funds due Contractor in hands of Owner.

1.8 TURN-IN

A. Contract Documents will not be closed out and final payment will not be made until all keys and locks issued to Contractor during prosecution of Work and letters from property owners, if required under paragraph 1.2.F of Section 01740 (Cleaning), are turned in to Owner.

1.9 COMPUTER PROGRAMS

A. When any equipment requires operation by computer programs, submit the program, on appropriate electronic media, plus all user manuals and guides for operating the programs and making changes in the programs for upgrading and expanding the databases. Program shall be Windows 7 compatible. Provide required licenses to Owner at no additional cost.

1.10 RELEASE OF CLAIMS

A. Contract Documents will not be closed out and final payment will not be made until Document 00650 (Agreement and Release of Any and All Claims) is completed and executed by Contractor and Owner.

1.11 FIRE INSPECTION COORDINATION

A. Coordinate fire inspection and secure sufficient notice to Owner to permit convenient scheduling (if applicable).

1.12 BUILDING INSPECTION COORDINATION

A. Coordinate with Owner a final inspection for the purpose of obtaining an occupancy certificate (if applicable).

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01780

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for the following Project Record Documents:
      a. Project Record Drawings and Shop Drawings
      b. Project Record Specifications
      c. Miscellaneous Project Record Submittals
B. Specific Project Record Documents requirements that expand requirements of this Section may be included in the individual Sections of Divisions 2 through 16.

1.2 SUBMITTAL

A. During construction, bring hard-copy updates of the Project Record Drawings (Field Set) to monthly Progress Payment Meetings.
B. At completion of Project, deliver Project Record Documents to Owner. Project Record Documents required include:
   1. Marked-up copies of Drawings (Field Set)
   2. Final Project Record Drawings
   3. Marked-up copies of Specifications
   4. Marked-up copies of Shop Drawings, if applicable
   5. Miscellaneous Project Record Submittals
C. Accompany submittal with transmittal letter containing:
   1. Date
   2. Project title and Owner's Contract number
   3. Contractor's name and address
   4. Number and title of each Project Record Document
   5. Certification that each document as submitted is complete and accurate, and signature of Contractor or Contractor's authorized representative.

1.3 GENERAL

A. Prior to start of construction, Owner will provide one full size set of Drawings and one copy of the Project Manual for Contractor's use for recording as-built conditions.
B. Post changes and Modifications to the Contract Documents as they occur. Do not wait until the end of the Project. Owner will review Project Record Documents on a monthly basis to assure compliance with this requirement.
C. Refer instances of uncertainty to Owner for resolution.
D. Maintenance of Documents:
   1. Store Project Record Documents in the field office apart from Contract Documents used for construction.
   2. Do not permit Project Record Documents to be used for construction purposes.
   3. Maintain Project Record Documents in good order and in a clean, dry, neat, and legible condition.
   4. Make Project Record Documents available at all times for inspection by Owner.

1.4 PROJECT RECORD DRAWINGS AND SHOP DRAWINGS

A. Quality Draftsmanship: Project Record Drawings and Project Record Shop Drawings shall be prepared by competent drafters and shall be clear and fully legible. Owner shall be the sole judge of the acceptability of the Project Record Drawings and Project Record Shop Drawings.

B. Mark-up Procedure: During the construction period, maintain a set of full size prints of Drawings and Shop Drawings for Project Record Documents purposes ("Field Set"). Stamp each document (on each sheet or page) "PROJECT RECORD" in 2-inch high letters. Keep record documents current. Note: A reference by number to a Change Order, CCD, RFI, RFQ, RFP, Field Order or other such document is not acceptable as sufficient record information on any record document. Do not permanently conceal any Work until required information has been recorded.

1. Mark Drawings and Shop Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:
   a. Dimensional changes to the Drawings and Shop Drawings
   b. Revisions to details shown on the Drawings and Shop Drawings
   c. Depths of various elements of foundation in relation to main floor level or survey datum
   d. Variable or concealed field conditions
   e. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements
   f. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure
   g. Locations of underground Work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations, and similar items
   h. Actual numbering and set points of each electrical circuit
   i. Field changes of dimension and detail
   j. Revisions to routing of piping and conduits
   k. Revisions to electrical circuitry
   l. Actual equipment locations
   m. Duct, conduit, and cable size and routing
   n. Changes made by Change Order or CCD
   o. Details not on original Drawings or Shop Drawings
2. Mark completely and accurately Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Drawings location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Use revision block to record information related to the mark-ups, including CCD numbers; Alternate numbers, Change Order numbers, and similar identification.
5. Mark Drawing and Shop Drawing sets with red, erasable colored pencil.
6. Responsibility for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing or Shop Drawing data, whether the individual or entity is the installer, Subcontractor, or similar entity, is required to prepare the mark-up on Project Record Drawings or Shop Drawings.

a. Accurately record information in an understandable and legible drawing technique.
b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

C. Preparation of Project Record Drawings and Project Record Shop Drawings: Immediately prior to inspection for Certification of Substantial Completion, review completed marked-up Project Record Drawings (Field Set)and Project Record Shop Drawings with Owner. When authorized, prepare final Project Record Drawings and Project Record Shop Drawings.
1. Project Record Drawings:
a. Prior to review of Contractor's Application for Payment, the Owner and Contractor will review updates to the Field Set of Project Record Drawings to verify that record documents are current.
b. Upon Certification of Substantial Completion, Contractor will transfer all updates from the "Field Set" to a clean set of full size contract drawings furnished by the Owner. Each sheet shall include a Project Record Drawing stamp which is dated and "wet signed" by the Contractor.
c. If Contractor chooses and Owner approves in advance, Contractor may submit electronic updates on final Project Record Drawings, so long as final Project Record Drawings preserve the integrity of the data and are compatible with Owner's software.
2. Project Record Shop Drawings:
a. Transfer all information previously marked on Field Set to a separate clean set of Shop Drawings provided by Owner. Erase, redraw, and add details and notations where applicable. Identify and date each Shop Drawing; include the printed designation "PROJECT RECORD SHOP DRAWING" in a prominent location on each Shop Drawing. Bind the set with durable paper cover sheets, with appropriate identification, including titles, dates, and other information on cover sheet.

D. In addition to requirements of this Section, comply with supplemental requirements of Divisions 15.
1. Division 15 of the Specifications may require the preparation of large scale, detailed layout drawings of the Work of that Division. These layout drawings are not Shop Drawings as defined by Section 01420 (References and Definitions), but together with Shop Drawings or layout drawings of all other affected Sections are used to check, coordinate, and integrate the work of the various Sections.
2. Include these layout drawings as part of the Project Record Documents.

1.5 PROJECT RECORD SPECIFICATIONS

A. During the construction period, maintain one copy of the Specifications, including Addenda and Modifications issued, for Project Record Documents purposes.

B. Mark the Project Record Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, Change Order and CCD Work, and information on concealed installation that would be difficult to identify or measure and record later.
1. In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.

2. Record the name of the manufacturer, catalog number, supplier and installer, and other information necessary to provide a record of selections made and to document coordination with Installation, Operation, and Maintenance Manuals.
3. For each principal product specified, indicate whether data has been submitted in Installation, Operation, and Maintenance Manuals.

C. Preparation of Project Record Specifications: Immediately prior to inspection for Certification of Substantial Completion, review completed Field Set Project Record Specifications with Owner. When authorized, prepare final Project Record Specifications.
1. After Substantial Completion and before Final Completion, carefully transfer all data shown on the Field Set to a separate clean set of Specifications provided by Owner. Include the printed designation "PROJECT RECORD SPECIFICATION" in a prominent location on the Specifications.

1.6 MISCELLANEOUS PROJECT RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Owner for Owner's records. Categories of requirements resulting in miscellaneous records may include, but are not limited to, the following:
1. List all products used in the Project, organized by Specification section and article. Product list shall be submitted in an electronic format, compatible with Microsoft Excel 2000.
2. Delivery records of materials incorporated into the Work
3. Records of product lot numbers and expiration dates
4. Quality Assurance/Quality Control records for field Work

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01800

OPENINGS AND PENETRATIONS IN CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Methods of installing and sealing openings and penetrations in construction.
B. Related Sections:
   1. Division 0 (Introductory Information, Bidding Requirements, Contracting Requirements, and Conditions of the Contract).
   2. Division 1 (General Requirements).
   3. Section 05505 (Miscellaneous Metals).
   4. Section 07900 (Joint Sealants).
   5. Section 09905 (Painting and Protective Coatings).

1.2 REFERENCES

A. ACI 318	Building Code Requirements for Structural Concrete
B. ASTM A36	Standard Specification for Carbon Structural Steel
C. ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
D. NFPA 70	National Electrical Code, Article 501, Class 1 Locations
E. NFPA 90A	Standard for Installation of Air Conditioning and Ventilating Systems
F. SMACNA	Sheet Metal and Air Conditioning Contractors' National Association

1.3 SUBMITTALS

A. Shop Drawings:
   1. For each structure provide dimensioned or scaled (minimum 1/8 IN = 1 FT) plan view drawings containing the following information:
      a. Vertical and horizontal location of all required openings and penetrations.
      b. Size of all openings and penetrations.
      c. Opening type.
      d. Seal type.
   2. Manufacturer's installation instructions for standard manufactured products.
B. Obtain prior approval from Owner when any opening larger than 100 SQ IN must be made in existing or newly completed construction.

1.4 DEFINITIONS

A. Hazardous Areas: Areas shown in the Contract Documents as having Class I or Class II area classifications.
B. Washdown Areas: Areas having floor drains or hose bibs.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe Sleeves: Steel, ASTM A53, Schedule 40, black.

B. Pipe Sleeves Penetrating into Corrosive Areas: Stainless steel, 1/4 IN minimum thickness.
C. Backing Rod and Sealant: See Specification Section 07900 (Joint Sealants).
D. Modular Mechanical Seals:
   1. Acceptable manufacturers:
      a. Link-Seal.
   2. 304 stainless steel bolts, nuts and washers.
E. Sheet Metal Sleeves: Steel, ASTM A36, 12 GA.
F. Commercial Wall Castings:
   1. For unclassified areas both sides of penetration:
      a. Ductile iron, class equal to connecting piping system.
   2. For wet/corrosive areas either side of penetration:
      a. Stainless steel, 304L.

PART 3 EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Perform HVAC penetrations in accordance with NFPA 90A.
B. Perform electrical penetrations in accordance with NFPA 70, Article 501.
C. Install sleeves and castings in accordance with ACI 318, Chapter #6.
D. Hot-dip galvanize in accordance with Specification Section 05505 (Metal Fabrications) (or paint in accordance with Specification Section 09905 (Painting and Protective Coatings)) all steel sleeves installed.
E. When mechanical or electrical work cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, insets, fixtures or devices necessary to permit installation later.
   1. Lay out chases, holes or other openings which must be provided in masonry, concrete or other work.
F. Where pipes, conduits or ducts pass through floors in washdown areas, install sleeves with top 3 IN above finish floors.
   1. In non-washdown areas, install sleeves with ends flush with finished surfaces.
G. Size sleeves, blockouts and cutouts which will receive sealant seal such that free area to receive sealant is minimized and seal integrity may be obtained.
H. For insulated piping and ducts, size sleeves, blockouts and cutouts large enough to accommodate full thickness of insulation.
I. Do not cut into or core drill any beams, joists, or columns.
J. Do not install sleeves in beams, joists, or columns.
K. Do not install recesses in beams, joists, columns, or slabs.
L. Field Cutting and Coring:
   1. Saw or core drill with non-impact type equipment.
   2. Mark opening and drill small 3/4 IN or less holes through structure following opening outline.
   3. Sawcut opening outline on both surfaces.
      a. Knock out within sawcuts using impact type equipment.
      b. Do not chip or spall face of surface to remain intact.
      c. Do not allow any overcut with saw kerf.
M. Precast-Prestressed Concrete Construction:
   1. Do not cut openings nor core drill vertically or horizontally through stems of members.

2. Do not locate or install sleeves or recess sleeves vertically or horizontally through or in stems of members.
3. Cast openings and sleeves into flanges of units.
4. Cast openings larger than 6 IN in diameter or 6 IN maximum dimension in units at time of manufacture.
5. Cast openings smaller than 6 IN in diameter or 6 IN maximum dimensions in flanges of units at time of manufacture or field cut.

N. Where alterations are necessary or where new and old work join, restore adjacent surfaces to their condition existing prior to start of work.

O. Provide waterstop plate/anchor flange for piping, ducts, castings and sleeves cast-in-place in concrete.
1. For fabricated units, weld plate to sleeve, pipe, or ductwork.
2. For commercial castings, cast water stop/anchor with wall pipe.
3. Plate is to be same thickness as sleeve, pipe, casting or ductwork.
4. For fabricated units, diameter of plate or flange to be 4 IN larger than outside diameter of sleeve, pipe or ductwork.
5. For commercial castings, waterstop/anchor size to be manufacturer standard.
6. Provide continuous around entire circumference of sleeve, pipe, or ductwork.

P. Where area is blocked out to receive sheet metal sleeve at later date:
1. If blockout size is sufficient to allow placement, utilize dowels for interface of initially placed concrete and sleeve encasement concrete which is placed later.
   a. Size blockout based on sleeve size required plus 4 to 6 IN each side of sleeve for concrete encasement.
   b. Provide #4 dowels at 12 IN spacing along each side of blockout with minimum of two (2) dowels required per side.
2. If blockout size is not sufficient to allow placement of dowels, provide keyway along all sides of blockout.
   a. Size blockout based on sleeve size required plus 2 to 4 IN each side of sleeve for concrete encasement.

Q. For interior wall applications where backer rod and sealant are specified, provide backer rod and sealant at each side of wall.

R. Use full depth expanding foam sealant for seal applications where single or multiple pipes, conduits, etc., pass through a single sleeve.

S. Do not make duct or conduit penetrations below high water levels when entering or leaving tankage, wet wells, or other water holding structures.

T. Modular Mechanical Seals:
1. Utilize one (1) seal for concrete thickness less than 8 IN and two (2) seals for concrete, 8 IN thick or greater.
2. Utilize two (2) seals for piping 16 IN diameter and larger if concrete thickness permits.
3. Install seals such that bolt heads are located on the most accessible side of the penetration.

U. Backer Rod and Sealant:
1. Install in accordance with Specification Section 07900 (Joint Sealants).
2. Provide backer rod and sealant for modular mechanical seal applications.
   a. Apply on top side of slab penetrations and on interior, dry side wall penetrations.

3.2 SCHEDULES

A. General Schedule of Penetrations through Floors, Roofs, Foundation Base Slabs, Foundation Walls, Foundation Footings, Partitions and Walls for Ductwork, Piping, and Conduit:
   1. Provide the following opening and penetration types:
      a. Type A - Block out 2 IN larger than outside dimensions of duct, pipe, or conduits.
      b. Type B - Saw cut or line-drill opening. Place new concrete with integrally cast sheet metal or pipe sleeve.
      c. Type C - Fabricated sheet metal sleeve or pipe sleeve cast-in-place. Provide pipe sleeve with water ring for wet and/or washdown areas.
      d. Type D - Commercial type casting or fabrication.
      e. Type E - Saw cut or line-drill opening. Place new concrete with integrally cast pipe, duct or conduit spools.
      f. Type F - Integrally cast pipe, duct or conduit.
      g. Type G - Saw cut or line-drill and remove area 1 IN larger than outside dimensions of duct, pipe or conduit.
      h. Type H - Core drill.
      i. Type I - Block out area. At later date, place new concrete with integrally cast sheet metal or pipe sleeve.
   2. Provide seals of material and method described as follows.
      a. Category 1 - Modular Mechanical Seal.
      b. Category 2 - Roof curb and flashing according to SMACNA specifications unless otherwise noted on drawings.
      c. Category 3 - 12 GA sheet metal drip sleeve set in bed of silicon sealant with backing rod and sealant used in sleeve annullus.
      d. Category 4 - Backer rod and sealant.
      e. Category 5 - Full depth compressible sealant with escutcheons on both sides of opening.
      f. Category 6 - Full depth compressible sealant and flanges on both sides of opening. Flanges constructed of same material as duct, fastened to duct and minimum 1/2 IN larger than opening.
      g. Category 7 - Full depth compressible sealant and finish sealant or full depth expanding foam sealant depending on application.
   3. Furnish openings and sealing materials through new floors, roofs, partitions and walls in accordance with Schedule A, Openings and Penetrations for New Construction.
   4. Furnish openings and sealing materials through existing floors, roofs, partitions and walls in accordance with Schedule B, Openings and Penetrations for Existing Construction.

SCHEDULE A. OPENINGS AND PENETRATIONS SCHEDULE FOR NEW CONSTRUCTION

APPLICATIONS	DUCTS		PIPING		CONDUIT	
	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY
Through floors with bottom side a hazardous location	C F I	7 Not Req 7	D F I (1)	Not Req Not Req 7	C F	7 Not Req
Through floors on grade above water table	C F I	4 Not Req 4	C F I (1)	7 Not Req 7	C F I (1)	4 Not Req 7
Through slab on grade below water table	F	Not Req	F	Not Req	F	Not Req
Through floors in washdown areas	C I	4 4	C H (2) I (1)	4 3 4	F H (2) I (1)	Not Req 3 7
Through walls where one side is a hazardous area	C F I	7 Not Req 7	D F I (1)	Not Req Not Req 7	C F	7 Not Req
Through exterior wall below grade above water table	C F I	7 Not Req 7	C D F I (1)	1 Not Req Not Req 1	F I (1)	Not Req 7
Through wall from tankage or wet well (above high water level) to dry well or dry area	C F I	7 Not Req 7	C D F H (2)	1 Not Req Not Req 1	C F H (2) I (1)	7 Not Req 7 7
Through wall from tankage or wet well (below high water level) to dry well or dry area	F	Not Req	F	Not Req	F	Not Req
Through exterior wall above grade	A B C	6 6 6	A B D H (2)	5 5 Not Req 5	C H (2)	5 4
Roof penetrations	A	2	A	2	A	2
Through interior walls and slabs not covered by the above applications	A C	4 4	A C	4 4	A C F	4 4 Not Req

SCHEDULE B. OPENINGS AND PENETRATIONS SCHEDULE FOR EXISTING CONSTRUCTION

APPLICATIONS	DUCTS		PIPING		CONDUIT	
	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY
Through floors with bottom side a hazardous location	B E	7 Not Req	B (1) E (3) H (2)	7 Not Req 7	B (1) E (3) H (2)	7 Not Req 7
Through floors on grade above water table	B	7	B	7	B	7
Through slab on grade below water table	E	Not Req	E	Not Req	E	Not Req
Through floors in washdown areas	G	3	G H (2)	3 3	G H (2)	3 3
Through walls where one side is a hazardous area	B E	7 Not Req	B (1) B (3) E H (2)	7 1 Not Req 7	B (1) (3) E H (2)	7 Not Req 7
Through exterior wall below grade above water table	B	7	B (1) B (3) H (2)	7 1 7	B (1) (3) H (2)	7 7
Through wall from tankage or wet well (above high water level) to dry well or dry area	B E	7 Not Req	B E H (2)	1 Not Req 1	B (1) (3) E H (2)	7 Not Req 7
Through wall from tankage or wet well (below high water level) to dry well or dry area	E	Not Req	E	Not Req	E	Not Req
Through exterior wall above grade	G	6	G (1) (3) H (2)	5 5	G (1) (3) H (2)	5 7
Roof penetrations	G	2	G (1) (3) H (2)	2	G	2
Through interior walls and slabs not covered by the above applications	G	4	G (1) (3) H (2)	4 4	G (1) (3) H (2)	4 4

(1) Multiple piping 3 IN and smaller or multiple conduits.
(2) Single pipe 3 IN and smaller or single conduit.
(3) Single pipe or conduit larger than 3 IN.

END OF SECTION

SECTION 01825

TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for training Owner's personnel, by persons retained by Contractor specifically for the purpose, on the proper operation and maintenance of the equipment and systems supplied under the Contract.

1.2 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Lesson plans for each training session to be conducted by the manufacturer's representatives. Lesson plans shall include:
      a. Subject of each training session
      b. Identity and qualifications of individuals to be conducting the training
      c. Proposed schedule of each training session including date, time, instructor and topic
      d. All sessions shall be aligned with shift schedules of the operations and maintenance staff
   2. Provide an electronic version of all training materials.

1.3 TRAINING - GENERAL

A. Where specified, the Contractor shall conduct training sessions for Owner's personnel to instruct the staff on the proper operation, care, and maintenance of the equipment and systems installed under this Contract. Training shall take place under the conditions specified in the following paragraphs.

1.4 LOCATION

A. Unless otherwise approved by Owner, training sessions shall take place in a training room selected by Owner at the Site.

1.5 LESSON PLANS

A. Formal written lesson plans shall be prepared for each training session. Lesson plans shall contain an outline of the material to be presented along with a description of visual aids to be utilized during the session. Each plan shall contain a time allocation for each subject.
B. One complete set of originals of the lesson plans, training manuals, handouts, visual aids, and reference material shall be the property of Owner and shall be suitably bound for proper organization and easy reproduction. The Contractor shall furnish ten copies of necessary training manuals, handouts, visual aids, and reference materials at least 7 Days prior to each training session.

1.6 FORMAT AND CONTENT

A. Each training session shall be comprised of time spent both in the classroom and at the specific location of the subject equipment or system. As a minimum, training session shall cover the following subjects for each item of equipment or system:
   1. Familiarization:

a. Review catalog, parts lists, drawings, etc., which have been previously provided for the plant files and Installation, Operation, and Maintenance manuals.
b. Review the installation of the specific equipment items.
c. Demonstrate the unit and indicate how all parts of the Specifications are met.
d. Answer questions.

2. Safety:
   a. Using material previously provided, review safety references.
   b. Discuss proper precautions around equipment.
3. Operation:
   a. Using material previously provided, review reference literature.
   b. Explain all modes of operation (including emergency).
   c. Review with Owner's personnel proper use of the equipment.
4. Preventive Maintenance:
   a. Using material previously provided, review preventive maintenance (PM) lists including:
      1) Reference material.
      2) Daily, weekly, monthly, quarterly, semiannual, and annual jobs.
   b. Show how to perform PM jobs.
   c. Show Owner's personnel what to look for as indicators of equipment problems.
5. Corrective Maintenance:
   a. List possible problems.
   b. Discuss repairs; identify special problems.
   c. Open up equipment and demonstrate procedures, where practical.
   d. Programming and troubleshooting control system.
6. Parts:
   a. Show how to use previously provided parts lists and order parts.
   b. Review spare parts on hand. Make recommendations regarding additional parts that should be available.
7. Local Representatives:
   a. Where to order parts: name, address, telephone.
   b. Service problems:
      1) Who to call.
      2) How to get emergency help.
8. Installation, Operation, and Maintenance Manuals:
   a. Review any other material submitted.
   b. Update material, as required.

1.7 VIDEO RECORDING

A. Owner may retain the services of a commercial video taping service to record each training session. After taping, Owner may edit and supplement material with professionally produced graphics to provide a permanent record. Advise all manufacturers providing training sessions that the material will be video taped.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Training shall be conducted no earlier than seven Days after starting and adjusting commences. Classes shall be scheduled such that classroom sessions are interspersed with field instruction in logical sequence. The Contractor shall arrange to have the training conducted on consecutive Wednesdays and Thursdays, with no more than eight hours of classes scheduled for any one Day. Concurrent classes will not be allowed.

B. Visits to the Site by manufacturer's representatives for demonstration and training purposes shall be deemed to be a separate visit to the Site, independent of visits required for equipment checkout, testing, and startup unless prior approval of Owner is received to combine visits.

C. The following services shall be provided for each item of equipment or system as required in individual Specification sections. Additional services shall be provided, where specifically required in individual Specification sections.

1. Operations personnel classroom equipment training shall include, at a minimum:
   a. Using slides and drawings, discuss the equipment's specific location in the plant and an operational overview.
   b. Purpose and function of the equipment (or systems).
   c. A working knowledge of the operating theory of the equipment.
   d. Start-up, shutdown, normal operation, and emergency operating procedures, including a discussion on system integration and electrical interlocks, if any.
   e. Identify and discuss safety items and procedures.
   f. Routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
   g. Operator detection, without test instruments, of specific equipment trouble symptoms.
   h. Required equipment exercise procedures and intervals.
   i. Routine disassembly and assembly of equipment if applicable for purposes such as operator inspection of equipment.
   j. Routing tests of electrical equipment and instruments, including schedule of tests.
2. Operations personnel hands-on equipment training shall include, at a minimum:
   a. Identify location of equipment and review the purpose.
   b. Identifying piping and flow options.
   c. Identifying valves and their purpose.
   d. Identifying instrumentation:
      1) Location of primary element.
      2) Location of instrument readout.
      3) Discuss purpose, basic operation, and information interpretation.
   e. Discuss, demonstrate, and perform standard operating procedures and operators' round checks.
   f. Discuss and perform the preventative maintenance activities.
   g. Discuss and perform start-up and shutdown procedures.
   h. Perform the required equipment exercise procedures.
   i. Perform routine disassembly and assembly of equipment if applicable.
   j. Identify and review safety items and perform safety procedures, if feasible.

   k. Routine tests of electrical equipment.
   l. Operation of electrical equipment and appurtenances.
3. Maintenance and repair personnel classroom equipment training shall include, at a minimum:
   a. Theory of operation.
   b. Description and function of equipment.
   c. Start-up and shutdown procedures.
   d. Normal and major repair procedures.
   e. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.
   f. Routine and long-term calibration procedures.
   g. Safety procedures.
   h. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.
   i. Discuss preventative maintenance Work based on hours of run time.
   j. Discuss predictive maintenance.
   k. Maintenance and repair of electrical equipment and appurtenances.
   l. HMI operation, troubleshooting and programming modifications.
   m. PLC wiring, layout, communication, control theory and register addressing.
4. Maintenance and repair personnel hands-on equipment training shall include, at a minimum:
   a. Locate and identify equipment components.
   b. Review the equipment function and theory of operation.
   c. Review normal repair procedures.
   d. Perform start-up and shutdown procedures.
   e. Review and perform the safety procedures.
   f. Perform routine assembly and disassembly of equipment if applicable.
   g. Identify and review safety items and perform safety procedures, if feasible.
   h. Perform Owner-approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.
   i. Perform HMI system operation and controls and alarm screens.

END OF SECTION

DIVISION 2

SITE CONSTRUCTION

SECTION 02072

DEMOLITION, CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolition, cutting and patching of existing construction as indicated, or as required to accommodate new Work shown or specified.

1.2 SUBMITTALS

A. Shop Drawings:
1. Indicating manufacturer and type of:
   a. Proposed nonshrink grout.
   b. Epoxy bonding adhesive.
   c. Proposed materials and methods to be used for matching and repairing existing construction.

1.3 DELIVERY, STORAGE, AND HANDLING

A. General:
1. Salvage items, designated for Owner's salvage, as a functional unit.
2. Clean, list and tag for storage.
3. Protect from damage and deliver to location designated.
4. Salvage each item with auxiliary or associated equipment required for operation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Nonshrink grout:
   a. Supreme Grout by Gifford Hill.
   b. Masterflow 713 by Master Builders.
   c. Sika Grout 212 by Sika.
   d. Or Approved Equal.
2. Epoxy bonding adhesive:
   a. Euco No.452 MV by Euclid Chemical Co.
   b. Sikadur 32, Hi-Mod by Sika Corporation.
   c. Or Approved Equal.

2.2 MATERIALS

A. Nonshrink Grout:
1. Nonmetallic, noncorrosive and nonstaining.
2. Premixed with only water to be added in accordance with manufacturer's instructions at Site.
3. Grout to produce a positive but controlled expansion. Mass expansion not to be created by gas liberation or by other means.
4. Minimum compressive strength at 28 Days to be 6500 psi.

B. Epoxy Bonding Adhesive:
   1. Two component, moisture insensitive adhesive manufactured for the purpose of bonding fresh concrete to hardened concrete.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide safety lights as required.

3.2 INSTALLATION

A. Cutting and Removal:
   1. Remove existing Work indicated to be removed, or as necessary for installation of new Work.
   2. Neatly cut and remove materials, and prepare all openings to receive new Work.
   3. Remove concrete in small sections.
   4. Coat exposed edges of grout with a cure/seal compound recommended by grout manufacturer.
B. Salvaged Items:
   1. Thoroughly dry and clean all metal surfaces.
   2. Prime all bare metal in accordance with Section 09905 (Painting and Protective Coatings).
   3. Dispose of items or materials not designated for Owner's salvage or reuse. Promptly remove from Site.
   4. Do not store or sell Contractor salvaged items or materials on Site.
C. Clean Up:
   1. Transport debris and legally dispose of off Site.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03002

CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete and grout.

1.2 REFERENCES

A. ACI 116R	Cement and Concrete Terminology
B. ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
C. ACI 212.3R	Chemical Admixtures for Concrete
D. ACI 304R	Guide for Measuring, Mixing, Transporting, and Placing Concrete
E. ACI304.2R	Placing Concrete by Pumping Methods
F. ACI 305R	Hot Weather Concreting
G. ACI 306R	Cold Weather Concreting
H. ACI 318	Building Code Requirements for Structural Concrete
I. ACI 347R	Recommended Practice for Concrete Formwork.
J. ASTM A82	Standard Specification Steel Wire, Plain, for Concrete Reinforcement
K. ASTM A185	Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
L. ASTM A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (Including Supplementary Requirements S1)
M. ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
N. ASTM C33	Standard Specification for Concrete Aggregates
O. ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
P. ASTM C94	Standard Specification for Ready-Mixed Concrete
Q. ASTM C138	Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
R. ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
S. ASTM C150	Standard Specification for Portland Cement
T. ASTM C157	Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
U. ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
V. ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
W. ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
X. ASTM C260	Standard Specification for Air Entraining Admixtures for

	Concrete
Y. ASTM C289	Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
Z. ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
AA.ASTM C494	Standard Specification for Chemical Admixtures for Concrete
BB. ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
CC.ASTM C1315	Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
DD.	
EE. ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
FF.	
GG.COE CRD-C572	Polyvinyl Waterstops

1.3 QUALITY CONTROL

A. Concrete Testing.
   1. Contractor to employ and pay for services of a testing laboratory to:
      a. Design concrete mixes.
      b. Mixing and test trials of concrete mixes.
   2.
   3. Concrete testing shall be the responsibility of the Owner.
B. Do not begin concrete production until proposed concrete mix design has been approved by Owner.
   1. Approval of concrete mix design by Owner does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Section 03002.
C. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
   1. Do not use revised concrete mixes until submitted to and approved by Owner.
D. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.

1.4 QUALIFICATIONS

A. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).
B. Formwork, shoring and reshoring for slabs and beams except where cast on ground to be designed by a professional engineer currently registered in the state of California.

1.5 DEFINITIONS

A. Per ACI 116R except as modified herein:
   1. Concrete fill: Non-structural concrete.
   2. Exposed concrete: Exposed to view after construction is complete.
   3. Lean concrete: Concrete with low cement content.
   4. Nonexposed concrete: Not exposed to view after construction is complete.

5. Required: Required by Contract Documents.
6. Specified strength: Specified compressive strength at 28 Days.
7. Submitted: Submitted to Owner.

1.6 SUBMITTALS

A. Shop Drawings:
1. Concrete mix designs proposed for use. Concrete mix design submittal to include the following information:
   a. Sieve analysis and source of fine and coarse aggregates.
   b. Test for aggregate organic impurities.
   c. Test for deleterious aggregate per ASTM C289.
   d. Proportioning of all materials.
   e. Type of cement with mill certificate for cement.
   f. Type of fly ash with certificate of conformance to specification requirements.
   g. Slump.
   h. Air content.
   i. Brand, type, ASTM designation, and quantity of each admixture proposed for use.
   j. 28-Day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
   k. Shrinkage test results.
   l. Standard deviation value for concrete production facility.
2. Manufacturer and type of joint filler, joint sealant, curing agent and chemical floor hardener.
3. Manufacturer and type of bonding and patching mortar and bonding adhesive used at construction joints.
4. Manufacturer and type of nonshrink grout and the cure/seal compound required for the nonshrink grout.
5. Reinforcing steel: Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
   a. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
   b. Obtain approval of shop drawings by Owner before fabrication.
   c. Mill certificates.
6. Strength test results of in place concrete including slump, air content and concrete temperature.
7. Detailed concrete placement schedule including:
   a. Layout drawing.
   b. Proposed expansion and construction joint locations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:
1. Cement:
   a. Store in moistureproof, weathertight enclosures.
   b. Do not use if caked or lumpy.
2. Aggregate:
   a. Store to prevent segregation and contamination with other sizes or foreign materials.
   b. Obtain samples for testing from aggregates at point of batching.
   c. Do not use frozen or partially frozen aggregates.
   d. Do not use bottom 6 IN of stockpiles in contact with ground.

e. Allow sand to drain until moisture content is uniform prior to use.
3. Admixtures:
   a. Protect from contamination, evaporation, freezing, or damage.
   b. Maintain within temperature range recommended by manufacturer.
   c. Completely mix solutions and suspensions prior to use.
4. Reinforcing steel:
   a. Support and store all rebars above ground.
5. Epoxy Grout:
   a. Each component packaged separately for mixing at Site.

B. Delivery:
1. Concrete:
   a. Prepare a delivery ticket for each load for ready-mixed concrete.
   b. Truck operator shall hand ticket to Owner at the time of delivery.
   c. Ticket to show:
      1) Mix identification mark.
      2) Quantity delivered.
      3) Amount of each material in batch.
      4) Outdoor temp in the shade.
      5) Time at which cement was added.
      6) Numerical sequence of the delivery.
      7) Amount of water added.
2. Reinforcing steel: Ship to Site with attached plastic or metal tags with permanent mark numbers.
   a. Mark numbers to match shop drawing mark number.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Nonshrink, nonmetallic grout:
   a. Sika "SikaGrout 212."
   b. Gifford Hill "Supreme Grout."
   c. Master Builders "Masterflow 713."
   d. Or Approved Equal.
2. Epoxy grout:
   a. Master Builders "Brutem MPG."
   b. Euclid Chemical Company, "High Strength Grout."
   c. Fosroc, "Conbextra EPHF".
   d. Or Approved Equal.
3. Expansion joint fillers:
   a. Permaglaze Co.
   b. Rubatex Corp.
   c. Williams Products, Inc.
   d. Or Approved Equal.
4. Waterstops, PVC:
   a. Greenstreak Plastic Products, Inc.
   b. W. R. Meadows, Inc.

c. Burke Company.
d. Or Approved Equal.

5. Waterstops, preformed strip type:
   a. Acceptable manufacturers:
      1) Hydrotite CJ by Greenstreak Plastics, Inc.
      2) Adeka Ultra Seal USA.
   b. Materials:
      1) Hydrophilic type waterstop manufactured solely for the purpose of preventing water from traveling through construction joints.
      2) Hydrotite type CJ-0725-3K.
      3) Or Approved Equal.
6. Form coating:
   a. Richmond "Rich Cote."
   b. Industrial Lubricants "Nox-Crete Form Coating."
   c. Protex "Pro-Cote."
   d. Or Approved Equal.
7. Prefabricated forms:
   a. Simplex "Industrial Steel Frame Forms."
   b. Symons "Steel Ply."
   c. Universal "Uniform."
   d. Or Approved Equal.
8. Chemical sealer:
   a. L & M Construction Chemicals, Inc.
   b. Euclid Chemical Co.
   c. Dayton Superior.
   d. Or Approved Equal.

2.2 MATERIALS

A. Portland Cement: Conform to ASTM C150 I-II Low Alkali.
B. Fly Ash:
   1. ASTM C618, Class F.
   2. Maximum loss on ignition: 4 percent.
   3. Compatible with other concrete ingredients.
   4. Non-staining.
      a. Hardened concrete containing fly ash to be uniform light gray color.
C. Admixtures:
   1. Air entraining admixtures: ASTM C260.
   2. Water reducing, retarding, and accelerating admixtures:
      a. ASTM C494 Type A through E.
      b. Conform to provisions of ACI 212.3R.
      c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Owner and at no cost to Owner.
      d. Follow manufacturer's instructions.
      e. Use chloride free admixtures only.
   3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:
      a. 0.10 all concrete.

4. Do not use calcium chloride.
5. Pozzolanic admixtures: ASTM C618.
6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.

D. Water: Potable, clean, free of oils, acids and organic matter.

E. Aggregates:
1. Normal weight concrete: ASTM C33, except as modified below.
2. Fine aggregate: Clean natural sand.
   a. No manufactured or artificial sand.
3. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material.
   a. Maximum amount of clay or shale particles: 1 percent.
4. Gradation of coarse aggregate:
   a. Lean concrete and concrete topping: Size #7.
   b. All other concrete: Size #57 or #67.

F. Concrete Grout:
1. Nonshrink nonmetallic grout:
   a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
   b. Grout to produce a positive but controlled expansion.
   c. Mass expansion not to be created by gas liberation.
   d. 28-Day minimum compressive strength of nonshrink grout: 6500 psi.
2. Epoxy grout:
   a. 3-component epoxy resin system.
      1) Two liquid epoxy components.
      2) One inert aggregate filler component.

G. Reinforcing Steel:
1. Reinforcing bars: ASTM A615, Grade 60.
2. Welded wire fabric: ASTM A185.
   a. Minimum yield strength: 60,000 psi.

H. Forms:
1. Prefabricated or job built.
2. Wood forms:
   a. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
   b. Built-in-place or prefabricated type panel.
   c. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire area.
   d. When approved by Owner, plywood may be reused.
3. Metal forms:
   a. Metal forms excluding aluminum may be used.
   b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
4. Chamfer strips: Clear white pine, surface against concrete planed.
5. Form ties: Removable end, permanently embedded body type with cones on outer ends not requiring auxiliary spreaders.
   a. Cone diameter: 3/4 IN minimum to 1 IN maximum.
   b. Embedded portion 1 IN minimum back from concrete face.
   c. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.

d. Provide ties with built-in waterstops at all walls that will be in contact with process liquid during plant operation.
6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

I. Waterstops:
1. Plastic: Corp of Engineers Specification CRD-C572.
2. Serrated with center bulb.
3. Thickness: 3/8 IN.
4. Length (general use): 6 IN unless indicated otherwise.
5. Expansion joints:
a. Length: 9 IN.
b. Center bulb: 1 IN OD x 1/2 IN ID.
6. Provide hog rings or grommets spaced at maximum 12 IN OC along the length of the water stop.
7. Provide factory made waterstop fabrications at all changes of direction, intersections and transitions leaving only straight butt splices for the field.

J. Chairs, Runners, Bolsters, Spacers, and Hangers:
1. Stainless steel, epoxy coated, or plastic coated metal.
a. Plastic coated: Rebar support tips in contact with the forms only.

K. Chemical Floor Sealer:
1. Colorless low VOC water-based solution containing acrylic copolymers.
a. ASTM C1315, Class B, minimum 30 percent solids.
2. Similar to L & M Construction Chemicals Inc. Dress & Seal WB 30.
3. Or Approved Equal.

L. Vapor Retarder:
1. Vapor transmission not exceeding 0.1 perm.
2. Tear strength 15 psi.
3. Similar to: Alumiseal "Zero Perm".
4. Or Approved Equal.

M. Membrane Curing Compound: ASTM C309, Type I-D.
1. Resin based, dissipates upon exposure to UV light.
2. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.

N. Expansion Joint Filler:
1. In contact with water or sewage:
a. Closed cell neoprene.
b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression deflection (Grade SCE41).

2.3 CONCRETE MIXES

A. General:
1. All concrete to be ready mixed concrete conforming to ASTM C94.
a. Discharge concrete from ready mix trucks within time limit and drum revolutions stated in ASTM C94.
2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.

B. Strength:
   1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
All Concrete	Normal weight	4000 psi

*Minimum 28-Day compressive strength.

C. Air Entrainment: Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	5 to 7
1/2 IN	5 1/2 to 8

   1. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump: 4 IN maximum, 1 IN minimum.
   1. Measured at point of discharge of the concrete into the concrete construction member.
   2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
   3. Pumped concrete:
      a. Provide additional water at batch plant to allow for slump loss due to pumping.
      b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
   4. Determine slump per ASTM C143.

E. Selection of Proportions:
   1. General - Proportion ingredients to:
      a. Produce proper workability, durability, strength, and other required properties.
      b. Prevent segregation and collection of excessive free water on surface.
   2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	MINIMUM CEMENT, LB/CY			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	MAXIMUM AGGREGATE SIZE, IN			
	1/2	3/4	1	
4000	611	611	611	0.45

   3. Sand cement grout:
      a. Three parts sand.
      b. One part Portland cement.
      c. Entrained air: Six percent plus or minus one percent.
      d. Sufficient water for required workability.
      e. Minimum 28-Day compressive strength: 3,000 psi.
   4. Pan stair fill:
      a. Coarse aggregate: 100 percent passing a 1/2 IN sieve.
      b. Proportions:
         1) 1 sack cement.

2) 150 LBS coarse aggregate.
3) 150 LBS fine aggregate (sand).

c. Adjust mix to obtain satisfactory finishing.

5. Normal weight concrete: Proportion mixture to provide desired characteristics using one of methods described below:
   a. Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
      1) Air content within range specified above.
      2) Record and report temperature of trial mixes.
      3) Proportion trial mixes per ACI 211.1.
   b. Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
      1) Field test records must be acceptable to Owner to use this method.
      2) Test records shall represent materials, proportions and conditions similar to those specified.
6. Required average strength to exceed the specified 28-Day compressive strength by the amount determined or calculated in accordance with the requirements of Paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in Paragraph 5.3.1 of ACI 318.

F. Allowable Shrinkage: 0.048 percent per ASTM C157.

PART 3 EXECUTION

3.1 FORMING AND PLACING CONCRETE

A. Formwork:
1. Contractor is responsible for design and erection of formwork.
2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
   a. Allowable tolerances: As recommended in ACI 347R.
3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.
   a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
   b. Do not place floor drains through beams.
4. Openings: Provide openings in formwork to accommodate work of other trades.
   a. Accurately place and securely support items built into forms.
5. Chamfer Strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
6. Clean and adjust forms prior to concrete placement.
7. Tighten forms to prevent mortar leakage.
8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

B. Reinforcement:
1. Position, support and secure reinforcement against displacement.
2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise.
5. Unless otherwise indicated, provide minimum concrete cover as follows:
   a. Concrete deposited against earth: 3 IN.

b. Formed surfaces exposed to weather or in contact with earth: 2 IN for reinforcing bars #6 or larger; 1-1/2 IN for reinforcing bars less than #6.
c. Formed surfaces exposed to or located above any liquid: 2 IN.
d. Interior surfaces: 1-1/2 IN for beams, girders and columns; 3/4 IN or bar diameter, whichever is greater, for slabs, walls and joists.

6. Do not weld reinforcing bars.
7. Welded wire fabric:
   a. Install welded wire fabric in maximum practical sizes.
   b. Splice sides and ends with a splice lap length measured between outermost cross wires of each fabric sheet not less than:
      1) One spacing of cross wires plus 2 IN.
      2) 1.5 x development length.
      3) 6 IN.
   c. Development length: ACI 318 basic development length for the specified fabric yield strength.

C. Construction, Expansion, and Contraction Joints:
1. Provide at locations indicated.
2. Locate wall vertical construction joints at 30 FT maximum centers and wall horizontal construction joints at 10 FT maximum centers.
3. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SF.
4. Locate construction joints in columns and walls:
   a. At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
   b. Haunches, drop panels, and column capitals are considered part of the supported floor or roof and shall be placed monolithically therewith.
   c. Column base need not be placed monolithically with the floor below.
5. Locate construction joints in beams and girders:
   a. At the middle of the span, unless a beam intersects a girder at that point.
   b. If the middle of the span is at an intersection of a beam and girder, offset the joint in the girder a distance equal to twice the beam width.
   c. Provide satisfactory means for transferring shear and other forces through the construction joint.
6. Locate construction joints in suspended slabs:
   a. At or near the center of span in flat slab or T-beam construction.
   b. Do not locate a joint between a slab and a concrete beam or girder unless indicated.
7. In pan-formed joists:
   a. At or near span center when perpendicular to the joists.
   b. Centered in the slab, midway between joists, when parallel to the joists.
8. Install construction joints in beams, slabs, and girders perpendicular to the planes of their surfaces.
9. At least 48 HRS shall elapse between placing of adjoining concrete construction.
10. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
11. Before new concrete is placed, coat all construction joints with an approved bonding adhesive used and applied in accordance with manufacturer's instructions.

D. Embedments:
   1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
   2. Use setting diagrams, templates and instructions for locating and setting.
   3. Secure waterstops in correct position using hog rings or grommets spaced along the length of the waterstop and wire tie to adjacent reinforcing steel.

E. Placing Concrete:
   1. Place concrete in compliance with ACI 304R and 304.2R.
   2. Place in a continuous operation within planned joints or sections.
   3. Begin placement when work of other trades affecting concrete is completed.
   4. Place concrete by methods which prevent aggregate segregation.
   5. Do not allow concrete to free fall more than 4 FT.
   6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.

F. Consolidation:
   1. Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.

G. Protection:
   1. Protect concrete from physical damage or reduced strength due to weather extremes.
   2. In cold weather comply with ACI 306R except as modified herein.
      a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
      b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 DegF	70 DegF
Between 30-45 DegF	60 DegF
Above 45 DegF	50 DegF

      c. Do not place heated concrete that is warmer than 80 DegF.
      d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 Days or 70 DegF for 3 Days.
      e. Do not allow concrete to cool suddenly.
   3. In hot weather comply with ACI 305R except as modified herein.
      a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
      b. Do not allow concrete temperature to exceed 90 DegF at placement.
      c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
      d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

H. Curing:
   1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
   2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
   3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.

4. Provide curing for minimum of 7 Days.
5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
6. In hot weather follow curing procedures outlined in ACI 305R.
7. In cold weather follow curing procedures outlined in ACI 306R.
8. If forms are removed before 7 Days have elapsed, finish curing of formed surfaces by one of above methods for the remainder of the curing period.
9. Curing vertical surfaces with a curing compound: Cover vertical surfaces with a minimum of two coats of the curing compound.
   a. Allow the preceding coat to completely dry prior to applying the next coat.
   b. Apply the first coat of curing compound immediately after form removal.
   c. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
   d. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

I. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-Day compressive strength.
3. Where re-shoring is planned, supporting formwork may be removed when concrete has sufficient strength to safely support its own weight and loads placed thereon.
   a. While re-shoring is underway, no superimposed loads shall be permitted on the new construction.
   b. Place reshores as soon as practicable after stripping operations are complete but in no case later than the end of working Day on which stripping occurs.
   c. Tighten reshores to carry their required loads.
   d. Leave reshores in place until concrete being supported has reached its specified 28-Day compressive strength.

3.2 CONCRETE FINISHES

A. Tolerances:
1. Class A: 1/8 IN in 10 FT.
2. Class B: 1/4 IN in 10 FT.

B. Surfaces Exposed to View: (Including submerged surfaces in aeration basins.)
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
   a. To be covered with a coating or covering material applied directly to concrete.
   b. Scheduled for grout cleaned finish.
2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
3. Fill tie holes with nonshrink nonmetallic grout.

C. Grout Cleaned Finish:
1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient bonding agent/water mixture to produce a grout with the consistency of thick paint.
   a. White Portland cement shall be substituted for gray Portland cement to produce a color that matches color of surrounding concrete as determined by trial patch for areas not to be painted.
2. Wet surface of concrete to prevent absorption of water by grout and uniformly apply grout with brushes or spray gun.

3. Immediately scrub the surface with a cork float or stone to coat and fill air bubbles and holes.
4. While grout is still plastic, remove all excess grout by working surface with rubber float, sack or other approved means.
5. After the surface whitens from drying, rub vigorously with clean burlap.
6. Keep final finish damp for a minimum of 36 HRS after final rubbing.

D. Troweled Finish:
1. Float finish surface.
2. Next power trowel, and finally hand trowel.
3. Produce a smooth surface which is relatively free of defects with first hand troweling.
4. Perform additional trowelings by hand after surface has hardened sufficiently.
5. Final trowel when a ringing sound is produced as trowel is moved over surface.
6. Thoroughly consolidate surface by hand troweling.
7. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
8. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.

E. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

F. Apply chemical floor hardener to permanently exposed interior concrete floor slab surfaces where indicated.
1. Apply in accordance with manufacturer's instructions.

3.3 GROUT

A. Preparation:
1. Nonshrinking nonmetallic grout:
   a. Clean concrete surface to receive grout.
   b. Saturate concrete with water for 24 HRS prior to grouting.
2. Epoxy grout: Apply only to clean, dry, sound surface.

B. Application:
1. Nonshrinking nonmetallic grout:
   a. Mix in a mechanical mixer.
   b. Use no more water than necessary to produce flowable grout.
   c. Place in accordance with manufacturer's instructions.
   d. Completely fill all spaces and cavities below the bottom of baseplates.
   e. Provide forms where baseplates and bedplates do not confine grout.
   f. Where exposed to view, finish grout edges smooth.
   g. Except as indicated, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
   h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
   i. Wet cure grout for 7 Days, minimum.
2. Epoxy grout:
   a. Mix and place in accordance with manufacturer's instructions.
   b. Completely fill all cavities and spaces around dowels and anchors without voids.
   c. Obtain manufacturer's field technical assistance as required to ensure proper placement.

3.4 FIELD QUALITY CONTROL

A. Owner will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.
   1. Contractor to cooperate with Owner in obtaining and testing samples.

B. Tests During Construction:
   1. Strength test - procedure:
      a. Three cylinders, 6 IN DIA x 12 IN high, will be taken from each sample per ASTM C172 and C31.
      b. Cylinders will be tested per ASTM C39:
         1) One at 7 Days.
         2) Two at 28 Days.
   2. Strength test - frequency:
      a. Not less than one test each Day concrete placed.
      b. Not less than one test for each 50 CY or major fraction thereof placed in one Day.
      c. Not less than one test for each type of concrete poured.
      d. Not less than one test for each concrete structure exceeding 2 CY volume.
   3. Slump test: Per ASTM C143.
      a. Determined for each strength test sample.
      b. Additional slump tests may be taken.
   4. Air content: Per ASTM C231, C173, and C138.
      a. Determined for each strength test sample.
   5. Temperature: Determined for each strength test sample.

C. Evaluation of Tests:
   1. Strength test results: Average of 28-Day strength of two cylinders from each sample.
      a. If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
      b. If both cylinders show any of above defects, test will be discarded.

D. Acceptance of Concrete:
   1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
      a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-Day compressive strength.
      b. No individual strength test falls below the required specified 28-Day compressive strength by more than 500 psi.
   2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Owner.
      a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.5 SCHEDULES

A. Form Types:
   1. Surfaces exposed to view:
      a. Prefabricated or job-built wood forms.
      b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
      c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
      d. Construct forms sufficiently tight to prevent leakage of mortar.

2. Surfaces normally submerged or not normally exposed to view:
   a. Wood or steel forms sufficiently tight to prevent leakage of mortar.
3. Other types of forms may be used:
   a. For surfaces not restricted to plywood or lined forms.
   b. As backing for form lining.

B. Grout:
1. Nonshrinking nonmetallic grout: General use.
2. Epoxy grout:
   a. Grouting of dowels and anchor bolts into existing concrete.
   b. Other uses as indicated.
3. Sand cement grout: Keyways of precast members.

C. Concrete:
1. Precast concrete: As indicated.
2. General use concrete: All other locations.

D. Concrete Finishes:
1. Grout cleaned finish: All exposed to view (including submerged) surfaces.
2. Slab finishes:
   a. Use following finishes as applicable, unless otherwise indicated:
      1) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
      2) Broom finish: Sidewalks and top of walkways.

END OF SECTION

DIVISION 5

METALS

SECTION 05505

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Custom fabricated metal items and manufactured units.
   2. All temporary bracing not indicated on Drawings.
   3. Systems and components, including but not limited to:
      a. Landings.
      b. Ladders.

B. Related Sections:
   1. Section 03002 (Concrete).
   2. Section 09905 (Painting and Protective Coatings).

1.2 REFERENCES

A. ASTM A6	Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
B. ASTM A36	Standard Specification for Carbon Structural Steel
C. ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
D. ASTM A48	Standard Specification for Gray Iron Castings
E. ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
F. ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
G. ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
H. ASTM A197	Standard Specification for Cupola Malleable Iron
I. ASTM A269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
J. ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
K. ASTM A307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
L. ASTM A312	Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
M. ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
N. ASTM A496	Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
O. ASTM A500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
P. ASTM A501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
Q. ASTM A536	Standard Specification for Ductile Iron Castings

R. ASTM A554	Standard Specification for Welded Stainless Steel Mechanical Tubing
S. ASTM A666	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
T. ASTM A668	Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use
U. ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
V. ASTM A992	Standard Specification for Steel for Structural Shapes
W. ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
X. ASTM B221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
Y. ASTM B308	Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
Z. ASTM B429	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
AA.ASTM B632	Standard Specification for Aluminum-Alloy Rolled Tread Plate
BB. ASTM F467	Standard Specification for Nonferrous Nuts for General Use
CC.ASTM F468	Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
DD.ASTM F1554	Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
EE. AWS A5.1	Standard Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
FF. AWS D1.1	Structural Welding Code Steel
GG.AWS D1.2	Structural Welding Code Aluminum
HH.NAAMM MBG 531	Metal Bar Grating Manual

1.3 QUALIFICATIONS

A. Qualify welding procedures and welding operators in accordance with AWS.
B. Fabricator shall have minimum of 10 years experience in fabrication of metal items specified.
C. Engineer for contractor-designed systems and components: Professional civil or structural engineer licensed in the State of California.

1.4 DEFINITIONS

A. Installer or Applicator:
   1. Installer or applicator is the person actually installing or applying the product in the field at the Site.
   2. Installer and applicator are synonymous.
B. Hardware: As defined in ASTM A153.
C. Galvanizing: Hot-dip galvanizing per ASTM A123 or ASTM A153 with minimum coating of 2.0 OZ of zinc per square foot of metal (average of specimens) unless noted otherwise or dictated by standard.
D. Building Code: California Building Code and associated standards, 2010 Edition including all amendments.
E. OSHA Standards: Occupational Safety and Health Standards, OSHA 29 CFR 1910.

1.5 SUBMITTALS

A. Shop Drawings:
   1. Fabrication and/or layout drawings and details:
      a. Submit drawings for all fabrications and assemblies.
         1) Include erection drawings, plans, sections, details and connection details.
      b. Identify materials of construction, shop coatings and third party accessories.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
      c. Provide manufacturer's standard allowable load tables for the following:
         1) Grating and checkered plate.
         2) Expansion anchor bolts.
         3) Adhesive anchor bolts.
         4) Castings, trench covers and accessories.
   3. Contractor designed systems and components, including but not limited to, anchors, stairs, landings and ladders:
      a. Certification that manufactured units meet all design loads specified.
      b. Shop Drawings and engineering design calculations:
         1) Indicate design live loads and lateral loads.
         2) Summary reactions of structural supporting Contractor designed system.
         3) Sealed by a professional civil or structural engineer licensed in the State of California.
B. Certifications:
   1. Certification of welders and welding processes.
      a. Indicate compliance with AWS.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle fabrications to avoid damage.
B. Store above ground on skids or other supports to keep items free of dirt and other foreign debris and to protect against corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Headed studs and deformed bar anchors:
      a. Nelson Stud Welding Div., TRW Inc.
      b. Stud Welding Products, Inc.
      c. Or Approved Equal.
   2. Expansion anchor bolts:
      a. Approved by Building Code for ACI 318 Appendix D installations in cracked concrete.
      b. Expansion anchors not to be used without written approval from Owner.
      c. Hilti Inc.
      d. Simpson Strongtie.

3. Epoxy adhesive anchor bolts:
   a. Approved by Building Code for ACI 318 Appendix D installations in cracked concrete.
   b. Hilti Inc.
   c. Simpson Strongtie.
4. Castings, trench covers and accessories:
   a. Neenah Foundry Co.
   b. Deeter Foundry Co.
   c. Barry Craft Construction Casting Co.
   d. McKinley Iron Works.
   e. Or Approved Equal.
5. Galvanizing repair paint:
   a. Clearco Products Co., Inc.
   b. ZRC Products.
   c. Or Approved Equal.

2.2 MATERIALS

A. Steel:
   1. Structural:
      a. W-shapes and WT-shapes: ASTM A992, Grade 50.
      b. All other plates and rolled sections: ASTM A36.
   2. Pipe: ASTM A53, Types E or S, Grade B or ASTM A501.
   3. Structural tubing:
      a. ASTM A500, Grade B (46 ksi minimum yield).
   4. Bolts, nuts and washers, high strength:
      a. ASTM A325.
      b. Provide two (2) washers with all bolts.
   5. Bolts and nuts:
      a. ASTM A307, Grade A.
   6. Welding electrodes: AWS D1.1, E70 Series.
   7. Steel forgings: ASTM A668.
B. Iron:
   1. Ductile iron: ASTM A536.
   2. Gray cast iron: ASTM A48 (minimum 30,000 psi tensile strength).
   3. Malleable iron: ASTM A47, ASTM A197.
C. Stainless Steel:
   1. Minimum yield strength of 30,000 psi and minimum tensile strength of 75,000 psi.
      a. Bars, shapes: ASTM A276, Type 304.
      b. Tubing and pipe: ASTM A269, ASTM A312 or ASTM A554, Type 304 or 316.
      c. Strip, plate and flat bars: ASTM A666, Type 304 or 316, Grade A.
      d. Bolts and nuts: ASTM F593, Type 303, 304 or 316.
   2. Minimum yield strength of 25,000 psi and minimum tensile strength of 70,000 psi.
      a. Strip, plate and flat bar for welded connections, ASTM A666, Type 304L or 316L.
   3. Welding electrodes: In accordance with AWS for metal alloy being welded.
D. Aluminum:
   1. Alloy 6061-T6, 32,000 psi tensile yield strength minimum.
      a. ASTM B221 and ASTM B308 for shapes including beams, channels, angles, tees and zees.

2. Alloy 6063-T5 or T6, 15,000 psi tensile yield strength minimum.
   a. ASTM B221 and ASTM B429 for bars, rods, wires, pipes and tubes.
3. ASTM B26 for castings.
4. ASTM F468, alloy 2024 T4 for bolts.
5. ASTM F467, alloy 2024 T4 for nuts.
6. Electrodes for welding aluminum: AWS D1.2, filler alloy 4043 or 5356.

E. Washers: Same material and alloy as found in accompanying bolts and nuts.

F. Embedded Anchor Bolts:
1. Building anchor bolts:
   a. ASTM F1554, Grade 55 with weldability supplement S1 or ASTM A36 for threaded rods galvanized.
   b. ASTM A307, Grade A for headed bolts galvanized.
2. All other anchor bolts: Type 304 or 316 stainless steel with matching nut and washer.

G. Expansion Anchor Bolts and Adhesive Anchor Bolts:
1. Stainless steel, Type 304, 314 or 316.
2. Provide minimum edge distance cover and spacing as recommended by manufacturer, or as indicated, whichever is larger.
   a. Minimum embedment as recommended by manufacturer or eight (8) diameters of bolt, whichever is larger.
   b. Notify Owner if required depth of embedment cannot be achieved at a particular anchor bolt location.
   c. Follow manufacturer's recommendations for installation and torque.

H. Headed Studs: ASTM A108 with a minimum yield strength of 50,000 psi and a minimum tensile strength of 60,000 psi.

I. Deformed Bar Anchors: ASTM A496 with a minimum yield strength of 70,000 psi and a minimum tensile strength of 80,000 psi.

J. Iron and Steel Hardware: Galvanized in accordance with ASTM A153 when required to be galvanized.

K. Galvanizing Repair Paint:
1. High zinc dust content paint for regalvanizing welds and abrasions.
2. ASTM A780.
3. Zinc content: Minimum 92 percent in dry film.
4. ZRC "ZRC Cold Galvanizing" or Clearco "High Performance Zinc Spray."

L. Dissimilar Materials Protection: See Section 09905 (Painting and Protective Coatings).

2.3 MANUFACTURED UNITS

A. Aluminum Grating:
1. NAAMM MBG 531.
2. Bearing bars: Rectangular, 1-1/2 x 3/16 IN at 1-3/16 IN OC spacing OR I-bar, 1-1/2 IN deep with minimum 1/16 IN thick bar and minimum 1/4 IN flange width at 1-3/16 IN OC spacing.
3. Cross bars:
   a. Welded, swaged or pressure locked to bearing bars:
   b. Maximum 4 IN/OC spacing.
4. Top edges of bars: Grooved or serrated.
5. Removable grating sections: Not wider than 3 FT and not more than 100 LBS.
6. Standard mill finish.
7. Ends and perimeter edges: Banded.

8. Openings through grating: Reinforced to provide required load carrying capacity and banded with 4 IN high toe plate.
9. Provide joints at openings between individual grating sections.
10. Clips and bolts: Stainless steel.
11. Seat angles: Aluminum.

2.4 FABRICATION

A. Verify field conditions and dimensions prior to fabrication.
B. Form materials to shapes indicated with straight lines, true angles, and smooth curves.
   1. Grind smooth all rough welds and sharp edges.
      a. Round all corners to approximately 1/32 - 1/16 IN nominal radius.
C. Provide drilled or punched holes with smooth edges.
   1. Punch or drill for field connections and for attachment of work by other trades.
D. Weld Permanent Shop Connections:
   1. Welds to be continuous fillet type unless indicated otherwise.
   2. Full penetration butt weld at bends in stair stringers and ladder side rails.
   3. Weld structural steel in accordance with AWS D1.1 using Series E70 electrodes conforming to AWS A5.1.
   4. Weld aluminum in accordance with AWS D1.2.
   5. All headed studs to be welded using automatically timed stud welding equipment.
   6. Grind smooth welds that will be exposed.
E. Conceal fastenings where practicable.
F. Fabricate work in shop in as large assemblies as is practicable.
G. Tolerances:
   1. Rolling:
      a. ASTM A6.
      b. When material received from the mill does not satisfy ASTM A6 tolerances for camber, profile, flatness, or sweep, the Contractor is permitted to perform corrective work by the use of controlled heating and mechanical straightening, subject to the limitations of the AISC Specifications.
   2. Fabrication tolerance:
      a. Member length:
         1) Both ends finished for contact bearing: 1/32 IN.
         2) Framed members:
            (a) 30 FT or less: 1/16 IN.
            (b) Over 30 FT: 1/8 IN.
      b. Member straightness:
         1) Compression members: 1/1000 of axial length between points laterally supported.
         2) Non-compression members: ASTM A6 tolerance for wide flange shapes.
      c. Specified member camber (except compression members):
         1) 50 FT or less: Minus 0/plus 1/2 IN.
         2) Over 50 FT: Minus 0/plus 1/2 IN (plus 1/8 IN per 10 FT over 50 FT).
         3) Members received from mill with 75 percent of specified camber require no further cambering.
         4) Beams/trusses without specified camber shall be fabricated so after erection, camber is upward.
         5) Camber shall be measured in fabrication shop in unstressed condition.

d. At bolted splices, depth deviation shall be taken up by filler plates.
   1) At welded joints, adjust weld profile to conform to variation in depth.
   2) Slope weld surface per AWS requirements.
e. Finished members shall be free from twists, bends and open joints.
   1) Sharp kinks, bends and deviation from above tolerances are cause for rejection of material.

H. Fabricate grating, checkered plate, ladders and accessories using aluminum unless otherwise indicated.
   1. Finish:
      a. Aluminum: Mill finished unless scheduled or otherwise specified or, if approved by Owner, finished in manufacturer's standard.
      b. Coat surfaces in contact with dissimilar materials.
         1) See Section 09905 (Painting and Protective Coatings).
   2. See Section 09905 (Painting and Protective Coatings) for preparation and painting of ferrous metals and other surfaces.

I. Maximum tolerance for difference in depth between checkered plate or grating depth and seat or support angle depth: 1/8 IN.

J. Distance between edge of grating or checkered plate and face of embedded seat angle or face of wall or other structural member shall be 1/4 IN.
   1. Tolerance per NAAMM MBG 531.

2.5 SOURCE QUALITY CONTROL

A. Surface Preparation:
   1. Refer to Section 09905 (Painting and Protective Coatings) for surface preparation requirements.

B. Shop Applied Paint Coating Application:
   1. Refer to Section 09905 (Painting and Protective Coatings) for painting requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide items to be built into other construction in time to allow their installation.
   1. If such items are not provided in time for installation, cut in and install.

B. Prior to installation, inspect and verify condition of substrate.

C. Correct surface defects or conditions which may interfere with or prevent a satisfactory installation.
   1. Field welding aluminum is not permitted unless approved in writing by Owner.

3.2 INSTALLATION

A. Set metal work level, true to line, plumb.
   1. Shim and grout as necessary.

B. Bolt Field Connections: Where practicable, conceal fastenings.

C. Grind welds smooth where field welding is required.

D. Field cutting grating or checkered plate to correct fabrication errors is not acceptable.
   1. Replace entire section.

E. Remove all burrs and radius all sharp edges and corners of miscellaneous plates, angles, framing system elements, etc.

F. Unless noted or specified otherwise:
   1. Connect steel members to steel members with 3/4 IN DIA ASTM A325 high strength bolts.
   2. Connect aluminum to aluminum with 3/4 IN DIA aluminum bolts.
   3. Connect aluminum to structural steel using 3/4 IN DIA stainless steel bolts.
      a. Provide dissimilar metals protection.
   4. Connect aluminum and steel members to concrete and masonry using stainless steel expansion anchor bolts or adhesive anchor bolts.
      a. Provide dissimilar materials protection.
   5. Provide washers for all bolted connections.
   6. Where exposed, bolts shall extend a maximum of 3/4 IN and a minimum of 1/2 IN above the top nut.
      a. If bolts are cut off to required maximum height, threads must be dressed to allow nuts to be removed without damage to the bolt or the nuts.
G. Install and tighten ASTM A325 high-strength bolts in accordance with the AISC Manual of Steel Construction - Allowable Stress Design (ASD).
   1. Provide hardened washers for all ASTM A325 bolts.
      a. Provide the hardened washer under the element (nut or bolt head) turned in tightening.
H. After bolts are tightened, upset threads of ASTM A307 unfinished bolts or anchor bolts to prevent nuts from backing off.
I. Secure metal to wood with lag screws of adequate size with appropriate washers.
J. Do not field splice fabricated items unless said items exceed standard shipping length or change of direction requires splicing.
   1. Provide full penetration welded splices where continuity is required.
K. Provide each fabricated item complete with attachment devices as indicated or required to install.
L. Anchor such that Work will not be distorted nor fasteners overstressed from expansion and contraction.
M. Set beam and column base plates accurately on nonshrink grout as indicated.
   1. See Section 03002 (Concrete) for non-shrink grout.
   2. Set and anchor each base plate to proper line and elevation.
      a. Use metal wedges, shims, or setting nuts for leveling and plumbing columns and beams.
         1) Wedges, shims and setting nuts to be of same metal as base plate they support.
         2) Tighten nuts on anchor bolts.
      b. Fill space between bearing surface and bottom of base plate with nonshrink grout.
         1) Fill space until voids are completely filled and base plates are fully bedded on wedges, shims, and grout.
      c. Do not remove wedges or shims.
         1) Where wedges or shims protrude, cut off flush with edge of base plate.
      d. Fill sleeves around anchor bolts solid with non-shrink grout.
N. Tie anchor bolts in position to embedded reinforcing steel using wire.
   1. Tack welding prohibited.
      a. Coat bolt threads and nuts with heavy coat of clean grease.
   2. Anchor bolt location tolerance:
      a. 1/16 IN.
      b. Provide steel templates for all column anchor bolts.

O. Provide abrasive stair nosings in each tread and landing of all concrete stairs and at each concrete stair landing having metal stair structure attaching to the concrete landing.
   1. Center stair nosings in stair width.
   2. Coordinate nosings with railing vertical posts.
      a. Maintain 2 IN clear between end of nosing and edge of railing base plate.
P. Accurately locate and place frames for openings before casting into floor slab so top of plate is flush with surface of finished floor.
   1. Keep screw holes clean and ready to receive screws.
Q. Attach grating to end and intermediate supports with grating saddle clips and bolts.
   1. Maximum spacing: 2 FT OC with minimum of two (2) per side.
   2. Attach individual units of aluminum grating together with clips at 2 FT OC maximum with a minimum of two (2) clips per side.
R. Coat aluminum surfaces in contact with dissimilar materials in accordance with Section 09905(Painting and Protecting Coatings).
S. Repair damaged galvanized surfaces in accordance with ASTM A780.
   1. Prepare damaged surfaces by abrasive blasting or power sanding.
   2. Apply galvanizing repair paint to minimum 6 mils DFT in accordance with manufacturer's instructions.

3.3 CLEANING

A. After erection, installation or application, clean all miscellaneous metal fabrication surfaces of all dirt, weld slag and other foreign matter.
B. Provide surface acceptable to receive field applied paint coatings specified in Section 09905 (Painting and Protecting Coatings).

END OF SECTION

SECTION 05522

ALUMINUM RAILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum guardrail.

1.2 REFERENCES

A. AA ADM-1	Aluminum Design Manual
B. AA 45	Designation System for Aluminum Finishes
C. AA 611	Voluntary Specification for Anodized Architectural Aluminum
D. ASME Section IX	Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators
E. ASTM B108	Standard Specification for Aluminum-Alloy Permanent Mold Castings
F. ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
G. ASTM B221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
H. ASTM B247	Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings
I. ASTM B308	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
J. ASTM B429	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
K. AWS C5.5	Recommended Practices for Gas Tungsten Arc Welding
L. AWS D1.2	Structural Welding Code Aluminum
M. NAAMM AMP 521	Pipe Railing Systems Manual
N. OSHA 29, CFR 1910	Occupational Safety and Health Standards, referred to herein as OSHA Standards
O. ICC	California Building Code and associated Standards, 2010 Edition including all amendments, referred to herein as Building Code.

1.3 QUALIFICATIONS

A. Qualify welding procedures and welding operators in accordance with AWS and ASME Section IX.

1.4 DEFINITIONS

A. Guardrail: A system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level.
B. Railing: A generic term referring to guardrail, handrail and/or stair rails.
C. Building Code: California Building Code and associated standards, 2010 Edition including all amendments.

D. OSHA Standards: Occupational Safety and Health Standards, OSHA 29 CFR 1910.

1.5 SUBMITTALS

A. Shop Drawings:
   1. Fabrication and/or layout drawings:
      a. Drawings showing profile, location, sections and fabrication details including all welding information of each railing.
      b. Type and details of anchorage.
      c. Location and type of expansion joints.
      d. Materials of construction, shop coatings and all third-party accessories.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation details.
   3. Certification that railings have been designed and fabricated to meet the loading requirements specified.
   4. Calculations for all proposed deviations from the Specification.
      a. Calculations shall be performed, sealed, signed and dated by a registered professional structural engineer licensed in the State of California.
      b. Calculations shall be specific to this Project and shall include all assumptions, references and design interpretations used to achieve the results obtained by the Owner's Representative.
      c. Reduction in load criteria is not acceptable as reason for deviation from sizes indicated in this Section 05522.
B. Miscellaneous Submittals:
   1. Certification of welders and welding procedures indicating compliance with AWS requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver and handle railings to preclude damage.
B. Store railings on skids, keep free of dirt and other foreign matter which will damage railings or finish and protect against corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Mechanically fastened component railing systems.
      a. Tuttle Railing Systems, Tabco 9000.
      b. Wagner Companies.
      c. Hollaender Railing Systems.
      d. Moultric Manufacturing Company Wesrail).
      e. Or Approved Equal.

2.2 MATERIALS

A. Alloy 6061-T6, 32,000 psi tensile yield strength minimum.
   1. ASTM B209 for sheets and plates.
   2. ASTM B221 and ASTM B308 for shapes - beams, channels, angles, tees, and zees.

3. ASTM B247 for forgings.

B. Alloy 6063-T5 or T6, 15,000 psi tensile yield strength minimum.
   1. ASTM B221 and ASTM B429 for bars, rods, wires, pipes and tubes.

C. Cast Fittings: Aluminum, ASTM B108.

D. Shims: Aluminum of same alloy as component being shimmed.

E. Fasteners: See Section 05500 (Metal Fabrications).

F. Expansion and Adhesive Anchors: See Section 05500 (Metal Fabrications).

2.3 FABRICATION

A. General:
   1. Verify field conditions and dimensions prior to fabrication.
   2. For fabrication of items which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
      a. Remove blemishes by grinding and buffing or by welding and grinding, prior to cleaning, treating and application of surface finishes.
   3. Form exposed work with smooth, short radius bends, accurate angles and straight edges.
      a. Ease exposed edges to a radius of approximately 1/32 IN.
      b. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
      c. Drill or punch holes with smooth edges.
   4. Form exposed connections with flush, smooth, hairline joints, using stainless steel or aluminum splice locks to splice sections together or by welding.
      a. Ease the edges of top rail splices and expansion joints and remove all burrs left from cutting.
   5. Provide for anchorage of type indicated on Drawings or as required by field conditions.
      a. Drill or punch holes with smooth edges.
   6. Design railings and anchorage system in accordance with NAAMM AMP 521 to resist loading as required by Building Code.
   7. Custom fabricate railings to dimensions and profiles indicated.
      a. Fabricate handrail mounted to wall or to guardrail vertical posts using minimum 1-1/2 IN nominal diameter Schedule 40 pipe.
      b. Fabricate all guardrail top rails using minimum 1-1/2 IN nominal diameter Schedule 40 pipe.
      c. Fabricate all guardrail vertical posts using minimum 1-1/2 IN nominal diameter Schedule 40 pipe.
         1) Guardrail vertical posts that are to be side-bracket mounted to a vertical concrete surface or metal structure shall use Alloy 6063-T6.
      d. All intermediate rails shall be fabricated using minimum 1-1/2 IN nominal diameter Schedule 40 pipe.
         1) Where details are not indicated, set horizontal rails and vertical pickets to requirements of the Building Code or OSHA Standards, whichever requires the more restrictive design.
      e. Space vertical posts as required by loading requirements but not more than 4 FT on center.
      f. Space handrail brackets as required by loading requirements but not more than 4 FT on center.

g. Base plate for vertical guardrail posts mounted to top of concrete surface:
   1) 3-3/4 IN x 7 IN plate, thickness designed by manufacturer.
   2) Predrilled to accept four (4) anchors.
   3) Provide a 1-1/2 IN DIA x 8 IN long solid aluminum rod welded to the base plate.
   4) Fit the vertical post over the solid rod and weld the post to the base plate.
h. Base plate for vertical guardrail post mounted to flange of metal structure:
   1) 3/8 x 3 x 8 IN plate.
   2) Predrilled to accept two (2) fasteners.
   3) Provide a 1-1/2 IN DIA x 8 IN long solid aluminum rod welded to the base plate.
   4) Fit the vertical post over the solid rod and weld the post to the base plate.
i. Mounting bracket for vertical guardrail post mounted to vertical concrete surface or web of metal structural member:
   1) Pair of 3/8 IN angles or bent plates.
   2) Predrilled to accept two (2) fasteners each.
   3) Weld angles or bent plates to vertical posts.
j. Provide 3/8 IN x 4 IN flat bar toeboards or 1/4 IN minimum thickness x 4 IN high extruded toeboard with stiffener ribs on back side at all elevated walkways, platforms and stair landings, and where indicated on the Drawings or required by OSHA Standards.

8. Fit exposed ends of guardrails and handrails with solid terminations.
   a. Return ends of handrail to wall, but do not attach to wall.
   b. Where guardrail terminates at a wall, provide a vertical post located 4 IN off the wall to center of post.
9. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly of units at Site.

B. Finish: Mill, match existing.

C. Install weeps to drain water from hollow sections of railing at exterior and high humidity conditions.
   1. Drill 1/4 IN weep hole in railings closed at bottom:
      a. 1 IN above walkway surface at bottom of posts set in concrete.
      b. 1 IN above solid aluminum rod at posts having base plate.
      c. At low point of intermediate rails.
      d. Do not drill weep holes:
         1) In bottom of base plate.

D. Expansion Joints:
   1. Joints to be designed to allow expansion and contraction of railing and still meet design loads required.
      a. Top rail splices and expansion joints shall be located within 8 IN of post or other support.
      b. Where railings span expansion joints; provide a railing expansion joint in the span crossing the expansion joint.
   2. Provide expansion joints in any continuous run exceeding 20 FT in length.
      a. Space expansion joints at not more than 20 FT on center.
   3. Provide minimum 0.10 IN of expansion joint for each 20 FT length of top rail for each 25 DegF differential between installation temperature and maximum design temperature.
      a. Maximum expansion joint width at time of installation shall not exceed 3/8 IN.
         1) Provide additional expansion joints as required to limit expansion joint width.

4. Provide slip-joint with internal sleeve.
    a. Extend slip joint min 2 IN beyond joint at maximum design width.
    b. Fasten internal sleeve securely to one side
        1) Provide allen-head set screw located in bottom of rail.
        2) Rivets or exposed screw heads are not acceptable.
5. Toeboards:
    a. Provide toeboard expansion joints at building or tank expansion joints.
    b. Design joints to allow expansion and contraction of toeboards.
    c. Space joints no more than 20 FT on center.

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to installation, inspect and verify condition of substrate.
B. Correct surface defects or conditions which may interfere with or prevent a satisfactory installation.
    1. Field welding aluminum is not permitted unless approved in writing by the Owner's Representative.

3.2 INSTALLATION

A. Install handrails and guardrails to meet loading requirements of the Building Code.
B. Install products in accordance with manufacturer's instructions.
C. Set work accurately in location, alignment and elevation; plumb, level and true.
    1. Measure from established lines and items which are to be built into concrete, masonry or similar construction.
D. Align railings prior to securing in place to assure proper matching at butting and expansion joints and correct alignment throughout their length.
    1. Provide shims as required.
E. Install proper sized expansion joints based on temperature at time of installation and differential coefficient of expansion of materials in all railings as recommended by manufacturer.
    1. Lubricate expansion joint splice bar for smooth movement of railing sections.
F. Provide removable railing sections where indicated on Drawings.
G. Attach handrails to walls or guardrail with brackets designed for condition:
    1. Provide brackets which provide a minimum 1-1/2 IN clearance between handrail and nearest obstruction.
        a. Handrails shall not project more than 4-1/2 IN into required stairway width.
    2. Anchor handrail brackets to concrete or masonry walls with 1/2 IN stainless steel adhesive anchors with stainless steel hex head bolts.
H. Anchor railings to concrete with minimum 1/2 IN stainless steel adhesive anchors with stainless steel bolts, nuts and washers unless noted otherwise in the Contract Documents.
    1. Where exposed, bolts shall extend minimum 1/2 IN and maximum 3/4 IN above the top nut.
        a. If bolts are cut off to required height, threads must be dressed to allow nuts to be removed without damage to the bolt or the nut.
        b. Bevel the top of the bolt after cutting to provide a smooth surface.
I. Anchor railings to metal structure with minimum 3/4 IN stainless steel bolts, nuts and washers.

J. Install toeboards to fit tight to the walking surface.
   1. Notch toeboards at base plates or other obstructions.
   2. Bottom of toeboard shall not exceed 1/4 IN above walking surface.
K. Coat aluminum in contact with dissimilar metal or concrete in accordance with Section 09905 (Painting and Protective Coatings).
L. Provide railings as required for stair construction identified in Section 05500 (Metal Fabrications).

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

SECTION 06610

FIBERGLASS REINFORCED PLASTIC BAFFLE WALL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fiberglass reinforced plastic (FRP) Baffle Wall System.

1.2 REFERENCES

A.	ASTM D256	Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
B.	ASTM D570	Standard Test Method for Water Absorption of Plastics.
C.	ASTM D638	Standard Test Method for Tensile Properties of Plastics.
D.	ASTM D695	Standard Test Method for Compressive Properties of Rigid Plastics.
E.	ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
F.	CBC 2010	California Building Code and Associated Standards.

1.3 SUBMITTALS

A. Product Data:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Manufacturer's installation instructions.
B. Shop Drawings:
   1. Fabrication and/or layout drawings.
      a. Plan showing location, section and details of each item including anchorage or support system(s).
      b. Locations and type of expansion joints.
      c. Materials of construction including shop applied coatings.
      d. Listing of all accessory items being provided indicating material, finish, etc.
      e. All connections of baffle wall panels to concrete walls, concrete slabs, or FRP support members shall be shown on shop drawings.
   2. Manufacturer's colors available for each component.
C. Quality Assurance/Control Submittals:
   1. Certificates:
      a. Certification that all components and systems have been designed and fabricated to meet the loading requirements specified.
   2. Qualification Statements:
      a. All fiberglass reinforced plastic systems shall be designed by a registered professional structural engineer in the State of California.
D. Miscellaneous Submittals:
   1. Complete design calculations for supporting structure and fastening conditions.
      a. Design calculations shall be stamped and signed by a structural engineering licensed in the State of California.

b. The baffle wall system shall be designed for all potential lateral and vertical loads. Sloshing forces from earthquake design loads shall be included in the baffle wall system design.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle each item to preclude damage.
B. Store all items above ground:
   1. Keep free of dirt and other foreign matter which will damage items or finish and protect from corrosion and UV exposure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Baffle walls:
      a. Enduro Composite Systems.
      b. MFG Water Treatment Products.
      c. Or Approved Equal.

2.2 MATERIALS

A. Baffle Wall Panels and support system:
   1. Fiberglass reinforced polymer (FRP).
B. Fasteners, Clips, Saddles, and Miscellaneous Components:
   1. 316 stainless steel.
C. Anchors: Epoxy adhesive type, per Specification Section 05505 (Metal Fabrications).

2.3 DESIGN CRITERIA

A. FRP Baffle Panels:
   1. Tensile strength: 42,000 psi, ASTM B638.
   2. Flexural Strength: 32,000 psi, ASTM D790.
   3. Flexural Modulus: 1,500,000 psi, ASTM D790.
   4. Izod Impact: 25, ASTM D256.
   5. Water Absorption: .25 percent maximum, ASTM D570.
   6. Maximum deflection with 3 IN static head differential: 0.8 IN.
   7. Maximum deflection with 6 IN static head differential: 1.6 IN.
   8. FRP access hatch dimensions: 3 FT - 0 IN x 7 FT - 0 IN tall minimum.
   9. Minimum modulus of elasticity: 2.5×10^6 psi.
   10. Provide one FRP access hatch and two 12 IN by 6 IN openings as indicated on drawings. Provide reinforcement for the access hatch and the opening. The access hatch hardware shall be 316 stainless steel.
B. Baffle wall panels shall exhibit the following minimum properties:
   1. Stiffness (El): 28×10^6 lb-in^2.
   2. Moment capacity: 32,680 in-lbs.
C. Baffle wall materials shall include UV stabilized polyester resin and surfacing veil at top and bottom sides.
D. Baffle Support System:
   1. Baffle wall support columns and beams shall have a minimum 50 percent glass fiber reinforcing content.

2. The FRP angles shall be a minimum of 3/8 IN thick.

2.4 FABRICATION

A. General:
   1. Verify field conditions and dimensions prior to fabrication.
   2. Preassemble items in shop to greatest extent possible.
   3. All components shall be treated with UV inhibitor.
   4. Drill or punch holes with smooth edges.
B. Factory cut edges and drilled holes shall be sealed with approved material.
C. Baffle wall panels shall be in a minimum 1/4 IN nominal thickness and shall have 50 percent minimum glass fiber reinforcing content, with top, horizontal ribs sloped downward not less than 10 degrees to minimize sediment build-up.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install baffle wall products in accordance with manufacturer's instructions.
B. Set work accurately in location, alignment and elevation, plumb, level, and true.
   1. Measure from established lines and levels.
   2. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.
   3. Tolerances:
      a. Maximum variation from plumb in vertical line: 1/8 IN in 3 FT.
      b. Maximum variation from level of horizontal line: 1/4 IN in 20 FT.
      c. Maximum variation from plan location: 1/4 IN in 20 FT.
C. Coat all exposed surfaces of stainless steel fasteners with minimum 15 mil gel coating to match component being anchored.
D. File cut ends of all fiberglass to a 1/32 IN radius.
E. Seal cut ends of all items with catalyzed resin as recommended by manufacturer.
   1. Provide same resin used in fabrication of item as a minimum.
F. Provide all modular framing components as required to suit condition.
   1. Install in accordance with manufacturer's recommendations.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07900

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sealant work.
B. Work included consists of but is not necessarily limited to:
   1. Sealing all joints which will permit penetration of dust, air or moisture, unless sealing work is specifically required under other sections.
      a. Work may include the following:
         1) Wall joints.
         2) Isolation joints.
         3) Concrete construction, control and expansion joints, exterior and interior.
         4) Joints at penetrations of walls, floors and decks by piping and other services and equipment.
         5) Sealing of plumbing fixtures to floor or wall.
         6) Sealing around piping, duct or conduit penetrations through roof, floors, interior and exterior walls.
         7) Other joints where calking, sealant, expanding foam sealant or compressible sealant is indicated.

1.2 REFERENCES

A.	ACI 302.1R	Guide for Concrete Floor and Slab Construction
B.	ASTM C920	Standard Specification for Elastomeric Joint Sealants
C.	ASTM C1521	Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
D.	NSF	National Sanitation Foundation International
E.	UL	Underwriters Laboratory

1.3 DEFINITIONS

A. "Caulk(ing)," "calk(ing)," and "sealant": Joint sealant work.
B. Installer or Applicator:
   1. Installer or applicator is the person actually installing or applying the product in the field at the Site.
   2. Installer and applicator are synonymous.
C. Finish sealant: Sealant material per this specification applied over face of compressible sealant or expanding foam sealant specified, to provide a finished, colored sealant joint.
D. Defect(ive): Failure of watertightness or airtightness.

1.4 SUBMITTALS

A. Product Data:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Manufacturer's installation instructions.
   3. Manufacturer's recommendations for joint cleaner, primer, backer rod, tooling and bond breaker.
B. Warranty.

C. Certification from sealant manufacturer stating product being used is recommended for and is best suited for joint in which it is being applied.
D. Certification of applicator qualification.
E. Samples:
   1. Cured sample of each color for Owner's color selection.
   2. Color chart not acceptable.
F. Test Results:
   1. Provide adhesion test results for each sealant sample providing adhesion results compared to adhesion requirements.
   2. Manufacturer's authorized factory representative recommended remedial measure for all failing tests.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in manufacturer's original unopened containers with labels intact: Labels shall indicate contents and expiration date on material.

1.6 WARRANTY

A. Material and Labor Warranty:
   1. Sealant work free of defects for a period of three (3) years from date of final acceptance.
   2. Warranty signed jointly by Applicator and sealant manufacturer.

1.7 QUALIFICATIONS

A. Sealant applicator shall have minimum five (5) years experience using products specified on projects with similar scope.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Polyurethane sealants:
      a. Pecora.
      b. Sika Chemical Corp.
      c. Sonneborn - Rexnord.
      d. Tremco.
      e. Or Approved Equal.
   2. Silicone sealants:
      a. General Electric.
      b. Dow Corning Corp.
      c. Tremco.
      d. Or Approved Equal.
   3. Compressible sealant:
      a. Polytite Manufacturing Corporation.
      b. Emseal.
      c. Norton.
      d. Sandell.
      e. Or Approved Equal.
   4. Polysulfide rubber sealant:
      a. Pecora.

b. Sonneborn.
c. Morton Polymer Systems.
d. Or Approved Equal.

5. Expanding foam sealant:
   a. Macklanburg Duncan.
   b. Convenience Products.
   c. FAI International, Inc.
   d. Power Fasteners.
   e. Or Approved Equal.
6. Polyurea joint filler:
   a. Dayton Superior Specialty Chemical Corporation.
   b. Euclid Chemical Co.
   c. L & M Construction Chemicals, Inc.
   d. Sonneborn.
   e. Or Approved Equal.
7. Backer rod, compressible filler, primer, joint cleaners, bond breaker: As recommended by sealant manufacturer.

2.2 MATERIALS

A. Sealants - General:
   1. Provide colors matching materials being sealed.
   2. Where compound is not exposed to view in finished work, provide manufacturer's color which has best performance.
   3. Nonsagging sealant for vertical and overhead horizontal joints.
   4. Sealants for horizontal joints: Self-leveling pedestrian/traffic grade.

B. Silicone Sealant:
   1. One (1) component.
   2. Meet ASTM C920, Type S, Grade NS, Class 25, Use NT, G, A, O.
      a. General Electric: Silpruf, Silglaze II.
      b. General Electric: Sanitary 1700 sealant for sealing around plumbing fixtures.
      c. Dow Corning: 786 for sealing around plumbing fixtures.
      d. Dow Corning: 790, 795.
      e. Tremco: Spectrem 1, Spectrem 3, Tremsil 600.
   3. Mildew resistant for sealing around plumbing fixtures.

C. Compressible Sealant:
   1. Size so that width of material is twice joint width.
   2. Foamed polyurethane strip saturated with polymerized polybutylene waterproofing coated on front face with nonreactive release agent that will act as bond breaker for applied sealant.
      a. Polytite Manufacturing Corp. "Polytite-B."
   3. Fire rated where required.

D. Joint Cleaner, Primer, Bond Breaker: As recommended by sealant manufacturer.

E. Sealant Backer Rod and/or Compressible Filler:
   1. Closed cell polyethylene, polyethylene jacketed polyurethane foam, or other flexible, nonabsorbent, nonbituminous material recommended by sealant manufacturer to:
      a. Control joint depth.
      b. Break bond of sealant at bottom of joint.
      c. Provide proper shape of sealant bead.

d. Serve as expansion joint filler.

F. Adhesive, Compressible Sealant: As recommended by sealant manufacturer.

G. Expanding Foam Sealant:
1. One (1) or two (2) component fire rated moisture cured expanding urethane.
2. Shall not contain formaldehyde.
3. Density: Minimum 1.5 pcf.
4. Minimum 70 percent closed cell content.
5. R-value minimum 5.0/IN.

H. Polysulfide Rubber Sealant:
1. One (1) or two (2) component.
2. Meet ASTM C920.
   a. Pecora Synthacalk GC2+.
   b. Sonneborn - Sonolastic - two-part polysulfide sealant.
   c. Morton Polymer Systems - Thiokol Sealants.

I. Polyurea Joint Filler:
1. Two (2) component, semi-rigid material for filling control, sawcut and construction joints in interior concrete floors.
   a. Dayton Superior Specialty Chemical Corp. "Joint Fill, Joint Seal, Joint Saver II" as required for condition and recommended by manufacturer.
   b. Euclid Chemical Co. "EUCO QWIK" joint.
   c. L & M Construction Chemicals, Inc. "Joint Tite 750".
   d. Sonneborn "TF-100" control joint filler.
2. Comply with ACI 302.1R performance recommendations regarding control and construction joints.
3. Color: Gray.

PART 3 EXECUTION

3.1 PREPARATION

A. Before use of any sealant, investigate its compatibility with joint surfaces, fillers and other materials in joint system.

B. Use only compatible materials.

C. Where required by manufacturer, prime joint surfaces.
1. Limit application to surfaces to receive calking.
2. Mask off adjacent surfaces.

D. Provide joint depth for joints receiving polyurea joint filler in accordance with manufacturer's recommendations.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions and UL requirements.

B. Clean all joints.

C. Make all joints water and airtight.

D. Make depth of sealing compounds, except expanding foam and polyurea sealant, not more than one-half width of joint, but in no case less than 1/4 IN nor more than 1/2 IN unless recommended otherwise by the manufacturer.

E. Provide correctly sized backer rod, compressible filler or compressible sealant in all joints to depth recommended by manufacturer:
1. Take care to not puncture backer rod and compressible filler.

2. Provide joint backer rod as recommended by the manufacturer for polyurea joint filler.

F. Apply bond breaker where required.
G. Tool sealants using sufficient pressure to fill all voids.
H. Upon completion, leave calking with smooth, even, neat finish.
I. Where piping, conduit, ductwork, etc., penetrate wall, seal each side of wall opening.
J. Install compressible sealant to position at indicated depth.
   1. Take care to avoid contamination of sides of joint.
   2. Protect side walls of joint (to depth of finish sealant).
   3. Install with adhesive faces in contact with joint sides.
   4. Install finish sealant where indicated.
K. Install expanding foam sealant to minimum 4 IN depth or thickness of wall being penetrated if less than 4 IN or as indicated on Drawings.
   1. Provide adequate fire rated backing material as required.
   2. Hold material back from exposed face of wall as required to provide backer rod and finish sealant.
      a. Allow expanding foam sealant to completely cure prior to installing backer rod and finish sealant.
   3. Material shall be minimum of 70 DegF prior to and during installation.
   4. Trim off excess material flush with surface of the wall if not providing finished sealant.

3.3 FIELD QUALITY CONTROL

A. Adhesion Testing:
   1. Perform adhesion tests in accordance with ASTM C1521 per the following criteria:
      a. Water bearing structures: One (1) test per every 1000 LF of joint sealed.
      b. Exterior precast concrete wall panels: One (1) test per every 2000 LF of joint sealed.
      c. Chemical containment areas: One (1) test per every 1000 LF of joint sealed.
      d. Building expansion joints: One (1) test per every 500 LF of joint sealed.
      e. All other type of joints except butt glazing joints: One (1) test per every 3000 LF of joint sealed.
      f. Manufacturer's authorized factory representative shall recommend, in writing, remedial measures for all failing tests.

3.4 SCHEDULE

A. Furnish sealant as indicated for the following areas:
   1. Exterior areas: Silicone.
   2. Interior wet areas: Silicone.
   3. Interior wet, corrosive areas: Polysulfide.
   4. Interior nonwet, corrosive areas: Silicone.
   5. Interior nonwet, noncorrosive areas: Silicone.
   6. Compressible sealant: Where indicated.
   7. Sealant which will be subject to prolonged contact with or submersion in water (except wastewater and sewage):
      a. Polysulfide or polyurethane: NSF approved for use in potable water tanks.
   8. Penetrations exterior wall above grade:
      a. For non-corrosive areas, provide expanding urethane foam, with polyurethane finish sealant.
      b. For corrosive areas, provide expanding urethane foam, bond breaker and polysulfide finish sealant on corrosive side with polyurethane finish sealant on non-corrosive side.

9. Sealant exposed to or having the potential of being exposed to concentrated chlorine gas or chlorine liquid: Polysulfide.
10. Sealant which will be immersed in wastewater or sewage: Polysulfide.
11. Interior concrete floor control joints or sawed joints: Polyurea joint filler.
12. Sealing around plumbing fixtures: Silicone.
13. Plastic laminate casework, plastic laminate countertops and solid surface materials: Silicone.

END OF SECTION

DIVISION 9

FINISHES

SECTION 09905

PAINTING AND PROTECTIVE COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Painting and protective coatings.
   2. Minimum surface preparation requirements.

1.2 REFERENCES

A.	ANSI A250.10	Test Procedure and Acceptance Criteria For Prime Painted Steel Surfaces for Steel Doors
B.	ANSI Z535.1	Safety Color Code
C.	ASTM A780	Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
D.	ASTM D4258	Practice for Surface Cleaning Concrete for Coating
E.	ASTM D4259	Practice for Abrading Concrete
F.	ASTM D4261	Practice for Surface Cleaning Concrete Unit Masonry for Coating
G.	ASTM D4262	Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
H.	ASTM D4263	Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
I.	ASTM E84	Test Method for Surface Burning Characteristics of Building Materials
J.	NBS	Certified Coating Thickness Calibration Standards
K.	NFPA 101	Life Safety Code
L.	NSF 61	Drinking Water System Components - Health Effects
M.	SSPC PA-2	Measurement of Dry Paint Thickness with Magnetic Gages
N.	SSPC SP-1	Solvent Cleaning
O.	SSPC SP-6	Commercial Blast Cleaning
P.	SSPC SP-7	Brush-off Blast Cleaning
Q.	SSPC SP-10	Near-White Blast Cleaning

1.3 DEFINITIONS

A. Installer or Applicator: Installer or applicator is the person actually installing or applying the product in the field at the Site.
   1. Installer and applicator are synonymous.
B. Approved Factory Finish: Finish on a product in compliance with the finish specified in the section where the product is specified.
C. Corrosive Environment: Immersion in, or not more than 6 IN above, or subject to frequent condensation, spillage or splash of a corrosive material such as water, wastewater, or chemical solution; or chronic exposure to corrosive, caustic or acidic agent, chemicals, chemical fumes, chemical mixture, or solutions with pH range of 5 - 9.
D. Highly Corrosive Environment: Immersion in, or not more than 6 IN above, or subject to frequent condensation, spillage or splash of a corrosive material such as water, wastewater,

or chemical solution; or chronic exposure to corrosive, caustic or acidic agent, chemicals, chemical fumes, chemical mixture, or solutions with pH range below 5 or above 9.

E. Exposed Exterior Surface: Surface which is exposed to weather but not necessarily exposed to view as well as surface exposed to view.

F. Paint: Includes fillers, primers, sealers, emulsions, oils, alkyds, latex, enamels, thinners, stains, epoxies, vinyls, chlorinated rubbers, urethanes, shellacs, varnishes, and any other applied coating specified within this Section 09905.

G. Surface Hidden from View: Surfaces such as those within pipe chases, and between top side of ceilings (including drop-in tile ceilings) and underside of floor or roof structure above.

1.4 SUBMITTALS

A. Manufacturer's statement regarding Applicator instruction on product use.

B. Applicator experience qualifications.

C. Manufacturer's recommendation for universal barrier coat.

D. Shop Drawings:
   1. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's application instructions.
      c. Manufacturer's surface preparation instructions.
      d. If products being used are manufactured by Company other than listed in this Section 09905, provide complete individual data sheet comparison of proposed products with specified products including application procedure, coverage rates and verification that product is designed for intended use.
      e. Contractor's written plan of action for containing airborne particles created by blasting operation and location of disposal of spent contaminated blasting media.
      f. Coating manufacturer's recommendation on abrasive blasting.

E. Samples:
   1. Manufacturer's full line of colors for Owner color selection.
   2. After initial color selection by Owner provide two 3 x 5 IN samples of each color selected.

F. Quality Assurance/Control Submittals:
   1. Certificates:
      a. Coating manufacturer’s certification of Applicator

G. Miscellaneous Submittals:
   1. Approval of application equipment.
   2. Applicator’s daily record:
      a. Submit daily record at end of each week in which painting Work is performed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original containers, labeled as follows:
   1. Name or type number of material.
   2. Manufacturer's name and item stock number.
   3. Contents, by volume, of major constituents.
   4. Warning labels.
   5. VOC content.

1.6 QUALIFICATIONS

A. Coating manufacturer's authorized representative shall provide written statement attesting that Applicator has been instructed on proper preparation, mixing and application procedures for coatings specified.
B. Applicators shall have minimum of 10 years experience in application of similar products on similar project. Provide references for minimum of three different projects completed in last 5 years with similar scope of work. Include name and address of project, size of project in value (painting) and contact person.

1.7 MISCELLANEOUS

A. Furnish paint through one manufacturer unless noted otherwise.
B. Deviation from specified mil thickness or product type is not allowed without written authorization of Owner.
C. Material may not be thinned unless approved, in writing, by paint manufacturer's authorized representative.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Tnemec.
   2. Ameron Protective Coatings Div.
   3. ICI Devoe.
   4. Valspar Corp.
   5. Carboline Protective Coatings.
   6. Sherwin Williams.
   7. Dampney Company, Inc.
   8. Or Approved Equal.

2.2 MATERIALS

A. All materials used must contain not more than 2.8 LBS/GAL VOC.
B. For unspecified materials such as thinner, provide manufacturer's recommended products.
C. Paint Systems - General:
   1. P=prime coat. F1, F2 . . . Fn = first finish coat,
      second finish coat . . … . nth finish coat, color as selected by Owner.
   2. If two finish coats of same material are required, Contractor may, at its option and by written approval from paint manufacturer, apply one coat equal to mil thickness of two coats specified.
D. Products specified in Paint Systems are manufactured by Tnemec. Equivalent products from approved manufactures are also acceptable.
E. Paint Systems:
   1. System #1 - Polyamidoamine Epoxy Primer with Polyamidoamine Epoxy or Aliphatic Acrylic Polyurethane Enamel Finish Coat(s).
      a. Prime coat:
         1) P1=1 coat, 3 mils, Series N69 Epoxoline (Polyamidoamine Epoxy), VOC=2.11

b. Finish coat(s):
   1) Interior:
      (a) F1=1 coat, 3 mils, Series N69 Epoxoline (Polyamidoamine Epoxy)
      (b) F2=1 coat, 3 mils, Series N69 Epoxoline (Polyamidoamine Epoxy)
   2) Exterior:
      (a) F1=1 coat, 3 mils, Series N69 Epoxoline (Polyamidoamine Epoxy)
      (b) F2=1 coat, 2.5 mils, Series 1074 Endura-Shield (Aliphatic Acrylic Polyurethane Enamel), VOC=1.81

2. System #2 - Zinc-Rich Urethane Primer with Polyamidoamine Epoxy or Waterborne Acrylic Polyurethane Finish Coat(s).
   a. Prime coat:
      1) P1 = 1 coat, 3.5 mils, Series 90-97 Tneme-Zinc (Zinc-Rich Urethane).
   b. Finish coat(s):
      1) Interior:
         (a) F1 = 1 coat, 6 mils, Series L69 Epoxoline (Polyamidoamine Epoxy).
      2) Exterior:
         (a) F1 = 1 coat, 6 mils, Series L69 Epoxoline (Polyamidoamine Epoxy).
         (b) F2 = 1 coat, 2.5 mils, Series 1080 Endura-Shield W.B.(Waterborne Acrylic Polyurethane).
3. System #3 - Polyamidoamine Epoxy Primer with Polyamidoamine Epoxy or Aliphatic Acrylic Polyurethane Enamel Top Coat(s).
   a. Prime coat:
      1) P1=1 coat, 5 mils, Series N69 Epoxoline (Polyamidoamine Epoxy), VOC=2.11
   b. Finish coat(s):
      1) Interior:
         (a) F1=1 coat, 5 mils, Series N69 Epoxoline (Polyamidoamine Epoxy)
      2) Exterior:
         (a) F1=1 coat, 2.5 mils, Series 1074 Endura-Shield (Aliphatic Acrylic Polyurethane Enamel), VOC=2.80
4. System #4 - Zinc-rich Urethane Primer with Polyamidoamine Epoxy or Aliphatic Acrylic Polyurethane Enamel Top Coat(s).
   a. Prime coat:
      1) P1=1 coat, 2.5 mils, Series 90-97 Tneme-Zinc (Zinc-Rich Urethane), VOC=2.67
   b. Finish coat(s):
      1) Interior:
         (a) F1=1 coat, 3 mils, Series N69 Epoxoline (Polyamidoamine Epoxy), VOC=2.11
      2) Exterior:
         (a) F1=1 coat, 2.5 mils, Series 1074 Endura-Shield (Aliphatic Acrylic Polyurethane Enamel), VOC=2.45
5. System #5 - Polyamide Epoxy Primer with Polyamidoamine Epoxy or Aliphatic Acrylic Polyurethane Enamel Top Coat(s).
   a. Prime coat:
      1) P1=1 coat, 2.0 mils, Series N27 F.C. Typoxy (Polyamide Enamel), VOC=2.49
   b. Finish coat(s):
      1) Interior:
         (a) F1=1 coat, 2.5 mils, Series N69 Epoxoline (Polyamidoamine Epoxy), VOC=2.11

2) Exterior:
   (a) F1=1 coat, 2.0 mils, Series 1074 Endura-Shield (Aliphatic Acrylic Polyurethane Enamel), VOC=2.45
   (b) F1=1 coat, 2.0 mils, Series 1075 Endura-Shield (Aliphatic Acrylic Polyurethane Enamel), VOC=1.82

6. System #6 - NOT USED.
7. System #7 - NOT USED.
8. System #8 - NOT USED.
9. System #9 - NOT USED.
10. System #10 - NOT USED.
11. System #11 - Zinc-Rich Aromatic Urethane Primer.
    a. Prime coat:
       1) P1=1 coat, 3.0 mils, 90-97 Tneme-Zinc (Zinc-Rich Urethane), VOC=2.67
12. System #12 - NOT USED.
13. System #13 - NOT USED.
14. System #14 - NOT USED.
15. System #15 - NOT USED.
16. System #16 - NOT USED.
17. System #17 - NOT USED.
18. System #18 - NOT USED.
19. System #19 - Polyamidoamine Epoxy Coating.
    a. Prime coat:
       1) P1=1 coat, 5 mils, Series N69 Epoxoline (Polyamidoamine Epoxy), VOC=2.11
20. System #20 - NOT USED.
21. System #21 - NOT USED.
22. System #22 - NOT USED.
23. System #23 - NOT USED.
24. System #24 - NOT USED.
25. System #25 - NOT USED.
26. System #26 - NOT USED.
27. System #27 - NOT USED.
28. System #28 - NOT USED.
29. System #29 - NOT USED.
30. System #30 - Modified Aromatic Polyurethane Primer with Hydrophobic Aromatic Moister-Cured Polyurethane Top Coat(s).
    a. Prime coat:
       1) P1 = 1 coat, 4 mils, Series 1 Omnithane (Modified Aromatic Polyurethane Primer).
    b. Finish coat(s):
       1) F1 = 1 coat, 8 mils, Series 446 Perma-Shield-MCU.
       2) F2 = 1 coat, 8 mils, Series 446 Perma-Shield-MCU.
31. System #31 - NOT USED.
32. System #32 - NOT USED.

PART 3 EXECUTION

3.1 ITEMS TO BE PAINTED

A. Exposed Exterior Surfaces including:
   1. Piping, valves, pumps, strainer, fittings, and hydrants.
   2. Conduit, device boxes, junction boxes and covers, pull boxes and covers, and supports when attached to a surface required to be painted.
   3. Miscellaneous ferrous metal surfaces.
B. Surfaces in Areas Not Considered Finished:
   1. Paint following surfaces in areas not considered as finished area:
      a. Piping, valves, pumps, strainer, fittings, and hydrants.
      b. Miscellaneous ferrous metal surfaces.
C. New and/or Existing Equipment:
   1. Paint new and/or existing equipment, except:
      a. Where noted in this Section 09905.
      b. Where specified elsewhere in the Contract Documents.

3.2 ITEMS NOT TO BE PAINTED

A. General: Do not paint items listed in Article 3.2 unless specifically noted in the Contract Documents to be painted.
B. Items with Approved Factory Finish.
C. Surfaces hidden from view except when in a corrosive or highly corrosive area, including:
   1. Piping.
   2. Conduit.
   3. Note: Manufacturer's standard coatings, if any, may remain.
D. Other Items:
   1. Stainless steel surfaces including:
      a. Piping.
      b. Banding as required to identify piping.
   2. Aluminum surfaces except:
      a. Where specifically shown in the Contract Documents.
      b. Where in contact with concrete.
      c. Where in contact with dissimilar metals.
   3. Fiberglass surfaces except:
      a. Fiberglass piping.
      b. Piping supports.
   4. Interior of pipe and conduits.
   5. Moving parts of mechanical and electrical units where painting would interfere with the operation of the unit.
   6. Code labels and equipment identification and rating plates.
   7. Structural steel or steel deck required to be fireproofed.
   8. Steel deck.
   9. Contact surfaces of friction-type connections.
   10. Galvanized steel items (except field touch up).

3.3 SCHEDULE OF ITEMS TO BE PAINTED AND PAINTING SYSTEMS

	PAINTING SYSTEM NUMBER
A. Miscellaneous Ferrous Metals:	1
B. Ferrous Metals:	
1. Pumps.	5
2. Ferrous materials immersed in wastewater.	30
3. Ferrous materials in corrosive area.	2
C. Galvanized Metals:	
1. Field touch-up.	4
a. Prime paint only the damaged area.	
2. Field touch-up of galvanized surfaces not requiring a finish top coat.	11
a. Paint only damaged areas.	
D. Electrical Conduit:	
1. Fiberglass.	3
E. Pipe, Valves, and Fittings:	
1. Steel, cast-iron, and uncoated ductile iron.	1
2. Exposed PVC.	3
F. Aluminum buried in concrete and between dissimilar metals which are not below liquid level.	19

3.4 PREPARATION

A. General:
   1. Prepare surfaces to be painted in accordance with coating manufacturer's instructions and this Section 09905, unless noted otherwise in the Specification.
   2. Remove all dust, grease, oil, compounds, dirt and other foreign matter which would prevent bonding of coating to surface.

B. Protection:
   1. Protect surrounding surfaces not to be coated.
   2. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar items; or provide ample in-place protection.

C. Prepare and Paint Before Assembly: Where component is subject to corrosive or highly corrosive environment, prepare and paint, before assembly, all surfaces which may be subject to environment which are inaccessible after assembly.

D. Ferrous Metal:
   1. Prepare ductile iron pipe in accordance with pipe manufacturer's recommendations and applicable AWWA standards.
   2. Complete fabrication, welding or burning before beginning surface preparation.
      a. Chip or grind off flux, spatter, slag or other laminations left from welding.
      b. Remove mill scale.
      c. Grind smooth rough welds and other sharp projections.
   3. Solvent clean in accordance with SSPC SP-1 all surfaces scheduled to receive additional SSPC surface preparation.
   4. Restore surface of field welds and adjacent areas to original surface preparation.

E. Galvanized Metal:
   1. Solvent clean in accordance with SSPC SP-1 followed by abrasive brush blast in accordance with SSPC SP-7 to provide 1 mil profile.
F. Preparation by Abrasive Blasting:
   1. All abrasive-blasted ferrous metal surfaces shall be inspected immediately prior to application of paint coatings.
      a. Inspection shall be performed to determine cleanliness and profile depth of blasted surfaces and to certify that surface has been prepared in accordance with this Section 09905.
   2. Schedule the abrasive blasting operation so blasted surfaces will not be wet after blasting and before painting.
   3. Perform additional blasting and cleaning as required to achieve surface preparation required. Prior to painting, reblast surfaces allowed to set overnight or surfaces that show rust bloom.
      a. Surfaces allowed to set overnight or surfaces which show rust bloom prior to painting shall be reinspected prior to paint application.
   4. Profile depth of blasted surface: Not less than 1 mil or greater than 2 mils unless required otherwise by coating manufacturer.
   5. Provide compressed air for blasting that is free of water and oil. Provide accessible separators and traps.
   6. Confine blast abrasives to area being blasted.
      a. Provide shields of polyethylene sheeting or other such barriers to confine blast material.
      b. Plug pipes, holes, or openings before blasting and keep plugged until blast operation is complete and residue is removed.
   7. Protect nameplates, valve stems, rotating equipment, motors and other items that may be damaged from blasting.
   8. Reblast surfaces not meeting requirements of this Section 09905.
   9. Abrasive blasting media may be recovered, cleaned and reused providing Contractor submits, for Owner review, a comprehensive recovery plan outlining all procedures and equipment proposed in reclamation process.
   10. Properly dispose of blasting material contaminated with debris from blasting operation not scheduled to be reused.

3.5 APPLICATION

A. General:
   1. Thin, mix and apply coatings by brush, roller, or spray in accordance with manufacturer's installation instructions.
      a. Application equipment must be inspected and approved in writing by coating manufacturer.
   2. Temperature and weather conditions:
      a. Do not paint surfaces when surface temperature is below 50 DegF unless product has been formulated specifically for low temperature application or approved in writing by Owner and paint manufacturer's authorized representative.
      b. Avoid painting surfaces exposed to hot sun.
      c. Do not paint on damp surfaces.
   3. Immediately after surface has been inspected apply structural steel and miscellaneous steel prime coat in the factory.

a. Finish coats shall be applied in the field.
b. Prime coat referred to here is prime coat as indicated in this Section 09905. Structural and miscellaneous steel prime coating applied in factory (shop) as part of fabricator's standard rust inhibiting and protection coating is not acceptable as replacement for specified prime coating.

4. Provide complete coverage to mil thickness specified.
   a. Thickness specified is dry mil thickness.
   b. All paint systems are "to cover." In situations of discrepancy between manufacturer's square footage coverage rates and mil thickness, mil thickness requirements govern.
   c. When color or undercoats show through, apply additional coats until paint film is of uniform finish and color.
5. If so directed by Owner, do not apply consecutive coats until Owner has had an opportunity to observe and approve previous coats.
6. Apply materials under adequate illumination.
7. Evenly spread to provide full, smooth coverage.
8. Work each application of material into corners, crevices, joints, and other difficult to work areas.
9. Avoid degradation and contamination of blasted surfaces and avoid intercoat contamination.
   a. Clean contaminated surfaces before applying next coat.
10. Smooth out runs or sags immediately, or remove and recoat entire surface.
11. Allow preceding coats to dry before recoating.
    a. Recoat within time limits specified by coating manufacturer.
    b. If recoat time limits have expired reprepare surface in accordance with coating manufacturer's printed recommendations.
12. Allow coated surfaces to cure prior to allowing traffic or other Work to proceed.
13. Coat all aluminum in contact with dissimilar materials.

B. Prime Coat Application:
   1. Prime all surfaces indicated to be painted. Apply prime coat in accordance with coating manufacturer's written instructions and as written in this Section 09905.
   2. Ensure field-applied coatings are compatible with factory-applied coatings. Ensure new coatings applied over existing coatings are compatible.
      a. Employ services of coating manufacturer's qualified technical representative.
         1) Certify thru material data sheets.
         2) Perform test patch.
      b. If field-applied coating is found to be not compatible, require the coating manufacturer's technical representative to recommend, in writing, product to be used as barrier coat, thickness to be applied, surface preparation and method of application.
      c. At Contractor's option, coatings may be removed, surface reprepared, and new coating applied using appropriate paint system listed in this Section 09905.
         1) All damage to surface as result of coating removal shall be repaired to original condition or better by Contractor at no additional cost to Owner.
   3. Prime ferrous metals embedded in concrete to minimum of 1 IN below exposed surfaces.
   4. Back prime all wood scheduled to be painted, prior to installation.
   5. Apply zinc-rich primers while under continuous agitation.

6. Ensure abrasive blasting operation does not result in embedment of abrasive particles in paint film.
7. Brush or spray bolts, welds, edges and difficult access areas with primer prior to primer application over entire surface.
8. When surface is scheduled to receive painted finish, completely fill all pores of concrete block using block filler specified.
9. Touch up damaged primer coats prior to applying finish coats. Restore primed surface equal to surface before damage.

C. Finish Coat Application:
1. Apply finish coats in accordance with coating manufacturer's written instructions and in accordance with this Section 09905.
2. Touch up damaged finish coats using same application method and same material specified for finish coat. Prepare damaged area in accordance with this Section 09905.

3.6 FIELD QUALITY CONTROL

A. Maintain daily record:
1. Provide the following information prior to each coat at beginning and end of each Day's painting work for each different area painted:
   a. Start time, end time, and all breaks taken by painters.
   b. Sky condition.
   c. Air temperature.
   d. Relative humidity.
   e. Wind speed and direction.
   f. Moisture content of substrate prior to each coat.
   g. Provisions utilized to maintain work area within manufacturer's recommended application parameters.
   h. Surface temperature of substrate to which paint is being applied.
2. Date and time of application for each following coat.
3. Moisture content of substrate prior to each coat.
4. Provisions utilized to maintain temperature and humidity of work area within manufacturer's recommended ranges.

B. Measure wet coating with wet film thickness gages.

C. Measure coating dry film thickness in accordance with SSPC PA-2 using Mikrotest gage calibrated against National Bureau of Standards "Certified Coating Thickness Calibration Standards."
1. Owner may measure coating thickness at any time during project to ensure conformance with this Section 09905.

D. Measure surface temperature of items to be painted with surface temperature gage specifically designed for such.

E. Measure substrate humidity with humidity gage specifically designed for such.

F. Provide wet paint signs.

G. Thickness and Holiday checking:
1. Thickness of coatings and paint shall be checked by Contractor with a nondestructive, magnetic-type thickness gauge. Coating integrity of all interior coated surfaces shall be tested by Contractor with an approved holiday testing device. Holiday detectors shall not exceed the voltage recommended by the manufacturer of the coating system. No pinholes or other irregularities will be permitted in the final coating.

H. Contractor to provide on-Site testing of materials to verify VOC content.

3.7 CLEANING

A. Clean paint spattered surfaces. Use care not to damage finished surfaces.
B. Upon completion of painting, replace hardware, accessories, plates, fixtures, and similar items.
C. Remove surplus materials, scaffolding, and debris. Leave areas broom clean.

3.8 ONE-YEAR WARRANTY INSPECTION

A. A one-year warranty inspection will be conducted during the eleventh month following completion of all coating and painting Work. All defective Work shall be repaired in strict accordance with this specification and to the satisfaction of Owner.
B. Notification - Owner will establish the date for the inspection at least 30 Days in advance. If an inspection date has not been established within twelve months after the coating and painting Work was completed, the first anniversary inspection shall be considered to be waived.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10405

IDENTIFICATION, STENCILING, AND TAGGING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tag, tape and stenciling systems for equipment, piping, valves, pumps, and similar items, and hazard and safety signs

1.2 REFERENCES

A.	ASME A13.1	Scheme for the Identification of Piping Systems
B.	ISA	Instrumentation, Systems, and Automation Society
C.	NEMA/ANSI Z535.1	Safety Color Code
D.	NEMA/ANSI Z535.2	Environmental and Facility Safety Signs
E.	NEMA/ANSI Z535.3	Criteria for Safety Symbols
F.	NEMA/ANSI Z535.4	Product Safety Signs and Labels
G.	NFPA 70	National Electrical Code (NEC)
H.	OSHA 29 CFR 1910.145	Specification for Accident Prevention Signs and Tags

1.3 SUBMITTALS

A. Shop Drawings:
   1. Product technical data including:
      a. Catalog information for all identification systems.
      b. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Identification register, listing all items in Part 3 to be identified, type of identification system to be used, lettering, location and color.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. W.H. Brady Co.
   2. Panduit.
   3. Seton.
   4. National Band and Tag Co.
   5. Carlton Industries, Inc.
   6. Or Approved Equal.

2.2 MANUFACTURED UNITS

A. Type A1 - Round Metal Tags:
   1. Materials:
      a. Aluminum or stainless steel.
      b. Stainless steel shall be used in corrosive environments.
   2. Size:
      a. Diameter: 1-1/2 IN minimum.

b. Thickness: 0.035 IN (20 GA) minimum.
3. Fabrication:
a. 3/16 IN minimum mounting hole.
b. Legend: Stamped and filled with black coloring.
4. Color: Natural.

B. Type A2 - Rectangle Metal Tags:
1. Materials: Stainless steel.
2. Size:
a. 3-1/2 IN x 1-1/2 IN minimum.
b. Thickness: 0.036 IN (20 GA) minimum.
3. Fabrication:
a. 3/16 IN minimum mounting hole.
b. Legend: Stamped and filled with black coloring.
4. Color: Natural.

C. Type A3 - Metal Tape Tags:
1. Materials: Aluminum or stainless steel.
2. Size:
a. Width 1/2 IN minimum.
b. Length as required by text.
3. Fabrication:
a. 3/16 IN minimum mounting hole.
b. Legend: Embossed.
4. Color: Natural.

D. Type B1- Square Non-Metallic Tags:
1. Materials: Fiberglass reinforced plastic.
2. Size:
a. Surface: 2 x 2 IN minimum.
b. Thickness: 100 mils.
3. Fabrication:
a. 3/16 IN mounting hole with metal eyelet.
b. Legend: Preprinted and permanently embedded and fade resistant.
4. Color:
a. Background: Manufacturer standard or as specified.
b. Lettering: Black.

E. Type B2 - Non-Metallic Signs:
1. Materials: Fiberglass reinforced or durable plastic.
2. Size:
a. Surface: As required by text.
b. Thickness: 60 mils minimum.
3. Fabrication:
a. Rounded corners.
b. Drilled holes in corners with grommets.
c. Legend: Preprinted, permanently embedded and fade resistant for a 10 year minimum outdoor durability.
4. Color:
a. Background: Manufacturer standard or as specified.
b. Lettering: Black.

5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.

F. Type C - Phenolic Name Plates:
1. Materials: Phenolic.
2. Size:
   a. Surface: As required by text.
   b. Thickness: 1/16 IN.
3. Fabrication:
   a. Two (2) layers laminated.
   b. Legend: Engraved through top lamination into bottom lamination.
   c. Two (2) drilled side holes, for screw mounting.
4. Color: Black top surface, white core, unless otherwise indicated.

G. Type D - Self-Adhesive Tape Tags and Signs:
1. Materials: Vinyl tape or vinyl cloth.
2. Size:
   a. Surface: As required by text.
   b. Thickness: 5 mils minimum.
3. Fabrication:
   a. Indoor/Outdoor grade.
   b. Weather and UV resistant inks.
   c. Permanent adhesive.
   d. Legend: Preprinted.
   e. Wire markers to be self-laminating.
4. Color: White with black lettering or as specified.
5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.

H. Type E - Heat Shrinkable Tape Tags:
1. Materials: Polyolefin.
2. Size: As required by text.
3. Fabrication:
   a. Legend: Preprinted.
4. Color: White background, black printing.

I. Type F - Underground Warning Tape:
1. Materials: Polyethylene.
2. Size:
   a. 6 IN wide (minimum).
   b. Thickness: 3.5 mils.
3. Fabrication:
   a. Legend: Preprinted and permanently imbedded.
   b. Message continuous printed.
   c. Tensile strength: 1750 psi.
4. Color: As specified.

J. Type G - Stenciling System:
1. Materials:
   a. Exterior type stenciling enamel.
   b. Either brushing grade or pressurized spray can form and grade.
2. Size: As required.

3. Fabrication:
   a. Legend: As required.
4. Color: Black or white for best contrast.

2.3 ACCESSORIES

A. Fasteners:
   1. Bead chain: #6 brass, aluminum or stainless steel.
   2. Plastic strap: Nylon, urethane or polypropylene.
   3. Screws: Self-tapping, stainless steel.
   4. Adhesive, solvent activated.

2.4 MAINTENANCE MATERIALS

A. Where stenciled markers are provided, clean and retain stencils after completion and include in extra stock, along with required stock of paints and applicators.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Install identification devices at specified locations.
B. All identification devices to be printed by mechanical process, hand printing is not acceptable.
C. Attach tags to equipment with sufficient surface or body area with solvent activated adhesive applied to back of each tag.
D. Attach tags with 1/8 IN round or flat head screws to equipment without sufficient surface or body area, or porous surfaces.
   1. Where attachment with screws should not or cannot penetrate substrate, attach with plastic strap.
E. Single items of equipment enclosed in a housing or compartment to be tagged on outside of housing.
   1. Several items of equipment mounted in housing to be individually tagged inside the compartment.

3.2 SCHEDULES

A. Process Systems:
   1. General:
      a. Provide arrows and markers on piping.
         1) At 20 FT maximum centers along continuous lines.
         2) At changes in direction (route) or obstructions.
         3) At valves, risers, "T" joints, machinery or equipment.
         4) Where pipes pass through floors, walls, ceilings, cladding assemblies and like obstructions provide markers on both sides.
      b. Position markers on both sides of pipe with arrow markers pointing in flow direction.
         1) If flow is in both directions use double headed arrow markers.
      c. Apply tapes and stenciling in uniform manner parallel to piping.
   2. Valves and slide gates:
      a. Tag type:
         1) Outdoor locations: Type B1 - Square Non-Metallic Tags.

2) Indoor non-corrosive:
   (a) Type A1 - Round Metal Tags.
   (b) Type B1 - Square Non-Metallic Tags.
3) Indoor corrosive:
   (a) Stainless steel Type A1 - Round Metal Tags.
   (b) Type B1 - Square Non-Metallic Tags.

b. Fastener:
   1) Type A1: Chain of the same material.
   2) Type B1: Stainless steel chain.

c. Color: Per ASME A13.1 corresponding to the piping system.

d. Legend:
   1) Letter height: 1/4 IN minimum.
   2) Valve designation as indicated on the Drawings (e.g., "V-xxx").

3. Process equipment (e.g., pumps, pump motors, etc.):

a. Tag type:
   1) Type B2 - Non-Metallic Signs.
   2) Type D - Self-Adhesive Tape Tags and Signs.
   3) Type G - Stenciling System.

b. Fastener:
   1) Self.
   2) Screws.
   3) Adhesive.

c. Legend:
   1) Letter height: 1/2 IN minimum.
   2) Equipment designation as indicated on the Drawings (e.g., "Vertical Turbine Pump P-xxx").

4. Piping systems:

a. Tag type:
   1) Outdoor locations: Type G - Stenciling System.
   2) Indoor locations:
      (a) Type D - Self-Adhesive Tape Tags and Signs.
      (b) Type G - Stenciling System.

b. Fastener: Self.

c. Color: Per ASME A13.1.

d. Legend:
   1) Letter height: Manufacturers standard for the pipe diameter.
   2) Mark piping in accordance with ASME A13.1.
   3) Use piping designation as indicated on the Drawings.
   4) Arrow: Single arrow.

5. Equipment that starts automatically:

a. Tag type:
   1) Type B2 - Non-Metallic Signs.
   2) Type D - Self-Adhesive Tape Tags and Signs.

b. Fastener:
   1) Type B2 - Screw or adhesive.
   2) Type D - Self.

c. Size: 5 IN x 7 IN

d. Location: Vertical Turbine Pumps.

e. Legend:
   1) OSHA Warning Sign.
   2) Description of Warning: "THIS MACHINE STARTS AUTOMATICALLY".

B. Instrumentation Systems:
1. Instrumentation Equipment (e.g., flow control valves, primary elements, etc.):
   a. Tag type:
      1) Outdoor locations: Type B1 - Square Non-Metallic Tags.
      2) Indoor non-corrosive:
         (a) Type A1 - Round Metal Tags.
         (b) Type B1 - Square Non-Metallic Tags.
      3) Indoor corrosive:
         (a) Stainless steel Type A1 - Round Metal Tags.
         (b) Type B1 - Square Non-Metallic Tags.
   b. Fastener:
      1) Type A1: Chain of the same material.
      2) Type B1: Stainless steel chain.
   c. Legend:
      1) Letter height: 1/4 IN minimum.
      2) Equipment ISA designation as indicated on the Drawings (e.g., "FIT-xxx").
2. Enclosure for instrumentation and control equipment, (e.g., PLC control panels, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/2 IN minimum.
      2) Equipment name (e.g., "PLC CONTROL PANEL PCP-xxx").
3. Components inside equipment enclosure, (e.g., PLC's, control relays, contactors, and timers):
   a. Tag type: Type D - Self-Adhesive Tape Tags.
   b. Fastener: Self.
   c. Legend:
      1) Letter height: 3/16 IN minimum.
      2) Description or function of component (e.g., "PLC-xxx" or "CR-xxx").
4. Through enclosure door mounted components (e.g., selector switches, controller digital displays, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/4 IN minimum.
      2) Component ISA tag number as indicated on the Drawings (e.g., "HS-xxx").

C. HVAC Systems:
1. Enclosure for instrumentation and control equipment, (e.g., fan control panels, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/2 IN minimum.
      2) Equipment designation as indicated on the Drawings (e.g., "FAN CONTROL PANEL FCP-xxx").

2. Components inside equipment enclosure, (e.g., controller's, control relays, contactors, and timers):
   a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
   b. Fastener: Self.
   c. Legend:
      1) Letter height: 3/16 IN minimum.
      2) Description or function of component (e.g., "CR-xxx").
3. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/4 IN minimum.
      2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., "HS-xxx").

D. Electrical Systems:
1. Trenches with ductbanks, direct-buried conduit, or direct-buried wire and cable.
   a. Tag type: Type F - Underground Warning Tape.
   b. Letter height: 1-1/4 IN minimum.
   c. Location:
      1) Where trench is 12 IN or more below finished grade: In trench 6 IN below finished grade.
      2) Where trench is less than 12 IN below finished grade: In trench 3 IN below finished grade.
   d. Electrical power (e.g., low and medium voltage):
      1) Color: Red with black letters.
      2) Legend:
         (a) First line: "CAUTION CAUTION CAUTION".
         (b) Second line: "BURIED ELECTRIC LINE BELOW".
   e. Communications (e.g., telephone, instrumentation, LAN, SCADA):
      1) Color: Orange with black letters.
      2) Legend:
         (a) First line: "CAUTION CAUTION CAUTION".
         (b) Second line: "BURIED COMMUNICATION LINE BELOW".
2. Switchgear, switchboards and motor control centers:
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Main equipment legend:
      1) Letter height:
         (a) First line: 1 IN minimum.
         (b) Subsequent lines: 3/8 IN minimum.
      2) First line: Equipment name (e.g., "MAIN SWITCHBOARD MSBxxx").
      3) Second line:
         (a) Source of power (e.g., "FED FROM MCCxxx LOCATED IN ROOM xxx").
         (b) The source of power room number is only required when there are multiple electrical rooms, if the source is in another building, the building name or number shall be used.
      4) Third line: System voltage and phase (e.g., "480/277 V, 3PH").

d. Main and feeder device legend:
   1) Letter height: 3/8 IN minimum.
   2) Description of load (e.g., “MAIN DISCONNECT”, "PUMP Pxxx" or "PANELBOARD HPxxx").

3. Panelboards and transformers:
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height:
         (a) First line: 3/8 IN minimum.
         (b) Subsequent lines: 3/16 IN minimum.
      2) First line: Equipment name (e.g., "PANELBOARD LPxxx" or "TRANSFORMER Txxx").
      3) Second line (panelboards only): System voltage and phase (e.g., “208/120V, 3PH”).
4. Transfer switches:
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height:
         (a) First line: 3/8 IN minimum.
         (b) Subsequent lines: 3/16 IN minimum.
      2) First line: Equipment name (e.g., "AUTOMATIC TRANSFER SWITCH ATSxxx").
5. Safety switches, separately mounted circuit breakers and motor starters, VFD’s, etc.:
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/4 IN minimum.
      2) First line: Description of load equipment is connected to (e.g., "PUMP Pxxx").
6. Enclosure for instrumentation and control equipment, (e.g., lighting control panels, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/2 IN minimum.
      2) Equipment name (e.g., "LIGHTING CONTROL PANEL LCPxxx").
7. Components inside equipment enclosures (e.g., circuit breakers, fuses, control power transformers, control relays, contactors, timers, etc.):
   a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
   b. Fastener: Self.
   c. Legend:
      1) Letter height: 3/16 IN minimum.
      2) Description or function of component (e.g., "M-xxx”, “CR-xxx” or “TR-xxx").
8. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.

c. Legend:
   1) Letter height: 1/4 IN minimum.
   2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., “HS-xxx”).

9. Conductors in control panels and in pull or junction boxes where multiple circuits exist.
   a. Tag type: Type D - Self-Adhesive Tape Tags.
   b. Fastener: Self.
   c. Tag conductor at both ends.
   d. Legend:
      1) Letter height: 1/8 IN minimum.
      2) Circuit number or wire number as scheduled on the Drawings or as furnished with the equipment.
10. Conductors in handholes and manholes.
   a. Tag type: Type A3 - Metal Tape Tags.
   b. Fastener: Nylon strap.
   c. Tag conductor at both ends.
   d. Legend:
      1) Letter height: 1/8 IN minimum.
      2) Circuit number or wire number as scheduled on the Drawings.
11. Grounding conductors associated with grounding electrode system in accordance with the following:
   a. Tag type: Type D - Self-Adhesive Tape Tags.
   b. Fastener: Self.
   c. Legend:
      1) Letter height: 1/8 IN minimum.
      2) Function of conductor (e.g., "MAIN BONDING JUMPER", "TO GROUND RING", "TO MAIN WATER PIPE").
12. Arc-flash protection for switchboards, panelboards, industrial control panels and motor control centers:
   a. Tag type: Type D - Self-Adhesive Tape Signs.
   b. Fastener: Self.
   c. Legend: Per NFPA 70.
13. Entrances to electrical rooms:
   a. Tag type: Type B2 - Non-Metallic Signs.
   b. Fastener: Screw or adhesive.
   c. Size: 5 IN x 7 IN.
   d. Location: Each door to room.
   e. Legend:
      1) OSHA Danger Sign.
      2) Description of Danger: “HIGH VOLTAGE, AUTHORIZED PERSONNEL ONLY”.
14. Equipment where more than one (1) voltage source is present:
   a. Tag type:
      1) Type B2 - Non-Metallic Signs.
      2) Type D - Self-Adhesive Tape Signs.
   b. Fastener:
      1) Screw or adhesive.
      2) Self.

c. Size: 1-3/4 IN x 2-1/2 IN.
d. Location: Exterior face of enclosure or cubical.
e. Legend:
   1) OSHA Danger Sign.
   2) Description of Danger: "MULTIPLE VOLTAGE SOURCES".

3.3 HAZARD AND SAFETY SIGNS

A. Provide 10 Hazard and Safety Signs:
   1. Inscription as directed by Owner.
   2. Locations and sizes coordinated with Owner.

END OF SECTION

DIVISION 11

EQUIPMENT

SECTION 11005

EQUIPMENT: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements of this Specification Section apply to all equipment provided on the Project including that found in Divisions 11, 12, 13, 14, 15, and 16, even if not specifically referenced in individual "Equipment" articles of those Specification Sections.

1.2 REFERENCES

A. ABMA	American Bearing Manufacturers Association
B. AGMA	American Gear Manufacturers Association
C. ASTM E1934	Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography
D. ASTM F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
E. HI 9.6.4-2000	Centrifugal and Vertical Pumps for Vibration Measurements and Allowable Valves
F. IEC	International Electrotechnical Commission
G. IEEE	Institute of Electrical and Electronics Engineers, Inc.
H. ISO 1940	Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerances
I. NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
J. NEMA ICS 6	Enclosures for Industrial Control and System
K. NEMA MG 1	Motors and Generators
L. NETA ATS	Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems
M. NFPA 70	National Electrical Code (NEC), Article 430, Motors
N. NICET	National Institute for Certification in Engineering Technologies
O. NIST	National Institute of Standards and Technology
P. OSHA 29 CFR 1910	Occupational Safety and Health Standards, referred to herein as OSHA Standards
Q. UL 508	Standard for Safety Industrial Control Equipment
R. UL 508A	Standard for Safety Industrial Control Panels

1.3 DEFINITIONS

A. Product: Manufactured materials and equipment.
B. Major Equipment Supports - Supports for Equipment:
   1. Located on slab-on-grade or earth with supported equipment weighing 5000 LBS or more.
C. Equipment:
   1. One (1) or more assemblies capable of performing a complete function.
   2. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection.

3. Not limited to items specifically referenced in "Equipment" articles within individual Specifications.

D. Installer or Applicator:
1. Installer or applicator is the person actually installing or applying the product in the field at the Site.
2. Installer and applicator are synonymous.

1.4 SUBMITTALS

A. Shop Drawings:
1. General for all equipment:
a. Data sheets that include manufacturer's name and complete product model number.
1) Clearly identify all optional accessories that are included.
b. Acknowledgement that products submitted comply with the requirements of the standards referenced.
c. Manufacturer's delivery, storage, handling, and installation instructions.
d. Equipment identification utilizing numbering system and name utilized in Drawings.
e. Equipment installation details:
1) Location of anchorage.
2) Type, size, and materials of construction of anchorage.
3) Anchorage setting templates.
4) Manufacturer's installation instructions.
f. Equipment area classification rating.
g. Shipping and operating weight.
h. Equipment physical characteristics:
1) Dimensions (both horizontal and vertical).
2) Materials of construction and construction details.
i. Equipment factory primer and paint data.
j. Manufacturer's recommended spare parts list.
k. Equipment lining and coatings.
l. Equipment utility requirements include air, natural gas, electricity, and water.
m. Ladders and platforms provided with equipment:
1) Certification that all components comply fully with OSHA requirements.
2) Full details of construction/fabrication.
3) Scaled plan and sections showing relationship to equipment.
n. Submit written certification that:
1) Equipment conforms to the requirements of Section 1.5 of this specification Section 11005.
2) Written certification to be signed and sealed by a registered professional Civil or Structural Engineer registered in the State of California. Submit certification along with shop drawings.
o. Structural calculations for the required force level for each component as required in Section 1.5 of this specification Section 11005.
1) Provide summary of loads to each anchor.
2) Structural calculations shall be signed and sealed by a registered professional Civil or Structural Engineer registered in the State of California.
3) Number calculation pages.
4) Include equipment data sheets showing equipment plan, elevation and weight.

2. Mechanical and process equipment:
   a. Operating characteristics:
      1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.
      2) Brake horsepower requirements.
      3) Copies of equipment data plates.
   b. Piping and duct connection size, type and location.
   c. Equipment bearing life certification.
   d. Equipment foundation data:
      1) Equipment center of gravity.
      2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.
3. Electric motor:
   a. Motor manufacturer and model number.
   b. Complete motor nameplate data.
   c. Weight.
   d. NEMA design type.
   e. Enclosure type.
   f. Frame size.
   g. Winding insulation class and temperature rise.
   h. Starts per hour.
   i. Performance data:
      1) Motor speed-torque curve superimposed over driven machine speed-torque curve during start-up acceleration and at rated terminal voltage a minimum permissible or specified terminal voltage for all motors over 30 HP.
      2) Time-current plots with acceleration versus current and thermal damage curves at the operating and ambient temperatures and at rated terminal voltage and minimum permissible or specified terminal voltage for all motors over 30 HP.
      3) Guaranteed minimum efficiencies at 100 percent, 75 percent, and 50 percent of full load
      4) Guaranteed minimum power factor at 100 percent, 75 percent, and 50 percent of full load.
      5) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
      6) Starting, full load, and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
   j. Bearing data and lubrication system.
   k. Fabrication and/or layout drawings:
      1) Dimensioned outlined drawing.
      2) Connection diagrams including accessories (strip heaters, thermal protection, etc.).
   l. Certifications:
      1) When utilized with a variable frequency controller, certify motor is inverter duty and the controller and motor are compatible.
         (a) Include minimum speed at which the motor may be operated for the driven machinery.
   m. Electrical equipment:
      1) Unless specified in a narrow-scope Specification Section, provide the following:

(a) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.

2) Control panels:
   (a) Panel construction.
   (b) Point-to-point ladder diagrams.
   (c) Scaled panel face and subpanel layout.
   (d) Technical product data on panel components.
   (e) Panel and subpanel dimensions and weights.
   (f) Panel access openings.
   (g) Nameplate schedule.
   (h) Panel anchorage.

4. Systems schematics and data:
   a. Provide system schematics where required in system specifications.
      1) Acknowledge all system components being supplied as part of the system.
      2) Utilize equipment, instrument and valving tag numbers defined in the Contract Documents for all components.
      3) Provide technical data for each system component showing compliance with the Contract Document requirements.
      4) For piping components, identify all utility connections, vents and drains which will be included as part of the system.
5. For factory painted equipment, provide paint submittals in accordance with Section 09905 (Painting and Protective Coatings).
6. Qualifications for:
   a. Vibration testing firm and personnel.
   b. Infrared thermography testing firm and personnel.
   c. Electrical equipment and connections testing firm and personnel.
7. Testing plans, in accordance with PART 3 of this Section 11005:
   a. Vibration testing.
   b. Thermography testing.
   c. Electrical Testing Program.

B. Miscellaneous Submittals:
1. Sample form letter for equipment field certification.
2. Certification that equipment has been installed properly, has been initially started up, has been calibrated and/or adjusted as required, and is ready for operation.
3. Certification for major equipment supports that equipment foundation design loads shown on the Drawings or specified have been compared to actual loads exhibited by equipment provided for this Project and that said design loadings are equal to or greater than the loads produced by the equipment provided.
4. Field noise testing reports if such testing is specified in narrow-scope Specification Sections.
5. Notification, at least one (1) week in advance, that motor testing will be conducted at factory.
6. Certification from equipment manufacturer that all manufacturer-supplied control panels that interface in any way with other controls or panels have been submitted to and coordinated with the supplier/installer of those interfacing systems.
7. Motor test reports.

8. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-made modifications.
9. Provide three (3) bound final written reports documenting vibration monitoring and testing for specified equipment.
   a. Include the acceptance criteria of all equipment tested.
   b. Provide individual tabbed sections for information associated with each piece of tested equipment.
10. Preliminary field quality control testing format to be used as a basis for final field quality control reporting.
11. Testing and monitoring reports in accordance with PART 3 of this Specification Section.
12. Certification that driven equipment and VFD are compatible.

1.5 REQUIREMENTS FOR BRACING AND ANCHORING EQUIPMENT

A. General: All equipment, including machinery, pumps, fans, tanks, aeration piping in Blower Building, electrical panels, generators, and their components and appurtenances, including their bracing, supports and anchorages, supplied by manufacturers, shall be designed for wind and seismic forces per the 2010 California Building Code (CBC) as follows:
   1. Design for all applicable Load Combinations as indicated on Drawings and in CBC Section 1605.2 or Section 1605.3.1 and Section 1605.4.
   2. Design all equipment subject to wind forces per ASCE 7-05 Chapter 6.
      a. Design tanks and similar equipment for empty condition and wind forces.
      b. Wind Importance Factor I_P = 1.0
   3. The equipment determined to be Nonstructural Components shall comply with all requirements of ASCE 7-05 Chapter 13.
      a. Indicate in submittal calculations Component Type used per ASCE 7-05 Chapter 13 Table 13.6-1.
      b. Seismic Importance Factor I_P = 1.5
      c. W_P = Operating Weight of the Equipment Including Contents
   4. The equipment determined to be Nonbuilding Structures Not Similar to Buildings or Nonbuilding Structures Similar to Buildings shall comply with all requirements of ASCE 7-05 Chapter 15.
      a. Indicate in submittal calculations Structure Type used per ASCE 7-05 Chapter 15 Table 15.4-1 or Table 15.4-2.
      b. Seismic Importance Factor I = 1.5
      c. W_P = Operating Weight of the Equipment Including Contents
   5. Anchorage design shall comply with Appendix D of ACI 318 (Building Code Requirements for Structural Concrete).
      a. For Nonbuilding Structures Not Similar to Buildings or Nonbuilding Structures Similar to Buildings anchors shall comply with IBC Section 1908.1.16.
   6. Each piece of equipment shall be anchored to resist a minimum lateral seismic force required either by Building Code or by the manufacturer of the equipment, or a minimum lateral seismic force of 40 percent of the operating weight of the equipment, whichever is greater. No equipment shall be anchored to vertical structural elements without written approval of the Owner.
B. Seismic forces shall be considered acting at the center of gravity of the piece under consideration.

C. Anchorages shall be designed and detailed assuming that they will not receive special Inspection as defined in the 2010 California Building Code.
D. Anchorage of equipment shall be coordinated with the concrete subcontractor so that anchorage may be installed at the time of concrete placement. If calculations and anchorage details are not submitted prior to placement of concrete, the Contractor shall be responsible for any strengthening of concrete elements to resist superimposed seismic or wind loading.
E. Equipment with vibration isolators shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4 IN. Deflection must be considered with respect to piping attached to the equipment. Equipment without vibration isolators shall be anchored directly to the supporting floor system.
F. In addition to the anchorage, all equipment shall be internally designed so that all static and moving parts are anchored to the supporting framework to resist the imposed seismic forces. All forces must be transmitted to the base in order to be anchored as required.
G. All piping, raceways, ductwork, accessories, appurtenances, and other items furnished with equipment shall be anchored to resist lateral considered acting at the center of gravity of the piece under consideration.
H. All piping installed shall be anchored to the floor system(s) to resist lateral seismic forces without excessive deflection. This force shall be considered acting at the center of gravity of the pipe under consideration.
I. Piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.

1.6 TESTING PROGRAMS

A. Vibration Testing Program:
   1. Testing firm:
      a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
      b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
   2. Field personnel:
      a. Minimum of one (1) year field experience covering all phases of field vibration testing and data gathering.
      b. Qualified Vibration Category I certification from the Vibration Institute.
   3. Analysis personnel:
      a. Minimum three (3) years combined field testing and data analysis experience.
      b. Qualified Vibration Category II certification from the Vibration Institute.
B. Electrical Testing Program:
   1. Testing firm:
      a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration , and adjusting of systems.
      b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
   2. Field personnel:
      a. Minimum of one (1) year field experience covering all phases of electrical equipment inspection, testing, and calibration.

b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
c. Supervisor certified by NETA or NICET.

3. Analysis personnel:
   a. Minimum three (3) years combined field testing and data analysis experience.
   b. Supervisor certified by NETA or NICET.

C. Miscellaneous:
1. A single manufacturer of a "product" to be selected and utilized uniformly throughout Project even though:
   a. More than one (1) manufacturer is listed for a given "product" in Specifications.
   b. No manufacturer is listed.
2. Equipment, electrical assemblies, related electrical wiring, instrumentation, controls, and system components shall fully comply with specific NEC requirements related to area classification and to NEMA 250 and NEMA ICS 6 designations as indicated on Electrical Power Drawings and defined in Division 16.
3. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and sure their compatibility.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Motors:
   a. Baldor.
   b. General Electric.
   c. Marathon Electric.
   d. Reliance Electric.
   e. Siemens.
   f. Teco-Westinghouse.
   g. U.S. Motors.
   h. Or Approved Equal.

2.2 MANUFACTURED UNITS

A. General:
1. Furnished equipment manufacturer’s field quality control services and testing as specified in the individual equipment Specifications.
2. Perform and report on all tests required by the equipment manufacturer’s Operation and Maintenance Manual.
3. Provide testing of electrical equipment and connections in accordance with Division 16.
4. Equip testing and analysis personnel with all appropriate project related reference material required to perform tests, analyze results, and provide documentation including, but not limited to:
   a. Contract Drawings and Specifications.
   b. Related construction change documentation.
   c. Approved Shop Drawings.

d. Approved Operation and Maintenance Manuals.
e. Other pertinent information as required.

B. Equipment Monitoring and Testing Plans:
1. Approved in accordance with Shop Drawing submittal schedule.
2. Included as a minimum:
a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
b. List and description of testing and analysis equipment to be utilized.
c. List of all equipment to be testing, including:
1) Name and tag numbers identified in the Contract Documents.
2) Manufacturer's serial numbers.
3) Other pertinent manufacturer identification,

C. Instruments Used in Equipment and Connections Quality Control Testing:
1. Minimum calibration frequency:
a. Field analog instruments: Not more than 6 months.
b. Field digital instruments: Not more than 12 months.
c. Laboratory instruments: Not more than 12 months.
d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
2. Carry current calibration status and labels on all testing instruments.
3. See individual testing programs for additional instrumentation compliance requirements.

D. Testing and Monitoring Program Documentation:
1. Provide reports with tabbed sections for each piece of equipment tested.
2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
a. Include legible copies of all forms used to record field test information.
3. Prior to start of testing, submit one (1) copy of preliminary report format for Owner's Representative review and comment.
a. Include data gathering and sample test report forms that will be utilized.
4. In the final report, include as a minimum, the following information for all equipment tested:
a. Equipment identification, including:
1) Name and tag numbers identified in the Contract Documents.
2) Manufacturer's serial numbers.
3) Other pertinent manufacturer identification,
b. Date and time of each test.
c. Ambient conditions including temperature, humidity, and precipitation.
d. Visual inspection report.
e. Description of test and referenced standards, if any, followed while conducting tests.
f. Results of initial and all retesting.
g. Acceptance criteria.
h. "As found" and "as left" conditions.
i. Corrective action, if required, taken to meet acceptance.
j. Verification of corrective action signed by the Contractor, equipment supplier, and Owner's representative.
k. Instrument calibration dates of all instruments used in testing.
5. Provide three (3) bound final reports prior to Project final completion.

E. Vibration Monitoring and Testing Program:
   1. Perform vibration monitoring in accordance with this Section 11005 and testing for equipment specified in Divisions 11, 12, 13, 14, 15, and 16 during the Field Quality Control Period.
   2. Provide vibration testing on all rotating and reciprocating equipment having driver 25 HP and greater.
   3. Additional requirements for vibration monitoring and testing equipment:
      a. Frequency response: 0.18 Hz to 25 kHz.
      b. Resolution: 6400 lines.
      c. Amplitude range: 18 bit for 96 dB dynamic range.
      d. Supports measurements of acceleration, velocity, displacement, envelope demodulation for bearing defect detection.
      e. Capable of two-place computer balancing.
      f. Requirements for vibration sensor:
         1) Sensitivity: +/- 5 percent at 25 DegC= 100 mV/g.
         2) Acceleration range: 80 g peak.
         3) Amplitude nonlinearity: 1 percent.
         4) Frequency response:
            (a) +/- 5 percent = 3-5000 Hz.
            (b) +/- 10 percent = 1-9000 Hz.
         5) Permanently attach vibration test and monitoring mounting pads to mechanical equipment at location recommended by the equipment manufacturer or as recommended by the testing firm.
         6) Acceptability of equipment conditions, except pumps, based on ISO 1940-1 Balance Quality Grade G2.5 criteria.
         7) Acceptability of pumping equipment to be based on HI 9.6.4 criteria.
         8) Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

F. Electrical Testing Program:
   1. Perform testing on Division 16 equipment and connections in accordance with Division 16 requirements.
   2. Testing of motors:
      a. After installation and prior to energizing the motor, perform inspections and tests per NETA ATS 7.15 for all motors 30 HP or above.
      b. Bump motor to check for correct rotation.
   3. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

G. Other Testing:
   1. Perform tests and inspections not specifically listed but required to assure equipment is safe to energize and operate.
   2. Subbase that supports the equipment base and that is made in the form of a cast iron or steel structure that has supporting beams, legs, and cross members that are cast, welded, or bolted shall be tested for a natural frequency of vibration after equipment is mounted.
      a. The ratio of the natural frequency of the structure to the frequency of the disturbing force shall not be between 0.5 and 1.5.

H. Electric Motors:
   1. Where used in conjunction with adjustable speed AC drives, provide motors that are fully compatible with the speed controllers.

2. Design for frequent starting duty equivalent to duty service required by driven equipment.
3. Design for full voltage starting even if driven by VFD.
4. Design bearing life based upon actual operating load conditions imposed by driven equipment.
5. Size for altitude of Project.
6. Furnish with stainless steel nameplates which include all data required by NEC Article 430.
7. Use of manufacturer's standard motor will be permitted on integrally constructed motor driven equipment specified by model number in which a redesign of the complete unit would be required in order to provide a motor with features specified.
8. AC electric motors less than 1/3 HP:
   a. Single phase, 60 Hz, designed for the supply voltage shown on the Drawings.
   b. Permanently lubricated sealed bearings conforming to ABMA standards.
   c. Built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element with stainless steel enclosure.
9. AC electric motors 1/3 to 1 HP:
   a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
   b. Permanently lubricated sealed bearings conforming to ABMA standards.
      1) For single phase motors, provide built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element.
10. AC electric motors 1-1/2 to 10 HP:
    a. 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
    c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.
11. AC electric motors greater than 10 HP:
    a. 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Oil or grease lubricated antifriction bearings conforming to ABMA standards.
       1) Design bearing life for 90 percent survival rating at 50,000 HRS of operation for motors up to and including 100 HP.
       2) For motors greater than 100 HP, design bearing life for 90 percent survival rating at 100,000 HRS of operation.
    c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.

I. NEMA Design Squirrel Cage Induction Motors:
1. Provide motors designed and applied in compliance with NEMA and IEEE for the specific duty imposed by the driven equipment.
2. Motors to meet NEMA MG 1 (NEMA Premium) {local jurisdiction} efficiencies.
3. Do not provide motors having a locked rotor kVA per HP exceeding the NEMA standard for the assigned NEMA code letter.
4. For use on variable frequency type adjustable speed drives, provide induction motors that are in compliance with NEMA MG 1, Part 31.
5. Design motor insulation in accordance with NEMA standards for Class F insulation with Class B temperature rise above a 40 DegC ambient.
6. Design motors for continuous duty.

7. Size motors having a 1.0 service factor so that nameplate HP is a minimum of 15 percent greater than the maximum HP requirements of the driven equipment over its entire operating range.
   a. As an alternative, furnish motors with a 1.15 service factor and size so that nameplate HP is at least equal to the maximum HP requirements of the driven equipment over its entire operating range.
8. Motor enclosure and winding insulation application:
   a. The following shall apply unless modified by specific specification sections:

MOTOR LOCATION	MOTOR ENCLOSURE / WINDING INSULATION
Unclassified Indoor Areas	DPFG (for horizontal motors), WP-I (for vertical motors) Standard Insulation, TEFC, Standard Insulation
Wet indoor Areas	TEFC, Standard Insulation WP-II (for vertical motors)

NOTE: Provide TENV motors in the smaller horsepower ratings where TEFC is not available.

9. Provide oversize conduit box complete with clamp type grounding terminals inside the conduit box.

2.3 ACCESSORIES

A. Guards:
   1. Provide each piece of equipment having exposed moving parts with full length, easily removable guards, meeting OSHA requirements.
   2. Interior applications:
      a. Construct from expanded galvanized steel rolled to conform to shaft or coupling surface.
      b. Utilize non-flattened type 16 GA galvanized steel with nominal 1/2 IN spacing.
      c. Connect to equipment frame with hot-dip galvanized bolts and wing nuts.
   3. Exterior applications:
      a. Construct from 16 GA stainless steel or aluminum.
      b. Construct to preclude entrance of rain, snow, or moisture.
      c. Roll to conform to shaft or coupling surface.
      d. Connect to equipment frame with stainless steel bolts and wing nuts.
B. Anchorage:
   1. Cast-in-place anchorage:
      a. Provide ASTM F593, Type 316 stainless steel anchorage for all equipment.
      b. Configuration and number of anchor bolts shall be per manufacturer's recommendations.
      c. Provide two (2) nuts for each bolt.
   2. Drilled anchorage:
      a. Adhesive anchors per Section 05500 (Metal Fabrications).
      b. Epoxy grout per Section 03002 (Concrete).
      c. Threaded rods same as cast-in-place.
C. Data Plate:
   1. Attach a stainless steel data plate to each piece of rotary or reciprocating equipment.
   2. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.

D. Gages:
   1. Provide gages in accordance with Section 13442 (Primary Elements and Transmitters).
   2. Provide at the following locations:
      a. Inlet and outlet of all pumps.
      b. At locations identified on Drawings.
   3. Utilize tapping sleeves for mounting per Section 15061 (Pipe and Pipe Fittings: Basic Requirements).
E. Lifting Eye Bolts or Lugs:
   1. Provide on all equipment 50 LBS or greater.
   2. Provide on other equipment or products as specified in the narrow-scope Specification Sections.

2.4 FABRICATION

A. Design, fabricate, and assemble equipment in accordance with modern engineering and shop practices.
B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.
C. Furnish like parts of duplicate units to be interchangeable.
D. Ensure that equipment has not been in service at any time prior to delivery, except as required by tests.
E. Furnish equipment which requires periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts.
   1. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.
F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option.
   1. Provide drain connection for 3/4 IN PVC tubing.
G. Machine the mounting feet of rotating equipment.
H. Fabricate equipment which will be subject to Corrosive Environment in such a way as to avoid back to back placement of surfaces that can not be properly prepared and painted.
   1. When such back to back fabrication can not be avoided, provide continuous welds to seal such surfaces from contact with corrosive environment.
I. Critical Speed:
   1. All rotating parts accurately machined and in as near perfect rotational balance as practicable.
   2. Excessive vibration is sufficient cause for equipment rejection.
   3. Ratio of all rotative speeds to critical speed of a unit or components: Greater than 1.2.
J. Control Panels Engineered and Provided with the Equipment by the Manufacturer:
   1. Manufacturer’s standard design for components and control logic unless specific requirements are specified in the specific equipment Specification Section.
   2. NEMA or IEC rated components are acceptable, whichever is used in the manufacturer’s standard engineered design, unless specific requirements are required in the specific equipment Specification Section.
   3. Affix entire assembly with a UL 508A label “Listed Enclosed Industrial Control Panel prior to delivery.
      a. Control panels without an affixed UL 508A label will be rejected.

2.5 SHOP OR FACTORY PAINT FINISHES

A. Electrical Equipment:
   1. Provide factory-applied paint coating system(s) for all electrical equipment components except those specified in Section 09905 (Painting and Protective Coatings) to receive field painting.
      a. Field painted equipment: See Section 09905 (Painting and Protective Coatings) for factory applied primer/field paint compatibility requirements.

B. Field paint other equipment in accordance with Section 09905 (Painting and Protective Coatings).
   1. See Section 09905 (Painting and Protective Coatings) for factory applied primer/field paint compatibility requirements.

2.6 SOURCE QUALITY CONTROL

A. Motor Tests:
   1. Test motors in accordance with NEMA and IEEE standards.
   2. Provide routine test for all motors.
   3. The Owner reserves the right to select and have tested, either routine or complete, any motor included in the project.
      a. The Owner will pay all costs, including shipping and handling, for all motors successfully passing the tests.
      b. The Contractor shall pay all costs, including shipping and handling, for all motors failing the tests.
      c. If two (2) successive motors of the same manufacturer fail testing, the Owner has the right to reject all motors from that manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment as shown on Drawings and in accordance with manufacturer's directions.
B. Utilize templates for anchorage placement for slab-mounted equipment.
C. For equipment having drainage requirements such as seal water, provide 3/4 IN PVC or clear plastic tubing from equipment base to nearest floor or equipment drain.
D. Route clear of major traffic areas and as approved by Owner’s Representative.
E. DO NOT construct foundations until major equipment supports are approved.
F. Extend all non-accessible grease fittings using stainless steel tubing to a location which allows easy access of fittings from closest operating floor level.
G. Equipment Base:
   1. Construct level in both directions.
   2. Take particular care at anchor bolt locations so these areas are flat and level.
H. Machine Base:
   1. Mount machine base of rotating equipment on equipment base.
      a. Level in both directions, using a machinist level, according to machined surfaces on base.
   2. Level machine base on equipment base and align couplings between driver and driven unit using steel blocks and shims.
      a. Size blocks and shims to provide solid support at each mounting bolt location.
         1) Provide area size of blocks and shims approximately 1-1/2 times area support surface at each mounting bolt point.

b. Provide blocks and shims at each mounting bolt.
   1) Furnish blocks and shims that are square shape with "U" cut out to allow blocks and shims to be centered on mounting bolts.
c. After all leveling and alignment has been completed and before grouting, tighten mounting bolts to proper torque value.

I. Couplings:
1. Align in the annular and parallel positions.
   a. For equipment rotating at 1200 rpm or less, align both annular and parallel within 0.001 IN tolerance for couplings 4 IN size and smaller.
      1) Couplings larger than 4 IN size: Increase tolerance 0.0005 IN per inches of coupling diameter, i.e., allow 6 IN coupling 0.002 IN tolerance, and allow a 10 IN coupling 0.004 IN tolerance.
   b. For equipment rotating at speeds greater than 1200 rpm allow both annular and parallel positions within a tolerance rate of 0.00025 IN per inch coupling diameter.
2. If equipment is delivered as a mounted unit from factory, verify factory alignment on-Site after installation and realigned if necessary.
3. Check surfaces for runout before attempting to trim or align units.

J. Grouting:
1. After machine base has been shimmed, leveled onto equipment base, couplings aligned and mounting bolts tightened to correct torque value, place a dam or formwork around base to contain grouting between equipment base and equipment support pad.
   a. Extend dam or formwork to cover leveling shims and blocks.
   b. Do not use nuts below the machine base to level the unit.
2. Saturate top of roughened concrete subbase with water before grouting.
   a. Add grout until entire space under machine base is filled to the top of the base underside.
   b. Puddle grout by working a stiff wire through the grout and vent holes to work grout in place and release any entrained air in the grout or base cavity.
3. When the grout has sufficiently hardened, remove dam or formwork and finish the exposed grout surface to fine, smooth surface.
   a. Cover exposed grout surfaces with wet burlap and keep covering sufficiently wet to prevent too rapid evaporation of water from the grout.
   b. When the grout has fully hardened (after a minimum of seven (7) days) tighten all anchor bolts to engage equipment base to grout, shims, and equipment support pad.
   c. Recheck driver-driven unit for proper alignment.

3.2 INSTALLATION CHECKS

A. For all equipment specifically required in detailed specifications, secure services of experienced, competent, and authorized representative(s) of equipment manufacturer to visit Site and inspect, check, adjust and approve equipment installation.
   1. In each case, representative(s) shall be present during placement and start-up of equipment and as often as necessary to resolve any operational issues which may arise.

B. Secure from equipment manufacturer's representative(s) a written report certifying that equipment:
   1. Has been properly installed and lubricated.
   2. Is in accurate alignment.
   3. Is free from any undue stress imposed by connecting piping or anchor bolts.
   4. Has been operated under full load conditions and that it operated satisfactorily.

a. Secure and deliver a field written report to Owner immediately prior to leaving Site.

C. No separate payment shall be made for installation checks.
   1. All or any time expended during installation check does not qualify as Operation and Maintenance training or instruction time when specified.

3.3 IDENTIFICATION OF EQUIPMENT AND HAZARD WARNING SIGNS

A. Identify equipment and install hazard warning signs in accordance with Section 10405 (Identification, Stenciling, and Tagging Systems).

3.4 FIELD PAINTING AND PROTECTIVE COATINGS

A. For required field painting and protective coatings, comply with Section 09905 (Painting and Protective Coatings).

3.5 WIRING CONNECTIONS AND TERMINATION

A. Clean wires before installing lugs and connectors.
B. Coat connection with oxidation eliminating compound for copper wire.
C. Terminate motor circuit conductors with copper lugs bolted to motor leads.
D. Tape stripped ends of conductors and associated connectors with electrical tape.
   1. Wrapping thickness shall be 150 percent of the conductor insulation thickness.
E. Connections to carry full ampacity of conductors without temperature rise.
F. Terminate spare conductors with electrical tape.

3.6 FIELD QUALITY CONTROL

A. Furnish equipment manufacturer services as specified in the individual equipment Specifications.
B. Inspect wire and connections for physical damage and proper connection.
C. After installation and prior to energizing the motor, provide insulation resistance test of all motors 30 HP and above.
   1. Conduct test with 500 or 1000 Vdc megger.
   2. Test each phase separately.
   3. Disconnect all extraneous leads to the motor.
   4. Comply with NEMA MG 1 safety requirements and test procedures.
D. Bump motor to check for correct rotation:
   1. Ensure motor has been lubricated.
   2. Check prior to connection to driven equipment.
E. Subbase that supports the equipment base and that is made in the form of a cast iron or steel structure that has supporting beams, legs and cross member that are cast welded or bolted, shall be tested for a natural frequency of vibration after equipment is mounted.
   1. Keep the ratio of the natural frequency of the structure to the frequency of the disturbing force out of the range from 0.5 to 1.5.
F. Equipment Vibration Monitoring and Testing:
   1. Utilize an Owner-approved testing agency to perform vibration monitoring and testing on equipment specified in Divisions 11, 13, 15, and 16.
   2. Permanently attach vibration test and monitoring mounting pads to the equipment at locations recommended by the equipment manufacturer or as recommended by the vibration testing agency.
   3. Utilize mounting pads suitable for permanent installation and for incorporation into a predictable maintenance program.

4. For variable speed equipment provide vibration testing at 1 Hz increments throughout entire operating range.
5. Diagnosis to include, but is not limited to the following:
   a. Unbalance.
   b. Misalignment.
   c. Bent shaft.
   d. Journal bearing related problems.
   e. Rolling contract bearing problems.
   f. Mechanical looseness.
   g. Resonance.
   h. Foundation flexibility.
   i. Electrically induced problems.
   j. Pump problems.
   k. Fan problems.
   l. Coupling problems.
   m. Drive belt problems.
   n. Gear problems.
   o. Centrifugal compressor problems.
   p. Electric motor induced vibration from VFD or VFD carrier frequency.
6. Provide machinery condition diagnosis based on an acceptable machinery vibration severity guide or machinery fault guide analysis provided by the testing agency, ISO 1940 Balance Quality Grade 6.3 as a minimum.
7. Tolerances for pumping equipment shall be per HI published standards.
8. Repair or replace equipment shown to be out of range of the specified tolerance until the equipment meets the specified normal operation range required in the machinery fault guide analysis.
9. Document testing with written report.
   a. Report to include initial testing results, acceptance criteria, corrective action taken to meet acceptance, verification of corrective action and acceptance report and baseline.

END OF SECTION

SECTION 11060

PUMPING EQUIPMENT: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pumping equipment.

1.2 REFERENCES

A. HI Standards for Centrifugal, Rotary and Reciprocating Pumps

1.3 DEFINITIONS

A. The abbreviations are defined as follows:
   1. IPS: Iron Pipe Size.
   2. NPSHR: Net Positive Suction Head Required.
   3. TDH: Total Differential Head.
   4. TEFC: Totally Enclosed Fan Cooled.
   5. VFD: Variable Frequency Drive.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 11005 (Equipment: Basic Requirements).
   2. Product technical data including:
      a. Performance data and curves with flow (gpm), head (FT), horsepower, efficiency, NPSH requirements, submergence requirement.
      b. Pump accessory data.
      c. Bearing supports, shafting details and lubrication provisions.
      d. Solids passage information.
   3. Certifications:
      a. Certified pump performance curves as described in Article 2.5.
   4. Test reports:
      a. Factory hydrostatic test.

B. Miscellaneous:
   1. Certifications:
      a. Provide a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by Owner's personnel.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Pumps:
      a. See individual pump Specification Sections.
   2. Mechanical seals:
      a. Chesterton.
      b. Garlock.

3. Seal water station:
   a. Chesterton.
   b. John Crane.
   c. AESSEAL.

2.2 COORDINATION

A. Fully coordinate all mechanical seal systems specified to ensure pump and seal compatibility.
B. Pump/motor and VFD coordination: See Section 11005 (Equipment: Basic Requirements).

2.3 ACCESSORIES

A. See Section 11005 (Equipment: Basic Requirements).
B. Each Unit:
   1. Lifting eye bolts or lugs.
   2. Plugged gage cock connection at suction and discharge nozzles.
   3. Tapped and plugged openings for casing and bearing housing vents and drains.
   4. Fittings for properly adding flushing lubricant.
   5. Pressure relief fittings for grease lubrication.
C. Packing Seal:
   1. Provide packing unless mechanical seal is specified in narrow-scope pump sections.
   2. Minimum of five (5) rings graphite impregnated synthetic packing.
   3. Provide minimum 1/4 IN DIA supply tap and 1/2 IN DIA minimum drain tap.
   4. Provide split Teflon or bronze water seal ring.
   5. Adjustable split follower cast iron or bronze gland.
D. Mechanical Seals:
   1. Provide as specified in the narrow-scope pump sections.
   2. Provide stationary balanced O-ring type.
   3. Provide water lubrication - cooling.
   4. Materials:
      a. Metal parts except springs: 316 stainless steel.
      b. Springs: Hastelloy C.
      c. Seal faces: Unfilled carbon graphite versus silica-free Grade 99.5 ceramic.
      d. Elastomers: Viton.

2.4 FABRICATION

A. Pump Support:
   1. Design base to support weight of drive, shafting and pump.
   2. Comply with HI vibration limitations.
   3. Mount horizontal pump, motor and coupling on single piece drip lip type baseplate.
   4. Mount vertical pumps on single piece pedestal baseplate.
   5. Fabricate to withstand all operating loads transmitted from the pump and drive.

2.5 SOURCE QUALITY CONTROL

A. If specifically required in the individual pump specification sections, provide factory tests:
   1. All units:
      a. Hydrostatic test at 150 percent of shutoff head for a minimum of 5 minutes.
   2. Adjustable speed units:
      a. Head (FT) verses flow (gpm) pump curves:
         1) Maximum, minimum and two (2) equally spaced intermittent speeds.

2) Efficiencies along each curve.
3) Brake horsepower along each curve.

3. Constant speed units:
   a. Head (FT) versus flow (gpm) pump curves:
      1) Efficiencies along curve.
      2) Brake horsepower along each curve.
4. Results certified by a registered professional engineer.

B. Statically and dynamically balance each pump per HI standards.

PART 3 EXECUTION

3.1 INSTALLATION

A. See Section 11005 (Equipment: Basic Requirements).
B. Floor or Pad-Mounted Units:
   1. Align vertically and horizontally level, wedge and plumb units to match piping interfaces.
   2. Assure no unnecessary stresses are transmitted to equipment flanges.
   3. Tighten flange bolts at uniform rate and manufacturer's recommended torque for uniform gasket compression.
   4. Support and match flange faces to uniform contact over entire face area prior to bolting pipe flange and equipment.
   5. Permit piping connecting to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.
   6. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.
   7. Assemble connecting piping with gaskets in place and minimum of four (4) bolts per joint installed and tightened.
      a. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange.
      b. Realign as necessary, install flange bolts and make equipment connection.
   8. Field paint units as defined in Section 09905 (Painting and Protective Coatings).

3.2 FIELD QUALITY CONTROL

A. Provide services of equipment manufacturer's field service representative(s) to:
   1. Inspect equipment covered by these Specifications.
   2. Supervise pre-start adjustments and installation checks.
   3. Conduct initial startup of equipment and perform operational checks.

END OF SECTION

SECTION 11081

HIGH SPEED TURBO AERATION BLOWER

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. High speed turbo blowers including:
      a. Integral drive unit.
      b. Adjustable frequency controller.
      c. Harmonic conditioning as required.
      d. Valves for blow-off, backflow prevention, and isolation.
      e. Inlet filter.
      f. Discharge silencer.
      g. Blow-off silencer.
      h. Flexible connectors.
      i. Pressure and temperature monitoring devices.
      j. Local control panel (LCP) for each blower.
      k. Main control panel (MCP).
   2. Custom software for control of blowers.
   3. Equipment numbers:
      a. B-01, B-02, B-03.

1.2 SUBMITTALS

A. Product Data:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Provide list of three (3) similar wastewater applications that have been in continuous operation for a minimum of three years.
   3. Manufacturer's installation instructions.
   4. Blower characteristics, specifications, and performance.
      a. Descriptive brochures and blower data.
      b. Factory certified performance curves indicating speed, capacity, horsepower, and efficiency over the range of operation for the complete assembled blower package including blower, motor, Adjustable Frequency Drive (AFD) or inverter, sinus filter, cooling systems or auxiliary systems if used, inlet filters, assembled housing, and discharge up to the isolation butterfly valve.
      c. Standard cubic feet per minute (SCFM) at discharge pressure for each listed design point in this Section 11081.
      d. Inlet cubic feet per minute (ICFM) at Equivalent Air Pressure (EAP) discharge pressure.
      e. Surge pressure and rise to surge pressure.
      f. Brake horsepower.
      g. Material list and catalog information showing the details of blower construction.
      h. Outline installation drawings for unit supplied.
      i. Blower weight and weights of each separate item of equipment.
      j. Complete bill of materials of all components and equipment supplied.

5. Motor characteristics, specifications, and performance (items marked with an asterisk (*) shall be included on the nameplate):
   a. Descriptive bulletins.
   b. Outline drawings with dimensions, weights, and conduit box details.
   c. Cut-away and exploded view drawings.
   d. *Manufacturer's type and frame designation.
   e. Parts list with material designations.
   f. Nameplate data.
   g. Description of insulation system.
   h. *Horsepower rating and service factor.
   i. *Ambient temperature rating.
   j. *Insulation system designation.
   k. *RPM at full load.
   l. *Electrical supply (number of phases, frequency, voltage).
   m. *Temperature rise at full load and service factor load.
6. Furnish a detailed identification of couplings, supports, and accessories, including, but not limited to, the following:
   a. Valves and instrumentation with designated tag numbers.
   b. Mechanical and structural components.
   c. Instruments.
   d. Programmable Logic controller.
   e. Operator Interface/machine monitors.
   f. Electrical components.
7. Adjustable frequency drive (AFD):
   a. Harmonic calculations by the AFD manufacturer with detailed drawings and/or information showing how protection is applied to comply with harmonic limits.
   b. Harmonic conditioner data including dimensional data if separately mounted.
   c. Technical cut sheet for the AFD, including nameplate data, performance data, and specifications
8. Certifications:
   a. Submit data to verify and certify service life in accordance with specified parameters.
9. Manufacturer's test reports:
   a. Certified acoustical test results for each blower package.
   b. Certified report of dynamic balancing and maximum vibration amplitude.
   c. Certified blower performance test the complete assembled blower package as defined in this Specification Section, in accordance with ASME PTC 10 or equivalent standard.
10. Factory Blower Testing:
    a. Submit a detailed test plan with complete piping and instrumentation configuration diagram per ASME PTC-10 or equivalent standard or per the proposed ASME PTC-13 for mini-turbine blowers.
       1) The "equivalent standard" test shall include, as a minimum, all the requirements for conducting a PTC-10 test, including, but not limited to, instruments, recording system, flow rate adjustment, etc.
    b. The location, type, and quantity of all major instruments necessary for performance data, including those on air, water, and lube oil with corresponding distances from reference points, shall be identified per ASME PTC-10 or equivalent standard requirements.

c. As a minimum, the detailed test plan shall include:
d. Quality control procedures.
   1) Air-end/gearbox ASME PTC-10 or equivalent standard test procedure and method of calculating results.
   2) Functional testing of entire assembled blower package, as defined in this Specification Section and including instrumentation, ancillary components, and LCP. Submit the actual ASME PTC-10 test report with the blower system O&M manuals.
e. If the proposed test, PTC-13, for high speed mini-turbine blowers is published prior to bid, then blower shall be tested in accordance with the new test procedure.

11. Provide equipment anchorage calculations as specified in Section 11005 (Equipment: Basic Requirements) demonstrating compliance with the applicable requirements of Section 11005 (Equipment: Basic Requirements).
12. Provide interconnect drawings.
13. Copies of software for all control panels.
14. Complete description of all controls and control panels, including complete master wiring diagrams, elementary or control schematics, and panel outline drawings.
15. A list of manufacturer's recommended spare parts.
16. Surface preparation and shop paint specifications
17. Program listing in MCP and configuration parameters for the LCP.
18. Submit technical information and cut sheet for the PLC including ladder logic, performance data, and specification. Submit copy of final loaded program and any required software on a CD.

B. Shop Drawings:
1. Unloading, handling, storage, and maintenance requirements.
2. Certified dimensional drawings of the blower unit, including cutaway views.
3. Mechanical drawings with general arrangement showing blower base dimensions, floor mounting, piping, overall weights, and weights of largest components requiring removal for maintenance.
4. Instrumentation and control system schematics, tubing and conduit details, and wiring diagrams for electrical and control components furnished.
5. Any necessary dimensional drawings to coordinate piping layout with structural, architectural, electrical, and/or mechanical work.
6. Description of process control logic and process and instrumentation diagrams.
7. Drawings of local and main control panels to include:
   a. Electrical ladder diagram.
   b. Interconnect to all components outside the panel.
   c. Door layout.
   d. Interior layout.
   e. Operator Interface screens for the LCP's and MCP.
   f. Preliminary input/output (I/O) listing for all control panel programmable logic controllers (PLC).
   g. Operating description for LCP's and MCP: Shall operate as described in the Blower Controls Description in this Section 11081.
      1) An electronic copy of all PLC programs for the MCP, complete with tag descriptions and rung comments in the native software format.
      2) Provide Owner with 1 PLC programming software package of the PLC used for the MCP.

3) Provide register addresses for all data.
4) Provide to Owner for back-up purposes software licenses of any PLC or Touchscreen OIT software that is used.
5) Provide a list of instrument settings.

h. Transfer software license to Owner and provide original documentation to Owner prior to Substantial Completion.
i. Program listing.
j. Control loop diagrams.
k. See Section 01330, (Submittal Procedures) for additional submittal requirements.

8. Certified dimensional drawings of the blower unit, including cutaway views.
9. Instrumentation and control system schematics, tubing and conduit details, and wiring diagrams for electrical and control components furnished.
10. Any necessary dimensional drawings to coordinate piping layout with structural, architectural, electrical, and/or mechanical work.

C. Installation, Operation, and Maintenance Manual:

1. See Section 01330, (Submittal Procedures) for requirements for:
   a. The mechanics and administration of the submittal process.
   b. The content of Operation and Maintenance Manuals.
2. Operation and maintenance manual will include the following:
   a. All dimensions, calculations and other information to be in USA English units of measure.
   b. Provide a list of components and catalog cuts fully describing all items:
      1) Mechanical and structural components.
      2) Instruments. Provide factory and field calibration sheets.
      3) Programmable Logic Controllers (PLC).
      4) Operator Interface/machine monitors.
      5) Electrical components (AFD). Provide as left programmable settings and copies of any associated software in O&M Manual.
   c. General description of blower with all performance data, blower curves, and model.
   d. Provide detailed information on structural, mechanical, electrical, or other changes or modifications necessary to adapt non-specified materials to the arrangement or details shown. Include the actual ASME PTC 10 test report.
   e. Mechanical drawings with general arrangement showing enclosure dimensions, overall weights, weights of largest components requiring removal for maintenance, and clearances required around unit for maintenance access. Indicate surface preparation and paint specifications.
   f. Description of process control logic and process and instrumentation diagrams.
   g. Drawings of all control panels to include:
      1) Electrical ladder diagram as addressed in this Specification Section.
      2) Interconnect to all components outside the panel.
      3) Door layout.
      4) Interior layout.
      5) Sample Operator Interface screens for the LCP's and MCP.
      6) Configuration points for AFD.
   h. Operating description for the entire blower control system. Provide for back-up purposes a copy of the software ladder logic covering all logic and sequences of operation. Provide a hard and soft copy of all documented "as-left" PLC programming on CD. Software licenses must be transferred to the Sonoma County

Water Agency and copies of licenses shall be provided to Owner. Provide Owner for back-up purposes with two software licenses for each PLC and Touchscreen OIT software that is used. Provide a list of instrument settings, comments and communication configurations.

i. Provide a detailed description of the data acquisition, monitoring, and predicted preventative maintenance software. Provide Owner-approved Operator Interface screens with detailed descriptions, the various monitors, preventative maintenance items, and data logging features.
j. Provide input/output (I/O) listing for all control panel PLCs.
k. Indicate all scheduled maintenance requirements and routine inspections. Include maintenance summary forms.
l. Provide list of recommended spare parts.
m. Provide a troubleshooting manual and passwords.
n. Provide the local sales representative contact information with the company name, contact person, phone number and address.

D. General:
1. See Section 01330, (Submittal Procedures) for requirements for the mechanics and administration of the submittal process.
2. Submittal shall be furnished in one complete package.
3. All submittal dimensions, calculations and other information shall be in USA English units of measure.

1.3 SYSTEM DESCRIPTION

A. Three turbo blowers to be installed. The blowers shall provide process air for Aeration Basin Nos. 1 and 2.
B. Provide blower, driver, and accessories through single manufacturer.
C. Contractor to coordinate with manufacturer and provide and install all external piping, pipe supports, wiring, instrumentation, conduit and appurtenances not provided by the blower manufacturer for a complete functional blower system.

1.4 DEFINITIONS

A. SCFM (Standard Cubic Feet per Minute): Flow of air at standard conditions defined by the American Society of Mechanical Engineers (ASME). With quantity expressed at 68 DegF, 14.7 psi absolute pressure and 36 percent relative humidity.

1.5 MANUFACTURER'S QUALIFICATIONS

A. Blower manufacturer shall meet the minimum following criteria:
1. Minimum of three separate installations operating in the United States for at least 3 years.
2. Minimum of six units operating in the United States distributed between the three installations.
3. Minimum of 20 installations and 50 blowers (units) operating world wide.
4. Control panel(s) meet and are labeled pursuant to UL 508.
5. Blowers shall be NRTL nameplate certified as a complete package, to the applicable UL standards.
6. Established base of operation in North America that furnishes experienced technical resources and service personnel to carry out start-up and trouble-shooting.
7. Service Network in North America providing responses to technical inquiries within twenty-four (24) hours and parts replacement on-Site within forty-eight (48) hours.

8. The AFD and PLC shall be supplied by a manufacturer with an established base of operation in North America that provides local Western United States parts and technical support service.
9. All communication shall be in English (i.e., service, drawings, nameplates, etc.) and all measurement and technical units shall be in English units.
10. The Blower manufacturer shall also have an established Service Center within eight (8) hours from the Owner's facility.

B. Provide documentation that supports and demonstrates that Manufacturer meets the minimum above requirements, and that the proposed equipment meets this specification. Refer to Article 2.1 for requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. All equipment shall be skid mounted or crated to protect against damage during shipment. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed, and the units and equipment are ready for operation.
B. Finished surfaces of all exposed flanges shall be protected by fiberboard blank flanges strongly built and securely bolted thereto.
C. Shipment is not to be made until the Manufacturer coordinates shipment to the Site with the Contractor, assuring that the equipment will be properly received and stored.
D. Upon receipt, store equipment in strict accordance with the Manufacturer's instructions, and connect and energize motor space heaters (and any other protective devices), as required.

1.7 SPARE PARTS

A. Furnish all special tools and appliances necessary to disassemble, service, repair, and adjust the blower equipment and appurtenances. The following spare parts shall be furnished:
   1. One (1) set of instrumentation for a blower/motor package.
   2. Six (6) complete sets of air filters for each blower furnished.
   3. One (1) spare blow-off valve solenoid valve.
   4. One (1) Maintenance Tools Box.
   5. One (1) PLC I/O module for each type used.
   6. One (1) pump for cooling system, if required.
B. All spare parts shall be suitably packaged and clearly identified with indelible marking on the containers. Tools and spare parts (except for the air filters) shall be supplied in a tool chest for long-term storage and marked with manufacturer's name, along with a complete description contents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. APG-Neuros, Inc. of Quebec, Canada, 866-592-9482.
   2. Aerzen USA, Pennsylvania, United States, 610-380-0244.
   3. Or Approved Equal.

B. Substitution Requests:
   1. An alternative item proposed as "equal" shall be Equal to that specified in this Section 11081. Contractor may utilize the right to substitute only by timely submitting Document 00600 (Substitution Request Form) as provided in Document 00200 (Instructions to Bidders). A substitution will be approved only if it is a true Equal item in every aspect, including but not limited to the manufacturer's qualifications requirements listed above in Article 1.5; evidence of which shall be included in the Request for Substitution.

2.2 GENERAL

A. Blowers shall be a high speed, mini turbo blower design.
B. Motor to be Permanent Magnet Synchronous Motor (PMSM).
C. The blower manufacturer shall supply, coordinate, start-up, and calibrate all items specified in this Specification Section.
D. After reaching operational speed, noise emission from the blower package shall not exceed 81 dBa at the machine location, at the air intake and at the discharge piping system, without any special sound attenuation installed in the blower room.
   1. Air intake filter system shall be internally mounted as indicated.
E. No special foundations shall be required for installation.

2.3 DESIGN CONDITIONS

A. Basis of Design:
   1. The blowers, as indicated, have been designed based on APG-Neuros, Inc.
B. Performance Tests:
   1. All the conditions specified herein shall be as defined in ASME PTC 10 - 1997 Performance Test Code on Compressors and Exhausters (re affirmed in 2003) or equivalent standard.
   2. All the pressures and temperatures specified herein refer to stagnation conditions as defined in ASME PTC-10 or equivalent standard.
   3. Inlet conditions are defined as the conditions that exist at the inlet of the air filter.
   4. The discharge conditions are defined as the conditions that exist at the upstream flange of the discharge isolation butterfly valve.
   5. The blower shall be designed to handle filtered air for the following rated conditions:
      a. Barometric pressure: 14.7 psia.
      b. Maximum pressure loss in clean inlet filter/silencer: 0.12 psig.
      c. Maximum total volumetric flow-rate of air required per blower: 580 scfm (corrected to 14.7 psia, 68 DegF, and 36 percent RH).
C. The blower shall not exceed the nameplate motor rating over the entire range of operation. When the blower is operating at or between any of the combinations of the following conditions, the electrical power draw (stated as horsepower) of the motor shall not exceed 30 HP and the blowers shall not surge.
   1. Elevation of Site: 62 FT.
   2. Inlet conditions:
      a. Pressure: 14.66 psia.
      b. Temperature:
         1) Range of monthly averages: 48 DegF to 69 DegF.
         2) Range of daily extremes: 29 DegF to 110 DegF.
      c. RH:
         1) Annual Averages: 80 percent morning; 59 percent afternoon.

2) Range of monthly averages: 59 percent to 80 percent.
3. Discharge capacity: 300 to 580 scfm per blower.
4. Discharge pressure: 22.7 psia (8 psig).
5. Blowers shall be capable of a minimum turndown to 55 percent of maximum design flow.

D. The blower shall maintain a minimum of 3.0 psig away from surge at any operating point in the capacity range above. The blowers shall be capable of operating continuously and satisfactorily at any point between the minimum and the maximum flows without surge, vibration, hunting, overload of motor or AFD or excessive heating of the bearings.

E. The vibration of the blower shall not exceed 0.3 mils as measured at the volute flanges. Refer to Section 11005 (Equipment: Basic Requirements) for vibration testing procedure.

F. Maximum blower dimensions:
1. Space is limited within existing blower room.
2. Dimensions: 5.5 FT long by 4 FT wide by 5 FT high (to top of cabinet).

2.4 ENCLOSURES

A. The standard enclosure:
1. Act as a sound enclosure and air intake for the blowers.
2. The enclosures must be designed for easy inspection and maintenance of all blower package components.
3. Hinged doors shall provide easy and quick access for routine maintenance of the blower and the package components.
4. Doors shall use a frame, reinforcements and supporting elements as required.

B. Blower electrical components, instrumentation and instrument connections shall all be mounted inside the blower enclosure. Operator Interface Terminals (OIT) shall be mounted on front of panels or enclosures for viewing without opening any covers.
1. Install fish eyes on the high voltage side of all enclosures for infrared testing.

C. Motors are located inside the blower enclosures. Requirements for motor cooling air shall meet the following requirements:
1. Forced motor cooling air from the blower room is required. Motor cooling air is exhausted to the blower room; or
2. Motor cooling air and inlet process air are common sources. All motor cooling air is exhausted with the process air.

2.5 BLOWERS

A. Blowers shall be air foil bearing turbo blowers and shall not require oils or lubricants for adequate operation. Blowers shall be capable of variable speed and output operation.

B. Blowers shall have been NRTL certified to meet UL standards, with certification label shown on nameplate. Field evaluation for certification approval shall not be permitted.

C. Blower casing shall have a maximum continuous duty design temperature of 400 DegF, and a design pressure of 50 psig.

D. Blower impellers:
1. To be of the backswept three dimensional high efficiency configuration, designed using Computational Fluid Dynamics (CFD) with two stages in one (axial and centrifugal) disk.
2. Milled from forged aluminum alloy or stainless steel
3. First lateral critical speed to be at least 120 percent of the maximum allowable operating speed.

4. The impeller shall be a single wheel mounted directly to the motor shaft and shall be statically and dynamically balanced.
5. Designed to achieve maximum aerodynamic efficiency.
6. The axial gap between the impeller and blower casing shall be adjusted by shims as needed.

E. Blower to provide a minimum rise to surge margin of 3.0 psig above the design discharge pressure and the head-capacity curve shall slope downward continuously (but not necessarily at the same slope) with increasing capacity and decreasing head. Blowers with curves that reflect two possible capacities for a given pressure (head) will not be acceptable.

F. Regardless of theoretical bearing life calculations, the bearings shall be designed for a minimum of expected twenty (20) years between major overhauls.

G. Manufacturer shall be responsible for attenuating noise and vibration in the blower package so that no vibration from the blower shall be transmitted to the floor, intake or discharge piping. Refer to Section 11005 for vibration testing procedures.

2.6 MOTORS

A. Each blower shall be supplied with a permanent magnet synchronous motor that shall operate on input voltage of 460 Volts, 3 Phase, 60 Hertz current, and be totally enclosed, air cooled.
   1. The maximum allowable motor horsepower shall be 30 HP.
   2. The motor to have a 1.15 service factor, if applicable.
   3. The motor to be able to start within 10 percent of rated voltage.
   4. The blower manufacturer to be responsible for coordinating the starting torque requirement of the blower and the motor.
   5. The motor to be capable of continuous operation at full load and rated frequency with a voltage variance of +/- 10 percent of the nameplate voltage.
   6. The motor to be capable of operation at the rated voltage with a variance of +/- 5 percent of the nameplate frequency. Motor to be rated for AFD.
   7. Motor accessories:
      a. The motor and controls shall not require any space heaters.
      b. The winding shall be provided with embedded thermocouples for temperature sensing and alarm at blower local control panel.
   8. Blower to include Sine Wave Filter and Line Input Reactor for reducing harmonic distortion.

2.7 BEARINGS

A. Blowers shall be provided with air bearing system as follows:
   1. Composed of corrugated bump foil and an inner high temperature alloy core.
   2. Bearing manufactured from synthetic media.
   3. Bearing clearance of 1/30,000 IN.
   4. The air bearing system shall not require any oil lubrication.

B. Provide bearing temperature sensors, as determined by manufacturer. High bearing temperature shall signal an alarm at the LCP.

2.8 INLET FILTER

A. The filter media shall have an efficiency of 90 percent by weight per ASHRE 52-76 of 3 micron or larger particles, MERV 14 and UL Class 2 rating.

B. Maximum clean pressure loss across the filter shall be less than 0.12 psig, able to withstand a maximum 0.18 psig differential pressure.

C. Provide instrumentation to measure pressure across filter. Values to be recorded by the Blower PLC and made available to the SCADA system over the Ethernet communication system.
D. Filter (and silencer) performance losses to be included in the blower performance calculation.
E. Inlet filter enclosures (if required):
   1. Galvanized sheet metal with stiffeners.
   2. Hinged access door with door handle and gasket.
   3. Rectangular to round pipe adaptor for remote mounted filter.
      a. Flanged connection with nuts and bolts.
   4. If inlet filter and inlet piping is remote from the blower, manufacturer shall be responsible for ensuring inlet filter configuration will fit inside existing building and maintain minimum clearances as shown on Drawings.

2.9 FLEXIBLE CONNECTOR

A. Provide each blower with an EPDM discharge expansion joint capable of withstanding the vacuum, pressure, and temperature under all operating conditions.
B. The expansion joint shall be included with control rods and galvanized steel flanges drilled for ASME/ANSI B16, Class 150 bolt pattern, size as recommended by blower manufacturer.
C. Provide flexible connector on inlet to blower where remote filter/silencer is installed.

2.10 BLOW OFF (BYPASS) VALVES

A. Provide manufacturer's standard automatic, pneumatic actuated or electro-pneumatic actuated blow-off valve.
   1. Provide valve with open-close position switches if required by blower controls.
B. Power and controls for the valve shall be provided from each blower LCP.
C. Valves shall be rated for the maximum discharge air temperature.

2.11 DISCHARGE SILENCER

A. Provide discharge silencer, if required, to meet noise attenuation requirements described in Paragraph 2.11 F.
B. Type 304 stainless steel flanges, size as recommended by blower manufacturer.
C. Type 304 stainless steel body.
D. Nominal 2 IN thick mineral wool within annular space.
E. Maximum operating pressure of 8 psig and maximum pressure loss of 0.02 psig at 580 scfm, 185 DegF air.
F. Noise attenuation:

Octave band, Hz	63	125	250	500	1000	2000	4000	8000
Insertion Loss, dBA	2	6	15	24	35	27	21	12

2.12 DISCHARGE VALVES

A. Provide blower with a flange type discharge butterfly valve meeting Section 15114 (Miscellaneous Valve).
   1. Provide valve with open-close position switches if required by blower controls.
B. Valves shall be rated for the maximum discharge air temperature.

2.13 CHECK VALVES

A. Provide each blower with a high performance wafer type non-slam discharge check valve of the dual, flat-plate type with 316 stainless steel center hinge, spring closure, cast 316 stainless steel body and plate, Viton-B seal and aluminum-bronze plates, Inkonel or Approved Equal springs, and rated for temperature of 400 DegF.

2.14 BLOW OFF SILENCER

A. A galvanized steel blow off silencer shall be provided for the blow-off (bypass) valve internal baffles, packed with nominal 2 IN fiberglass or mineral wool sound absorbent material.
B. The blow off silencer shall be an integral unit, fitted with one flange for direct bolting to the blow off valve or connected to the blow off valve discharge pipe via a slip fit connection and set screws.
C. Noise sound attenuation:

Octave band, Hz	63	125	250	500	1000	2000	4000	8000
Insertion Loss, dBA	1	4	8	15	34	22	15	11

2.15 INSTRUMENTATION

A. The blower manufacturer shall provide the blower instrumentation as specified and described in this Section 11081 and in Division 13. These components shall be mounted within the LCP enclosure except as noted.
B. The controls shall be designed such that the blower cannot operate unless the controls are energized and functional. All controls and instruments shall fail into a safe condition.
C. Each blower shall be supplied with an integral TUV/UL certified AFD inverter for motor speed control supplied by an AFD manufacturer with an established support operation in North America.
   1. 97 percent efficiency at full rated motor speed and power.
D. Each blower shall be equipped with an integral touch screen, Allen Bradley-compatible, microprocessor-based local control system and integral inverter for motor speed control.
   1. Each blower LCP shall communicate to the MCP using Ethernet.
E. Instrumentation for each blower shall include, as a minimum:
   1. Inlet air temperature gauge field supplied or within blower enclosure.
   2. Inlet air temperature transmitter 4-20 mA.
   3. Inlet air filter differential pressure transmitter 4-20 mA.
   4. Discharge temperature transmitter, 4-20 mA
   5. Surge switch to shut down blower if blower infringes on surge point.
   6. Blower air flow rate reading.
   7. Blow off valve switches for position indication (open/closed).
   8. Discharge butterfly valve switches for position indication (open/closed) at blower LCP, if required.
   9. Motorized butterfly valve position transmitter for position indication at each DO controlled zone at the blower MCP.
   10. Thermocouple monitoring system:
      a. Monitor and display actual motor winding temperatures at the Blower LCP.

b. A high temperature (as determined by the blower manufacturer) shuts down the blower and gives an alarm. The alarm/shutdown shall be displayed until reset.
c. Provide necessary hardware for direct communication between thermocouples, PLC, and Operator Interface.

11. Bearing temperature monitoring system:
    a. Monitor and display actual bearing temperatures at the Blower LCP.
    b. High temperature (as determined by the blower manufacturer) shuts down the blower and gives an alarm.
12. Amperage monitoring system:
    a. Monitor amperage at the AFD.
    b. High amperage signal shall shutdown the blower and give an alarm.
13. Vibration monitoring system:
    a. Monitor and display vibration (as determined by manufacturer).
    b. High vibration (as determined by the blower manufacturer) shuts down the blower and gives an alarm.

F. Local Control Panel (LCP):
1. Each blower shall be equipped with an integral touch screen and Allen Bradley-compatible, microprocessor-based based control system.
2. The LCP shall contain controls for blower start-up operation and shutdown including valve sequencing, surge and overload control, and equipment monitoring.
3. All LCP controls, alarms and monitoring shall be accessible through a touch screen control panel or a keypad/display screen combination.
4. Ethernet/IP communication shall be provided for communication with the blower MCP.
5. Timers in the LCP, shall provide interlocks, time delays, and pulse signals for blower control.
6. LCP's shall have UPS power for at least 15 minutes operation.

G. Main Control Panel (MCP):
1. Blower supplier to furnish a MCP which will provide the following:
    a. Implement the blower and aeration control strategy in Section 13441 (Control Loop Descriptions), including blower sequencing, blower speed control, header pressure control and four D.O. control loops.
    b. Coordinate the operation of the blowers through the blower LCP's.
    c. Gather blower information from the blower LCP's.
    d. Communicate data to the building PLC and plant SCADA through an Ethernet data link to the Operations building PLC. Ethernet switches to be unmanaged, N-Tron, or Approved Equal.
    e. Select Basin 1 or 2 or both in service.
    f. Selection of manual or automatic system operation.
    g. Selection of lead, lag and standby blower.
    h. Setpoint selections and control loop tuning constants.
    i. Other required functions for complete control system.
2. The MCP shall be wall or floor mounted NEMA 12 with an operator interface and other required controls on the front of the control panel and other required equipment inside the panel including PLC.
    a. Programmable Logic Controller (PLC) to be Owner's standard in accordance with Section 13455 (Programmable Logic Controller [PLC] Control System).

b. Operator interface to be Allen Bradley HMI Model 2711P-T15CAD1 Panelview Plus 1500 color, touch screen, 15 IN with Ethernet and RS-232 ports, 64 MB and 24 VDC or Approved Equal.

3. MCP shall have panel supplier's standard UPS power for at least 15 minute operation.
4. MCP shall meet the construction requirements of Section 13448 (Control Panels and Enclosures).
5. Panel power connection will be 120 VAC, 20 ampere circuit.
6. The following information shall be made available to the plant SCADA system over the Ethernet data link.
   a. Air filter differential pressure.
   b. Air filter differential high alarm.
   c. Inlet air temperature.
   d. Motor winding and bearing temperature.
   e. Discharge air temperature.
   f. High vibration alarm.
   g. Blowoff valve open/closed.
   h. Discharge air pressure.
   i. Blower AFD speed.
   j. Blower air flow.
   k. Discharge valve open/closed.
   l. D.O. in each zone.
   m. Blowers in operation.
   n. Blower fail.
   o. System in automatic.
   p. All system alarms.
   q. Aeration Basins in operation.
   r. Motorized valve position and position command for each of 4 DO control motorized valves.

H. Ethernet communication shall be provided between the MCP and the building PLC. The PLC in the MCP shall be able to communicate all blower and system data and alarms to the building PLC and SCADA. The blower manufacturer shall coordinate with the system integrator to ensure proper configuration and setting up a tag database according to the Owner standards.

2.16 HARMONIC PROTECTION REQUIREMENTS

A. Each AFD shall be designed and provided with all necessary equipment to protect the AFD and the power system ahead of the AFD from voltage and current distortion. The AFD manufacturer shall provide any required harmonic conditioning as part of the blower package:
   1. In accordance with and as defined by IEEE 519:
      a. Each AFD shall be designed to operate from a power bus that may contain up to 8 percent voltage distortion.
      b. Each single or multiple set of AFDs powered from the same bus shall be designed to limit percent distortion factor to a maximum of 5 percent voltage distortion.
      c. Current distortion limits shall not exceed the values listed in Table 10.3 of IEEE 519.
      d. Line-to-line notching at the input to the drive shall have a maximum notch depth of 20 percent and a maximum notch area of 22,800 volt-microseconds reflected back to the power source.

2. The Point of Common Coupling (PCC) for all harmonic calculations and field measurements for both the voltage and current distortion shall be defined as the primary (line side) connection at the MCC for each AFD.

B. Harmonic conditioning may be separately mounted from the AFD. Where harmonic conditioning is separately mounted, provide NEMA Type 1 enclosures with automatic isolating contact. The harmonic conditioning shall not be connected to the distribution system when the associated blower is not in operation. The dimensions are restricted to be not greater than the space allocated on the Drawings. Provide custom enclosures to meet the space restrictions. Contractor shall verify final cable and conduit sizing for the equipment supplied and provide the cable and conduit.

C. Power conductors for separately mounted harmonic conditioning shall be connected from the load side of the blower skid disconnect and feed the line side of the AFD. Coordinate manufacturer's requirements and connect at recommended location if different than shown at no additional cost to the Owner.

D. The Point of Common Coupling (PCC) for all harmonic calculations and field measurements for both the voltage and current distortion shall be defined as the primary (line side) connection of each AFD.

2.17 BLOWER VENTILATION REQUIREMENTS

A. Each blower enclosure shall be ventilated in accordance with the manufacturer's recommended standards and this Section 11081 to ensure proper operation of the mechanical equipment, controllers, AFD and motors.

B. Each manufacturer has differing ventilation requirements. The Contactor shall provide all ancillary ventilation equipment, ductwork and electrical components as needed to provide ventilation in accordance with the manufactures recommend standard.

C. The Contractor shall coordinate the blower ventilation requirements. Coordinated shop drawing submittals with calculations shall support the ventilation equipment and systems selected for the blower enclosures.

D. The existing blower room is not air conditioned.

2.18 SURFACE PREPARATION AND SHOP PRIMING

A. All carbon steel or iron surfaces shall be prepared, shop primed, and finish painted with two finish coats of Manufacturer's standard paint system per Section 09905 (Painting and Protective Coatings).

B. Machine surfaces that are not painted shall be protected by a coating with a Manufacturer's standard corrosive protective compound per Section 09905 (Painting and Protective Coatings).

2.19 SOURCE QUALITY CONTROL

A. Upon completion of assembly, the blower package, shall be functionally tested at the place of assembly, witnessed by representatives of Owner and a Witnessing Engineer (provided by, but independent of the blower manufacturer) as specified in this Specification Section.

B. At a minimum, the blower system shall be factory tested for a duration of not less than 8 hours at maximum load and maximum temperature.

C. The entire blower system, blow-off valve, check valve, LCPs and MCP shall be tested as an operational system for operation as required by Contract Documents before shipment. The LCP's and MCP shall be connected to all enclosure instruments, and appurtenances. All start/stop, running sequences, control sequences and all safety and alarm systems shall be tested. The Witnessing Engineer shall sign the test procedure and results, certifying that the

assembled blowers, auxiliaries, blow off valves, discharge valves, LCP's and MCP were tested together, as a system, using the parameters required by Contract Documents, in the blower manufacturer's shop.

D. Each blower shall be performance tested in accordance with the ASME PTC 10 - 1997 Performance Test Code on Compressors and Exhausters (re affirmed in 2003). The test shall verify compliance with the performance and design criteria in paragraph 2.3 of this specification.

E. Net delivered flow rate and discharge pressure shall be guaranteed with no negative tolerance. There shall be no tolerances or measuring uncertainties used in reporting test results (i.e., the tests shall be reported with ± zero percent tolerance using the measured values).

F. The sound pressure level shall be measured to verify compliance with these specifications.

G. The Witnessing Engineer shall sign each copy of the test data log sheet certifying that the required tests were performed in strict accordance with these specifications and the ASME PTC 10 Codes or equivalent standard, modified to permit zero tolerance for flow and power.
   1. The capacity of the blower shall be defined as per Paragraph 4.26 of the ASME PTC 10 Power Test Code, including Air flow measurement with zero (0) tolerances.
   2. All test equipment shall be calibrated and certified by an independent test agency no more than 12 months prior to the test date. Certificates shall show the stability of calibration over a period of at least one year per ISO 9001, Paragraph 4.11.
   3. Velocity vibration versus frequency levels shall be recorded within 10-1,000 and 10-10,000 Hz frequency range. Report vibration in velocity versus frequency.

H. The blower test report shall present computations in exact accordance with Section 5, 6, and 7 of ASME PTC 10 Code or equivalent standard with performance curves showing capacity, pressure, and horsepower inputs.

I. Test results of the motors and blowers shall be included in the Operations & Maintenance Manual. Provide copy of test results to Owner prior to field startup.

J. If test is conducted in a country other than the United States, include two (2) business class air line tickets to the test site plus arrange for a hotel accommodation and transport from the airport to the hotel.

K. Motor Tests:
   1. The motor shall be tested as a part of blower system and where it is applicable:
      a. Motor insulation systems shall be conformance with NEMA Standard MG1-20.49.
      b. Vibration on the motor frame shall be measured with the motor/blower assembly running unloaded at full speed and loosely set, free from mechanical connections.
      c. Stator temperature attainment may be accomplished by restricting cooling air flow or by other industry standard methods but all effects of the method of testing shall be evaluated. Vibration readings shall be taken while air flow is not restricted.
      d. Motor/blower assembly during test shall be complete including accessories and have nothing removed for convenience except the power lead conduit box. No extra devices shall be used except those required to measure or monitor variables.
      e. All test variables shall conform to actual field values and shall be maintained throughout tests.
      f. Prior to shipment to the blower manufacturer, the motor supplier shall demonstrate that the motor meets the following criteria:
         1) Vibration with motor(s) bolted to steel floor, stator at design temperature, motor shaft extension with half-key, and lubrication at normal operating temperature

shall not exceed the following as measured in any plane on bearing caps of both ends:

(a) 0.10 inches/second at rotational frequency and at all multiples through 120 Hz and one half of rotation frequency.

(b) 0.15 inches/second unfiltered.

2) Excessive noise and overheating shall be eliminated.

3) Changes made to enable motor(s) to meet above requirements shall make initial test unacceptable and final shop tests shall be run after such changes have been made.

g. Motor/blower assembly shall be given complete tests at 100, 75, 50, and 25 percent full load, power factors at 100, 75, 50, and 25 percent of full load, winding resistances, high potential, and bearing inspection. Certified motor test data sheets shall be submitted for review and acceptance. Data sheets shall give the observed and nameplate temperature and results of dielectric tests in addition to the above data. The sheets shall be marked to indicate motor application, manufacturer, type, frame size, bearing type, and enclosure type, and motor serial number.

PART 3 EXECUTION

3.1 INSTALLATION

A. The blowers, motors, LCP's, MCP, and appurtenances shall be installed in accordance with the instructions of the Manufacturer, and in compliance with Section 11005 (Equipment: Basic Requirements). All piping shall be supported so as to preclude the possibility of exerting undue forces and movements on the blower flanges. Each blower unit shall be mounted on a flat and level concrete pad (± 1/4 IN) in accordance with the recommendations of the Manufacturer and contract documents, whichever is more stringent.

B. The Contractor shall furnish the required piping, pipe supports, flange gaskets, bolts, nuts, oil, and grease for initial operation in accordance with the Manufacturer's recommendations.

C. Provide one 480 volt, 3 phase connection point for electrical power to each skid and prewire all equipment on each skid and blow off valve.

D. Provide one 120 VAC, single phase connection point for power to MCP.

3.2 FIELD QUALITY CONTROL

A. General Requirements:

1. All Operation and Maintenance Manuals shall be in USA English and contain USA English units.
2. All field service, online service, and/or phone service shall be provided in English.
3. All nameplates for blower enclosures, motors, AFDs, etc., shall be in English and contain USA English units.

B. At a minimum, each blower package shall be field tested for duration of not less than 24 hours at maximum load and maximum temperature.

C. The Contractor shall provide third party electrical mitigation testing of all AFDs associated with the blower system. The third party testing shall:

1. Demonstrate to the Owner that the harmonic distortion to the electrical system meets IEEE 519.
2. Be performed for each blower package for a duration of not less than 24 hours.

3. Be repeated if necessary at no cost to the Owner.

D. Noise Level:
1. The blower manufacturer shall include all necessary provisions for reducing noise to meet the maximum sound pressure level requirements of this Specification Section.
2. The maximum sound pressure level at any point at a distance of 3 feet or more from any blower/motor surface shall not exceed 81 dBA with the blower running at any speed.
   a. The specified maximum sound pressure level of 81 dBA includes the noise emitted from any possible source in the Blower Room related to delivery of air, including but not limited to, the noise from the motor; the blower; inlet and discharge piping, fittings, valves and silencers; and any reflected noise.
3. The Contractor shall provide sound testing for the blowers.
   a. Submit testing plan prior to test.
   b. The sound pressure level shall be measured during the preliminary equipment tests of field testing after installation in the Blower Room and with one blower running.
   c. If it is found that the actual sound pressure level 3 feet away from the blower exceeds the maximum specified sound pressure level, the blower manufacturer shall make such modifications and additions as approved by Owner as are necessary to limit the noise to 81 dBA.

3.3 BLOWER MANUFACTURER'S FIELD SERVICES

A. The blower manufacturer must provide on-Site technical personnel to inspect the final installation and supervise the field start-up tests of the equipment and software. The services of the representative shall be provided for a minimum of three (3), 8-hour days for **each blower** and not less than 3 trips. If there are difficulties in operation of the equipment due to the blower manufacturer's fabrication and programming or Contractor's installation, additional service shall be provided at no extra cost to Owner.
1. Provide, as a minimum, the following field services: Provide written documentation for check out including who performed the work, when performed, what was final setting or tolerance and who witnessed the final settings.
   a. Verify proper connection of piping and installation of accessories.
   b. Check leveling of blower enclosure.
   c. Confirm proper wiring of all instruments and field wired items.
2. A minimum 4 hours, for each blower, field acceptance test shall demonstrate that, under all conditions of operation, each unit:
   a. Has not been damaged by transportation or installation.
   b. Has been properly installed.
   c. Have no mechanical defects.
   d. Has fully functional instrumentation that is properly calibrated and set.
   e. Will start, run, and stop in the prescribed manner.
   f. Will run through the entire range of specified pressure and flow.
   g. Has the proper shutdown sequence of standard stop, soft stop, and emergency stop.
   h. Is free of overheating of any parts.
   i. Is free of objectionable vibration and noise.
   j. Is free of overloading of any parts.
3. Field acceptance testing shall be conducted after the installation of all equipment has been completed and all instrumentation calibrated and working as intended and the equipment has operated for a sufficient period to make all desirable corrections and

adjustments. Contractor shall schedule testing with the full knowledge and consent of Owner.

B. The blower manufacturer shall furnish the services of the programmer responsible for programming the blower LCP's and MCP. The services of the programmer shall be provided for a minimum of five (5), 8-hour workdays on-Site and 2 trips to assist Owner programmer with programming and troubleshooting of aeration system and blower software programs as well as coordinate with monitoring for the plant SCADA system. The programmer must have complete knowledge of proper blower operation and of the blower and aeration control system software programs supplied in this Specification Section. The blower manufacturer shall deliver to the Owner a copy of the PLC program for coordination with the plant SCADA system. The programmer shall be available to answer questions concerning the PLC program.

C. The blower manufacturer shall include a 2 Day follow up visit about 2-6 months after startup by a service/factory representative.

3.4 FIELD PERFORMANCE

A. Performance Test:
   1. Test performed by representative of manufacturer in presence of Owner.
   2. Run test over continuous 4 HR period.
   3. Results from test will be used to verify compliance with requirements in PART 2 of this Specifications Section and shall be submitted to Owner.
   4. Air flow rate, CFM, to be measured and recorded every 15 minutes.
   5. Power feed to blower will be measured and recorded with a recording watt meter.
   6. Test will be run at same conditions as defined in Articles 1.6 and 1.7.
      a. Measured values will be averaged for each condition specified in Article 1.6 and the results compared to the guaranteed values.
      b. Power input to be measured by calibrated watt meter.
      c. Air flow measured by mass air flow meter.

B. Referee Test:
   1. In the event that the performance test is not successful, supplier may request a third-party referee test to verify that requirements are achievable.
   2. Request must be made within 10 Days after completion of performance test.
   3. Test to be arranged and paid for by Supplier/Manufacturer.
   4. Owner may select any portable measuring devices meeting basic design requirements of this Project Manual.
   5. Test to be performed according to procedure outlined for performance test.
   6. Results will be used to establish new performance requirements, to be no more stringent that those specified herein.
   7. If results of referee test meet or exceed performance test requirements, supplier shall submit to Owner a certified copy of the test report with positive results.
   8. If results of referee test do not meet the performance test requirements, supplier/manufacturer shall modify blower so that it meets the performance test requirements.

C. Training:
   1. Instruct Owner's personnel per Section 01825 (Training) with a minimum of 2 workdays of actual instruction separate from the field services time. This training shall include specific session on electrical and instrumentation, HMI and PLC programming and AFD configuration.

END OF SECTION

SECTION 11084

SUBMERSIBLE PROPELLER PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Contractor shall furnish submersible pumps for Mixed Liquor Return pumping in the aeration basins. Provide two (2) per Aeration Basin, as indicated on drawings.
2. Furnish all labor, materials, tools and equipment necessary for complete installation of submersible propeller pumps in the aeration basins as indicated on the drawings and specified herein.
3. Furnish and install all submersible propeller pumps complete with submersible power cable, guide rail system, hoist base, lifting cable, power cable, support cable, controls, motor protection unit and all appurtenant equipment, complete and operable, in accordance with the requirements of the Contract Documents.

1.2 REFERENCES

A. ASTM A48	Standard Specification for Gray Iron Castings
B. ASTM A53	Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
C. ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates

1.3 SUBMITTALS

A. Product Data:
1. Complete performance data showing capacity and power input.
2. Electrical data that includes:
   a. Motor rating, hp.
   b. Motor temperature rating.
   c. Motor full load rotational speed.
   d. Motor full load current.
   e. Motor locked rotor current.
   f. Power cable data.
   g. Motor performance curves showing speed, efficiency, current power, etc.
   h. Moisture sensor protection characteristics and wiring diagram.

B. Shop Drawings:
1. Submit the following:
   a. Submersible propeller pump:
      1) Name of manufacturer.
      2) Type and model.
      3) Rotational speed.
      4) Major component materials of construction.
   b. Propeller pump specification describing construction details.
   c. Outline dimension drawing.
   d. Installation drawing with mounting details for pump mast assembly and davit crane.
   e. Propeller pump mast assembly:
      1) Mast assembly specifications.

2) Mast assembly details and materials of construction.

f. Davit crane assembly:
   1) Boom mast, base, wire rope and winch details and specifications.
   2) Materials of construction.
   3) Dimensioned drawing.
   4) Capacity curves or tables.

g. Engineering calculations:
   1) Include:
      (a) Sizing of all anchors for securing davit crane base.
      (b) Sizing of all anchors for securing pump mast assembly wall and base brackets.
      (c) Sizing of pump support mast.

C. Quality Assurance/Control Submittals:
   1. Contractor shall submit the following:
      a. Special shipping, storage and protection, and handling instructions.
      b. List of suggested spare parts to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance.
      c. List of special tools, materials, and supplies furnished with equipment for use prior to and during startup.
   2. Test Reports:
      a. Factory performance test reports.
   3. Certificates:
      a. Manufacturer's Certificate of Proper Installation.
      b. Functional Test Certification.
   4. Manufacturer's Instructions:
      a. Manufacturer's printed installation instructions.
   5. Provide with first submittal a list of three (3) similar wastewater installations that have been in continuous operation for a minimum of three years.

D. Installation, Operation, and Maintenance Manual:
   1. Provide operations and maintenance data for all equipment furnished for the project in accordance with Section 01330 (Submittal Procedures).

E. Tools:
   1. Special tools necessary for maintenance and repair of the equipment shall be furnished as a part of the Work hereunder; such tools shall be suitably stored in metal tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

1.4 SPARE PARTS

A. Each size and type of propeller pump shall be supplied with the following parts:
   1. Two sets motor shaft bearings.
   2. Two sets seals, gaskets, and O-rings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Wilo-EMU USA.
   2. Flygt Horizontal Propeller Pumps.
   3. Or Approved Equal.

2.2 GENERAL

A. Number of Propeller Pumps: 4. (ML Recycle Pump, PMP-1, ML Recycle Pump, PMP-2, ML Recycle Pump, PMP-3, ML Recycle Pump, PMP-4)
B. Liquid Pumped: Mixed Liquor Activated Sludge.
C. Design Liquid Suspended Solids Concentration Range (mg/l): 2,500 to 4,000.
D. Duty: Continuous.
E. Maximum Liquid Depth (FT): 14.5.

2.3 SUBMERSIBLE PROPELLER PUMPS

A. General:
   1. Type: The direct motor shall drive the submersible pump propeller and shall be directly connected to the propeller. The propeller shall be capable of handling solids, fibrous materials, heavy sludge, and other matter found in wastewater applications.
   2. Submergence: All components of the propeller pump, including motor, shall be capable of continuous underwater operation in both of the following conditions: (1) propeller pump blade completely submerged. In addition, all components of the propeller pump, including motor, shall be capable of continuous operation in air, completely un-submerged, for 15 minutes minimum.
   3. Mounting:
      a. Propeller pumps shall be designed to be easily raised, lowered, and removed for inspection or service, without the need for personnel to enter the tank.
      b. A sliding guide bracket shall be an integral part of each propeller pump.
      c. Guide bracket shall guide the propeller pump into position and be capable of carrying the entire weight of the propeller pump and the maximum loads created by the propeller pump.
      d. Propeller pump, with its appurtenances and power cable, shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 65 FT.
   4. Mating surface seals: All mating surfaces where watertight sealing is required shall be machined and be fitted with a double set of nitrile rubber or Viton O-rings.
   5. Propeller:
      a. Propeller shall be non-clogging backward curved design, capable of handling solids, fibrous materials, heavy sludges, and other matter normally found in wastewater treatment applications.
      b. Propeller shall be dynamically balanced so the propeller imbalance does not exceed ISO 1940 G6.3 tolerances to prevent excessive vibrations.
      c. Propeller vanes, diameter, blade angle, (in degrees), shall be as indicated.
      d. Each blade shall be laser cut and welded to the hub to ensure that the propeller is properly balanced.

6. Bearings:
   a. Shaft shall rotate on two or three permanently lubricated bearings.
   b. Outboard propeller end bearing shall be an angular contact or deep groove bearing.
   c. Inboard, motor end, bearings shall be an angular contact or deep groove to take up the axial loads and a radial bearing to take up the radial loads.
   d. Bearings shall be pre-loaded, if needed, by a bearing loading nut located on the motor end of the shaft in order to reduce shaft deflection and increase bearing and seal life.
   e. All bearings shall have a minimum L-10 rated life of 100,000 hours.
7. Shaft:
   a. Wall pump shafts shall be Series 420 stainless steel. Carbon steel shafts with or without shaft sleeves are not acceptable or equal to stainless steel.
   b. Shafts shall be supported by single or double row outer bearings for radial thrust and a single or double row inner bearing for axial thrust.
   c. All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. Shaft overhang shall not exceed 2.5 times the shaft diameter. The diameter shall be the diameter of the shaft as it passes though the mechanical seal area. The overhang shall be the length of shaft from the propeller side of the last bearing closest to the propeller to the hub of the propeller. Certified dimensions and measurements shall be submitted to verify compliance to the specifications. The Owner reserves the right to require submission of a sample output shaft and detail drawing to independently verify submittal calculations.
   d. Minimum motor shaft diameter shall be: 50 mm (1.97 IN).
8. Shaft seals:
   a. Each propeller pump shall be provided with two sets of lapped end face type mechanical seals or an outside lapped end face type mechanical seal and inner lip seal running in an oil chamber for cooling and lubrication. Shaft seals without positively driven rotating members shall not be accepted. Only the seal faces of the outer seal assembly shall be exposed to the mixed media.
   b. Each propeller pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed for oil pressure compensation. The drain and inspection plugs, with positive anti-leak seal, shall be easily accessible from the outside.
   c. The mechanical seal shall require neither maintenance nor adjustment, shall not be damaged when the propeller pump is run dry, shall be easy to check and replace, and shall be capable of running in either direction without damage. Shaft seals that rely on the tank fluid as a lubricant will not be considered acceptable or equal.
9. Shroud: Each propeller pump assembly shall be provided with a shroud a full 360 degrees around the propeller. A maximum clearance of 1-1/2 IN shall be maintained between the propeller tip and the shroud. The shroud shall be designed so that it connects to the pipe mounted connection with guide rails. The shroud and the pipe flange mounted discharge connection shall be of Type 316 stainless steel.

B. Performance Requirements for each pump:

Condition 1	Minimum Speed Operation
Pump Capacity (gpm)	1,000 ± 250
TDH (FT)	0.7

Condition 2	Reduced Speed Operation (2 pumps operating per basin)
Pump Capacity (gpm)	1,825 + 250
TDH (FT)	1.1
Condition 3	Full Speed Operation
Pump Capacity (gpm)	2,310 + 250
TDH (FT)	1.3
Propeller	
Number of Vanes	3
Diameter (IN)	16
Nominal Wall Pipe Diameter (IN)	16
Blade Angle (degrees)	7
Motor Electrical	
Voltage, Phase, Hertz	480/3/60
Drive Type	VFD
Maximum Motor Size (hp)	10

C. Materials of Construction:
   1. Except as noted below, pump components in contact with the liquid shall be of Type 316 stainless steel with smooth surfaces devoid of blow holes and other irregularities. All exposed nuts, bolts, fasteners, and hardware shall be of Type 316 stainless steel.
   2. The propeller and shroud shall be of Type 316 stainless steel.
   3. The propeller shaft shall be of Type 316 or Type 420 stainless steel.
   4. The mechanical seals shall contain a stationary face ring of silicon carbide and a rotating face ring of silicon carbide.
   5. All anchor bolts, nuts, and washers shall be Type 316 stainless steel.
   6. Wall pipe: Type 316 stainless steel.
   7. Motor housing and gear casing: cast iron, ASTM A48 40B, with two component ceramic-based coating, minimum 16 mils DFT, or Approved Equal.

D. Controls:
   1. Pump control devices shall be supplied per Section 16493 (Control Equipment Accessories).
   2. Each motor shall be provided with temperature and moisture protection system meeting the requirements below:
      a. Provide each motor with integral winding temperature sensors, one on each leg, which opens on high temperature.
      b. Each pump shall be equipped with an electrical probe to detect the presence of moisture before bearing and motor damage occurs.
      c. Control conductors for the sensors shall be integral with the motor power cable.
      d. Furnish loose for field installation one Flygt Mini CAS 120 or Approved Equal and mounting base for each pump or equal protection for pump actually supplied.

E. Motor and Power Cable:
   1. General: The motor shall be a squirrel cage, induction, shell type design, housed in an air filled, sealed, watertight chamber. The motor shall be designed for continuous duty, capable of sustaining a maximum of at least ten evenly spaced starts per hour and have a minimum 1.15 service factor. The motor shall be suitable for service in a Class 1, Division 2 environment and bear UL or FM approval. The stator winding shall be insulated with moisture resistant Class H insulation which will resist a temperature of

180 degrees C (356 degrees F). The stator shall be dipped and baked three times in Class F varnish. The rotor bars and short circuit rings shall be made of aluminum.

2. Cable: Provide pump cable of sufficient length to connect to terminal junction box where indicated. Pump cable shall be sized according to the NEC and ICEA Standards, suitable for submersible service. The cable shall be rated for 600-volt and 90 degrees C with a 40 degrees C ambient temperature and shall be FM approved.
3. Cable Entry: Cable entry seal design shall provide a watertight submersible seal. The cable entry housing shall be an integral part of the back plate or upper lid. The cable entry shall have a double set elastomer grommets or a single grommet with cable strain. The cable entry shall be comprised of one or two cylindrical elastomer grommets, each flanked by washers designed with a close tolerance fit against the cable outside diameter and the entry inside diameter. The assembly shall bear against a shoulder and be compressed to from a watertight seal. The cable entry shall be designed to insure a watertight seal between the electrical junction chamber and the motor, preventing fluid leakage into the motor.

F. Mounting and Support System:
1. Each propeller pump shall be equipped with a mounting assembly and vertical support mast designed to secure the propeller pump while in operation and guide it during installation and removal without entering or emptying the tank. The vertical support mast shall be supported from the basin floor and the basin walkway as appropriate.
2. Pipe Flange Mounted Discharge Connection: Each propeller pump shall be provided with a 316 Stainless Steel pipe flange mounted discharge connection as shown on the Contract Drawings.
3. All components of the mounting assembly including propeller pump mounting base plate, pipe flange mounted discharge connection, vertical support mast, sliding bracket, and fastening hardware shall be Type 316 stainless steel.
4. The vertical support mast section shall be a minimum of 4-IN by 4-IN by 3/16 IN if square or 4 IN diameter schedule 10 if round. The assembly shall be designed and constructed to securely support the propeller pump, including providing adequate thrust resistance under all propeller pump operating conditions, including both submerged and un-submerged operation. The mast shall be provided with a cable holder that prevents the electric cable from being entangled with the propeller pump propeller during operation. The mast shall be constructed to positively lock the mast in place at all operating positions.
5. Power Cable Support: Provide a minimum 1/4-IN diameter 316 stainless steel power cable support cable with each propeller pump permanently attached to the propeller pump shackle on one end and the upper guide bracket of the mounting system on the other end. The power cable shall be attached to the support cable using clamps at 5 FT intervals.
6. Lifting Cable: Provide a minimum 1/4 IN diameter 316 stainless steel lifting cable and securely attach to each propeller pump. The top of the cable shall end in an eye of sufficient strength to develop the strength of the cable. Provide a hook to secure the cable at the top of the mast.

G. Accessories:
1. Adjustable hoists:
   a. Provide hoist as indicated in drawings.
      1) Minimum 96 IN reach range.
      2) 41 IN mast height.

3) Primary lifting capacity equal to but not greater than 2,000 pounds with the boom fully lowered and retracted.
4) Secondary lifting capacity equal to but not greater than 1,000 pounds with boom fully lowered and fully extended to the maximum hook reach of 81 IN.
5) One hoist system for each pair of ML recycle pump, as shown on the drawings.
6) Exact location to be determined at time of construction.

b. Provide a permanent wall mount utilizing epoxy anchors into existing concrete.
c. The boom, mast, base, and wire rope, shall be of 304 or 316 stainless steel construction.
d. The boom shall telescope to four different lengths and shall be adjustable in height under load by means of a jack screw.
e. Hand winch:
1) Worm gear design, hand-operated, with capability to be operated by hand drill motor (do not furnish drill motor).
2) Provide an anchor hole in the flange of the drum for easy attachment and removal of the lifting cable to allow the cable assembly to be attached to a cleat if the hoist is moved.
3) Provide an automatic friction brake to prevent the winch load from freewheeling.
4) Make the winch handle an integral part of the braking mechanism.
5) Material: carbon steel with three part epoxy coating.

f. Capable of rotating 360 degrees under load enabling the pump to be removed from the tank in a single lifting and rotating motion.
g. Wire rope:
1) Provide one wire rope assembly with swaged ball fitting and load hook for each ML Recycle pump.
2) Minimum cable length: 45 FT.
3) Minimum cable diameter: 1/4 IN.

h. Thern Model 5124 M2 SS or Approved Equal.

2. Lifting Lugs: Equipment weighing over 100 pounds shall be provided with lifting lugs.
3. Identification Plate: An identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear the 1/4 IN die-stamped equipment identification number and equipment data.
4. Anchors: Concrete anchors shall be in conformance with Section 05505 (Metal Fabrications), minimum 5/8 IN diameter Type 316 stainless steel. Coordinate required size and location with Shop Drawings. The pump Manufacturer shall determine the size and proper location for anchors and shall furnish the anchors.

H. Protective Coating:
1. Shop and field painting shall be in accordance with requirements specified in Section 09905 (Painting and Protective Coating).

I. Manufacturers:
1. Unit responsibility:
a. The submersible propeller pumps and accessories specified herein shall be the design and fabrication of a single Manufacturer which shall have the sole source responsibility for the propeller pumps and accessories.
b. To ensure the integrity of the mounting system the propeller pump Manufacturer shall supply the support guide brackets, and mast, as specified above.

PART 3 EXECUTION

3.1 GENERAL

A. Execution shall be in accordance with Section 11060 (Pumping Equipment: Basic Requirements).

3.2 DELIVERY AND STORAGE

A. A complete set of Manufacturer's instructions covering storage, installation, operation, lubrication, and maintenance shall be furnished to the Owner no later than the date the equipment is shipped. Care during storage and procedures for installation, lubrication, and startup of the equipment and motors shall be in strict conformance with the Manufacturer's instructions.

3.3 INSTALLATION

A. Install in accordance with the Manufacturer's printed instructions.

3.4 TESTING

A. Comply with Section 01650 (Facility Start-Up) and Section 11005 (Equipment: Basic Requirements).

B. Factory Testing: Pumps shall be tested at the factory. The Owner may, at Owner's discretion, witness the factory test. Testing shall include the following:
   1. Verify that propeller, motor rating, and electrical connections comply with this Section.
   2. Measure for moisture content and insulation defects in motor and cable, both before and after the submergence test below.
   3. Run pump dry to verify proper rotation and alignment.
   4. Run pump submerged at least 30 minutes under at least 6 FT of water to check for balance, unusual noise, and overheating. Verify proper pumping capacity.
   5. Test motor for no-load current at rated voltage, high potential, and locked rotor current.
   6. A factory test report showing that the above testing procedure has been performed and that the mixer successfully passed the tests shall be completed. The factory test report shall be supplied with the final documents.

C. Functional Testing: A functional wet test shall be conducted at pre-commissioning in accordance with Section 01650 (Facility Start-Up). The functional wet test should verify operation without excessive noise, vibration, cavitation, or overheating and document motor voltage and current draw.

D. Pre-Commissioning:
   1. A factory trained representative shall inspect the installation of the pumps before the tank is filled with treated effluent and before start up to assure the installation has been completed in accordance with the Manufacturer's recommendations.
   2. Start up of the pumps shall be in accordance with the Manufacturer's recommended start up procedures.
   3. An installation start up form shall be completed for each pump and supplied with the final documents.
   4. Start up should take no more than 2-3 hours per pump.
   5. A functional wet test shall be conducted at plant pre-commissioning in accordance with Section 01650 (Facility Start-Up).
   6. Verify operation without excessive noise, vibration, cavitation, or overheating. Document motor voltage and current draw.
   7. Test MiniCAS protective relay.

8. Test the hoist for binding and ease of operation manually and with hand drill.

3.5 TRAINING

A. Provide two (2) 4 hour training sessions. Schedule with Owner on separate days.

END OF SECTION

SECTION 11088

AERATION EQUIPMENT: FINE BUBBLE TYPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Supply and installation of fine bubble aeration equipment to form a complete aeration system within two existing aeration basins to satisfy process oxygen requirements and maintain solids suspension including, but not limited to:
      a. Fixed header fine-bubble membrane diffusers.
      b. All distribution and manifold piping including drop pipes as indicated on the Drawings.
      c. Adjustable pipe supports.
      d. Moisture blow-offs.
      e. Air piping expansion provisions.
      f. Anchor bolts, and expansion anchors.
   2. As indicated on the Drawings, the aeration basins are arranged in two, two-pass process trains. Each process train begins with two anaerobic zones followed by two anoxic/swing aeration zones and two aeration zones. Process train basin flow sequences are as follows:
      a. 1A (anaerobic) - 1B (anaerobic) - 1C (anoxic/swing) - 1D (anoxic/swing) - 1E (oxic) - 1F (oxic).
      b. 2A (anaerobic) - 2B (anaerobic) - 2C (Anoxic/swing) - 2D (anoxic/swing) - 2E - 2F (oxic).

1.2 REFERENCES

A.	ASCE	Oxygen Transfer Standards
B.	ASTM A774	Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
C.	ASTM A778	Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products
D.	ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
E.	ASTM D573	Standard Test Method for Rubber-Deterioration in an Air Oven
F.	ASTM D1171	Standard Test Method for Rubber Deterioration-Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
G.	ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
H.	ASTM D2240	Standard Test Method for Rubber Property-Durometer Hardness
I.	ASTM D2241	Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
J.	ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride)

(PVC) Sewer Pipe and Fittings

K. ASTM F593 Standard Specification for Stainless Steel bolts, Hex Cap Screws, and Studs

1.3 SUBMITTALS

A. Product Data:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Manufacturer's installation instructions.

B. Shop Drawings:
   1. See Section 01330 (Submittal Procedures).
   2. Fabrication and/or layout drawings.
      a. Diffusers:
         1) Manufacturer.
         2) Type and model.
         3) Dimensional information.
         4) Stable airflow rate range and corresponding headloss.
         5) Oxygen transfer efficiency (clear water) for design conditions.
         6) Mounting arrangement.
         7) Mounting instructions.
         8) Number and distribution per basin.
         9) Engineering calculations.
            (a) Documenting number of diffusers.
            (b) Document SOTR achieved.
            (c) Document mixing achieved.
            (d) Document uniform: distribution of air throughout each basin so that the air flow per diffuser does not vary by more than 5 percent at any specified air flow rate.
      b. Air distribution system:
         1) Dimensional information including size and spacing of all piping, Drawings to scale showing installation in existing aeration basins.
         2) Materials.
         3) Joint restraint.
         4) Expansion compensation.
         5) Moisture blow-off details.
         6) Pipe support details including layout for laterals, manifolds and headers.
         7) Installation instructions.
         8) Engineering calculations.
            (a) Thrusts due to pressurized pipes.
            (b) Forces due to expansion of pipes.
            (c) Forces on pressurized pipe due to sudden loss of air pressure.
            (d) Temperature of pipe walls for site conditions in air distribution piping.
            (e) Headloss calculations. (Diffusers to top of dropleg over the air flow range specified).
            (f) Performance curves. (Headloss versus diffuser air flow over the air flow range specified).
            (g) Forces due to submersible mixer velocities in Zones 1C, 1D, 2C, 2D.

C. Quality Assurance/Control Submittals:
   1. Design Data:
      a. Calculations showing normal buoyancy uplift forces and structural calculations to meet the requirements of Section 11005 (Equipment: Basic Requirements).
      b. Provide equipment anchorage calculations as specified in Section 11005 (Equipment: Basic Requirements) demonstrating compliance with the applicable requirements of Section 11005 (Equipment: Basic Requirements) and Section 15090 (Pipe Support Systems).
      c. Calculations showing oxygen transfer efficiencies and diffuser grid layouts.
   2. Test Reports:
      a. Including but not limited to:
         1) Certified Oxygen transfer tests.
         2) Quality control tests.
         3) Permeability tests.
         4) Uniformity test.
         5) Strength testing.
      b. Reports signed by registered professional engineer.
      c. Reports to include:
         1) Description of test facility.
         2) Description of sampling procedures.
         3) Engineering calculations.
         4) Summary of test results.
   3. Qualification Statements:
      a. Supplier to provide with first submittal a list of three membrane disk installations that have operated for a minimum of three years continuously.

D. Certificate of Proper Installation:
   1. Include benchmark pressure at the connection dropleg to the airflow control butterfly valve. Benchmark pressure shall be determined as specified in Subsection 3.3.

1.4 WARRANTY

A. The membrane diffuser elements shall not fail for a period of 5 years from Partial Utilization or 5 years-6 months after delivery, whichever occurs first. Failure shall be defined as one or more of the following measured or observed changes on diffusers in a cleaned condition:
   1. Any rupture or tear of the membrane.
   2. Any measured durometer exceeding 80 Shore A.
   3. If one or both of the above changes occurs, the manufacturer shall provide replacement membranes for the failed membranes to the Owner for replacement by the Owner. If more than 60 percent of the membranes in a basin fail, all membranes in the tank shall be provided with replacement membranes.

B. Additionally the manufacturer shall warranty the aeration system and components as follows:
   1. Manufacturer shall warrant that membranes will operate continuously for seven years after startup, and pressure drop increase across membranes in a cleaned condition as compared to benchmark pressure drop test specified in paragraph 3.3 shall not exceed 0.7 psig during that period.
   2. If the pressure drop increase exceeds 0.7 psig, as determined by Owner, pressure drop testing on clean membranes within seven years after startup, the manufacturer shall

furnish new membranes for all diffusers within the affected tank(s) to the Owner for replacement by the Owner.

3. Manufacturer will be compensated for providing replacement membranes according to the following formula:

$$\text{Replacement Membrane Compensation} = \frac{(P)\ (Y)\ (N)}{7}$$

P = Purchase price per new membrane delivered to the Site
Y = Years of operation prior to failing pressure drop test by Owner
(Partial years will be rounded to nearest 0.1 year)
N = Total No. of Replacement Membranes

1.5 SPARE PARTS

A. Furnish, tag and box for shipment and storage the following spare parts:
   1. 10 percent extra diffusers, including gaskets.
   2. 10 percent extra diffuser assemblies.
   3. 10 percent extra diffuser tap plugs.
   4. 1 set of special tools required to assemble/disassemble the diffusers and grid piping.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Sanitaire- Silver Series.
   2. Aquarius.
   3. Stamford Scientific, Inc.
   4. Or Approved Equal.

2.2 MATERIALS

A. Membrane Diffusers:
   1. Circular membrane diffuser discs of 9 IN DIA with integral O-ring of EPDM synthetic rubber compound with precision die formed slits.
      a. Thermoplastic materials (i.e., plasticized PVC or polyurethane) are not acceptable.
   2. Add carbon black to the material for resistance to ultraviolet light.
   3. Design diffuser as one piece injection molded part with a minimum thickness of 0.080 IN.
   4. Limit the maximum tensile strength of the diffuser to 10 psi when operating at 2.4 standard cubic feet per minute per square foot (SCFM/FT2) of material.
      a. Furnish proportionately thicker material for larger diameter disc diffusers to limit the maximum tensile stress and to resist stretching.
   5. Produce diffusers free of tears, voids, bubbles, creases or other structural defects.
   6. Furnish diffuser material to meet the following:
      a. Base polymer: EPDM, ASTM D573.
      b. UV resistance: Carbon black.
      c. Specific gravity: 1.25 or less.
      d. Durometer: Minimum 58 durometer, +5 percent, ASTM D2240.
      e. Modulus of elasticity: 500 psi, ASTM D412.

f. Ozone resistance (72 HRS: 40 DegC, 50 parts per hundred million [pphm]): No cracks at 2X magnification, ASTM D1171, Test A.
g. Tensile strength: 1200 psi, ASTM D412.
h. Elongation percentage:
1) Retained 70 HRS at 100 DegC: 75 percent maximum, ASTM D573.
2) Minimum at break: 350 percent, ASTM D412.

B. Diffuser Assemblies:
1. Furnish diffuser assemblies including diffuser, diffuser gasket, holder, retaining ring and air flow control orifice.
2. Membrane diffuser:
a. Incorporate an integral check valve into the membrane diffuser.
b. Design and test diffusers for a dynamic wet pressure (DWP) of 6 IN ± 20 percent water column at 1.0 SCFM/diffuser and 2 IN submergence.
3. Diffuser support plate: Provide a PVC or glass filled polypropylene support plate to form an air plenum under the diffuser and support for the membrane when the air is off.

C. Air Piping and Supports:
1. Header pipe: Diameter in aeration basin, as indicated on Drawings.
2. Dropleg:
a. Provide each basin with the number and size of droplegs as indicated in Drawings.
b. Dropleg from header to manifold shall be fabricated from Schedule 10 or 12 gauge type 304L stainless steel, ASTM 240; full immersion passivate per ASTM A380.
c. Dropleg shall extend from the manifold to the stainless steel air header connection as indicated on the Drawings.
d. Provide stainless steel flanged joint at the elevation indicated on the Drawings and support dropleg from its upper connection.
3. Manifold:
a. Connect dropleg to manifold with a stainless steel band coupling.
b. Furnish manifolds having the same nominal pipe diameter as the dropleg.
c. Manifold shall be fabricated from Schedule 10, type 304L stainless steel, ASTM 240; full immersion passivate per ASTM A380.
d. Join manifold sections with 125 LB flanges and gaskets.
e. Fabricate manifolds with 4 IN DIA flanged or factory solvent welded stub connections to each air distribution header.
f. Provide stainless steel supports for each diffuser manifold with a maximum spacing of 8 FT between supports, except as indicated otherwise on Drawings.
g. Design manifold, connections and supports to resist thrust generated by expansion or contraction of the piping system.
h. Ensure supports are adjustable vertically and horizontally for alignment of piping on sloped basin floor.
i. Design manifold connections and supports in Zones 1C, 1D, 2C and 2D to resist thrust forces from operation of submersible mixers in these zones, as indicated in Drawings.
4. Air distribution piping:
a. Furnish distribution piping having a nominal diameter of 4 IN minimum, or as required.
b. Distribution piping shall be fabricated from unplasticized PVC conforming to ASTM D3034, SDR-33.5.

c. All piping, and diffuser assemblies shall contain 2 percent titanium dioxide (TiO_2) to protect against UV degradation.
d. Supply factory solvent welded holders on maximum 4 FT spacing. Field welding will not be permitted.
e. Join sections of distribution piping with 125 LB flanges and gaskets or non-rotational fixed union-type joints and gaskets.
f. Union style joints shall use interlocking spines or equivalent to prevent rotation.
g. All joints, regardless of type, shall resist 80 ft-lbs minimum without rotation.
h. Provide stainless steel supports for each distribution header with a maximum spacing of 8 FT between supports, unless indicated otherwise on Drawings.
i. Ensure supports are adjustable vertically and horizontally for field alignment of piping on sloped basin floor.
j. Maximum spacing between diffuser distribution header (diffuser lateral): 4 FT.
k. Air distribution piping system capable of withstanding a minimum lateral force of 10 lb/sq.ft.
l. Space diffuser laterals equally unless resulting spacing results in clearance (diffuser edges of adjacent laterals) of less than 12 IN. In this case, stagger the lateral spacing so that a pair of laterals will be placed closer together to permit a clearance greater than 12 IN on remaining laterals.
m. Provide minimum diffuser clearance from FRP access hatches in Zones 1C, 1D, 2C, 2D, 1E, 2E, 1F, 2F, as indicated on Drawings.

5. Provide each aeration grid with a moisture blow off system for removing liquid within the distribution grid.
   a. Provide SCH 80 PVC piping and fittings.
   b. Ball valve and discharge point: Locations as indicated on Drawings. Ball valve easily accessible. Ball valve horizontal.
   c. Support from vertical walls at 4-FT 0-IN with stainless steel pipe clamps and stainless steel expansion anchors.
   d. System complete with all pipes, valves, fittings, and accessories.
   e. Ball valves: 3/4 IN type 316 stainless steel or PVC.
   f. Provide flexible pipe connections and all other allowances for expansion and contraction.
   g. Design: As indicated on Drawings.

D. Supports:
1. Manifold supports:
   a. Provide manifold supports, of 316 stainless steel.
   b. Manifold supports shall include manifold hold downstrap (U-bolt or Approved Equal), cross-tree and supporting structure.
   c. Supports to be adjustable to allow the diffuser grid to be installed at the same level throughout the two trains.
2. Distribution piping supports:
   a. Provide one fixed anchor support of 316 stainless steel for each distribution header section to prevent longitudinal and rotational movement of the distribution header at the support.
   b. Furnish guide supports which allow longitudinal movement of the distribution header to allow for thermal expansion and contraction of the header.

c. Provide a PVC expansion joint, when required, between each distribution header section restrained by a fixed anchor support to allow for thermal expansion and contraction of the header between fixed supports.
d. Supports to be adjustable to allow the diffuser grid to be installed at the same level throughout the two trains.
e. Air distribution piping supports shall be ½ IN diameter threaded rods, minimum to meet seismic requirements.
f. Supports shall use single anchor bolt design.

3. Anchor bolts:
   a. Provide 316 stainless steel epoxy adhesive anchor bolts.
   b. Adhesive anchors to meet requirements in Section 05505 (Metal Fabrications).
   c. Anchors for grid piping shall be designed for at least 10 times the normal buoyancy uplift forces.
4. All fasteners and supports shall be ground to minimize sharp protruding edges.

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

A. Conditions of Service:
   1. Elevation at Site: 62 FT MSL.
   2. Ambient air temperature: 29 DegF to 110 DegF.
   3. Ambient atmospheric pressure: 14.7 psia.
   4. Discharge air temperature: Maximum 210 DegF.

B. Design Criteria:
   1. Provide aeration in two aeration basins as shown on the Drawings and per the following elevation criteria:

CRITERIA	BASIN NUMBER			
	1C, 2C	1D, 2D	1E, 2E	1F, 2F
Water surface, minimum	56.34	56.26	56.13	56.06
Water surface, maximum	56.64	56.6	56.55	56.52
Water surface, average	56.34	56.26	56.13	56.06
Floor slab, average	42	42	42	42
Centerline diffuser manifolds and distribution piping, maximum	42.4	42.4	42.4	42.4

C. Provide aeration grids for each of the two aeration basins as shown in the table below:

AERATION GRIDS	GRIDS REQ'D	LENGTH (FT)	WIDTH (FT)	VOLUME (GALLONS)
Anoxic Swing 1C	1	23.75	25.5	72,028
Anoxic Swing 1D	1	24.25	25.5	73,545
Oxic 1E	1	48	25.5	145,573
Oxic 1F	1	47.17	25.5	143,056
Anoxic Swing 2C	1	23.75	25.5	72,028
Anoxic Swing 2D	1	24.25	25.5	73,545
Oxic 2E	1	48	25.5	145,573
Oxic 2F	1	47.17	25.5	143,056

D. Diffusers:
   1. Membrane Disc.
   2. Diameter: 9 IN.
   3. Zones 1C, 1D, 2C, and 2D are swing zones; no air will be delivered to these zones when they are operated as anoxic zones. Install sufficient diffusers to meet maximum oxygen demands at the two Design Peak Hour flow conditions in Article 2.3 E and 2.3 F.
   4. Install sufficient diffusers to meet the maximum oxygen demands at the two Design Peak Hour flow conditions, plus an additional 10 percent blanks in Basins 1C, 1D, 2C, 2D, and 15 percent blanks in 1E, 1F, 2E, and 2F.
      a. Spacing of diffuser "blanks" shall be such that uniform aeration and additional mixing of the basin contents is maintained when additional diffusers are added.
      b. For each diffuser blank, furnish diffuser element holder mounted on air distribution header but with PVC, stainless steel or rubber plug in place of diffuser.

E. Standard Oxygen Transfer Rate Distribution Summary.

	SOTR, LBS/HR/BASIN						
FLOW/LOADING CONDITION	TRAINS REQ'D	1 C, 2 C	1 D, 2 D	1 E, 2 E	1 F, 2 F	TOTAL ALL ZONES/BASINS	TOTAL ALL BASINS
Current Minimum	1	25	25	30	30	110	110
Current ADWF	1	30	30	40	30	130	130
Design ADWF	1	65	65	80	50	260	260
Design MM	2	40	40	50	30	160	320
Design MD	2	70	70	85	50	275	550
Design Peak Hour – Condition 1	1	70	70	90	80	310	310
Design Peak Hour – Condition 2	1	-	-	200	100	300	300

F. Maximum Airflow Distribution Summary.

	SOTR, SCFM/BASIN						
FLOW/LOADING CONDITION	TRAINS REQ'D	1 C-1, 2C	1 D, 2 D	1 E, 2 E	1 F, 2 F	TOTAL ALL ZONES/BASINS	TOTAL ALL BASINS
Current Minimum	1	100	100	150	150	500	500
Current Average	1	120	120	160	150	550	550
Design ADWF	1	260	260	320	200	1040	1040
Design MM	2	160	160	200	150	670	1340
Design MD	2	280	280	340	200	1100	2200
Design Peak Hour – Condition 1	1	280	280	360	320	1240	1240
Design Peak Hour – Condition 2	1	-	-	800	400	1200	1200

Note: PH = Peak Hour, MM = Maximum Month, MD = Maximum Day

G. Maximum pressure at top of dropleg all basins: 7.5 psig.

H. Mixing Requirements:
   1. Ensure mixing over the air flow range specified prevents deposition of solids in or near basin corners behind columns, supports and incidental structural components.

2. Ensure no progressive buildup of solids exists or is such that process can be adversely affected.

I. Holders Installed:
1. Number to meet maximum air flow rates, headloss and oxygen demand requirements above plus additional 10 percent blank diffuser holders in Basins 1C, 2C, 1D, 2D, and 15 percent in 1E, 1F, 2E and 2F.
2. Diffuser "blanks" spacing to achieve uniform aeration and mixing.
3. For each blank, furnish diffuser element holder mounted on air distribution header but with PVC, EPDM or threaded stainless steel plug in place of diffuser.

J. Air Distribution System: Refer to Section 2.2 of this specification Section.

2.4 SOURCE QUALITY CONTROL

A. Shop Oxygen Transfer Test:
1. Conduct a performance test to demonstrate capability of the aeration equipment to meet the specified oxygen transfer requirements. The test will be witnessed by Owner.
2. Base all tests on the following criteria:
   a. A minimum of 3 tests for the average and peak conditions in complete accordance with ASCE Clean Water Test Procedure (ASCE/EWRI 2-06) normalized to 1000 mg/l TDS for each (1 condition x 3 tests x 4 zones + 1 condition x 3 tests x 2 zones = 18 tests).
   b. Conduct tests by an aeration testing firm in a full scale aeration test tank (minimum of 200 sq.ft.) at the specified submergence and water depth with a diffuser density equivalent to the specified tank configuration. Diffuser density is defined as the ratio of the total tank surface area to the total active diffuser surface area.
   c. Conduct shop test with air rate and mass rate of oxygen transfer directly proportional to the ratio of the shop test tank volume and the design tank volume.
   d. Plot of standard condition pounds of oxygen transferred per day per 1000 cubic feet of tank volume versus standard condition cubic feet of air per minute per 1000 cubic feet of tank volume. (lbs-o_2/day/1000 cubic feet-tank) vs. (SCFM/1000 cubic feet-tank).
      1) Standard conditions of oxygen transfer are defined as 68 DegF, 1 atmosphere ambient pressure, clean water.
      2) Standard air is defined as 68 DegF, 1 atmosphere, 36 percent R.H., containing 23 percent oxygen by weight.
3. Certify and stamp all tests by a Professional Engineer.
4. Include all costs for testing (exclusive of witnesses' expenses) in the equipment price. All tests may be witnessed at Owner option.
5. Submit all test data from oxygen transfer tests for approval by the Owner prior to manufacturing equipment.

PART 3 EXECUTION

3.1 INSTALLATION

A. See Section 11005 (Equipment: Basic Requirements).
B. For aeration system equipment, assemble in factory to ensure proper fit. Mark parts with erection marks, disassemble for shipment.
C. Install in compliance with manufacturer's instructions:
1. Do not use power tools to secure orifice bolts, clamps, or retaining rings.

2. Use calibrated torque wrenches that slip when set torque is exceeded.

D. Pipe Supports and Tie Downs:
1. Sliding support: As required to compensate for expansion/contraction.

E. Diffuser Leveling:
1. Installed within +/- 1/4 IN of common horizontal plane.
2. Check installation elevation by filling basin to top of diffusers.
3. Adjust diffuser elevations as required to achieve horizontal plane.

F. Cleaning:
1. Clean all piping to remove visible dirt, dust, and other matter before starting system or installing diffusers.
2. Do not use process air compressors for air cleaning.
3. Air furnished by Contractor.

3.2 FIELD QUALITY CONTROL

A. Provide manufacturer's field services in accordance with Section 01450 (Quality Control).
1. Provide Owner with a written Certificate of Proper Installation that manufacturer's equipment has been installed properly, has been started up, and is ready for operation by Owner's personnel. Include results of benchmark pressure test.

3.3 FIELD TESTING

A. All testing and remedial action shall be done at the Contractor's expense.

B. Quality control tests:
1. The quality control tests described below shall be performed by the equipment supplier.
   a. Detailed reports on all test results shall be submitted to the Owner for acceptance prior to shipment.
2. Unless otherwise specified, each test shall be performed on a minimum total sample size of 40 diffusers selected at random from the total number of diffusers to be supplied.
   a. If diffuser production requires multiple batches, select, at random, an equal number of diffusers from each batch so that the total number of diffusers tested is not less than 40.
3. For each quality control test, 95 percent of the diffusers tested shall comply with the requirements of the test.
   a. If more than 5 percent of the test sample fails to meet the requirements of the specific test, then the entire batch of diffusers shall be tested to ensure that 95 percent of all diffusers meet the test requirements.

C. Uniformity testing:
1. Perform a uniformity test to demonstrate an even distribution of air bubbles when the diffusers are submerged.
   a. For the number of diffusers selected for the test, submerge the diffusers to a depth of 1 IN of clean tap water.
   b. Apply an initial air flow of 2.5 scfm per diffuser for a period of 5 minutes and then reduce the air flow per diffuser in increments of 0.5 scfm for a period of 5 minutes at each air flow rate to a minimum of 0.5 scfm per diffuser.
   c. Visually observe and photograph the water surface to assure uniformity of air distribution.
2. The uniformity test shall be conducted with diffusers arranged and spaced in a pattern similar to that proposed for the installation.
   a. 95 percent of the diffusers tested shall show a substantially even distribution of air at air flows from 0.5 to 2.0 scfm per diffuser.

D. Benchmark Pressure Test.
   1. Perform following benchmark pressure test for each basin.
      a. Temporarily provide and install calibrated 0-15 psi pressure reading device with 0.05 psi graduations located at connection of air line to butterfly valve.
      b. Adjust airflow to basin dropleg to equal 2.5 SCFM per installed diffuser as measured by flowmeter installed at dropleg.
      c. Measure and record:
         1) Dropleg pressure in psig.
         2) Airflow in SCFM using flowmeter port installed in air line.
         3) Ambient air temperature.
         4) Relative Humidity.
         5) Barometric Pressure.
         6) Basin liquid elevation.
   2. Submit test results attesting in writing that values provided represent aeration system benchmark pressures. Benchmark pressures will be compared with subsequent like testing results by the Owner, at its discretion, with diffusers in a cleaned condition to determine compliance with warranty requirements specified in Article 1.4.

3.4 TRAINING

A. Provide two (2) 4 hour training sessions. Schedule with Owner on separate days.

END OF SECTION

SECTION 11089

AERATION EQUIPMENT: COARSE BUBBLE TYPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coarse bubble type aeration equipment.
2. All piping, fittings, supports, mixing diffusers and appurtenances as indicated on drawings.

1.2 REFERENCES

A. ASTM A554-72 Welded Stainless Steel Mechanical Tubing
B. ASTM A530-72 General Requirements for Specialized Carbon and Allow Steel Pipe.

1.3 SUBMITTALS

A. Shop Drawings:
1. Provide details of diffuser assembly indicated. Include designation of diffuser type, number of diffusers, cfm range, attachment to header, support of header, expansion provisions and other associated appurtenances.

1.4 SPARE PARTS

A. Furnish the following extra materials.
1. 2 extra diffuser elements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are approved:
1. Sanitaire.
2. Aquarius Technologies, Inc.
3. Stamford Scientific, Inc.
4. Or Approved Equal.

2.2 MATERIALS

Item	Material
Diffuser Body	304L Stainless Steel, 20 gauge
Piping System Components	304L Stainless Steel, 12 gauge
Air Header Manifold and Distribution Supports	Stainless Steel, type 316
Non Welded Parts	304 Stainless Steel

2.3 EQUIPMENT

A. Basic Configuration:
1. Lay out air diffusion system in mixed liquor channels as shown on Drawings.

a. Furnish the coarse air aeration equipment beginning with a stainless steel flanged connection at the upstream side of the dropleg and include the dropleg, slip joint connection to the air distribution header, air distribution header, diffuser connectors, diffusers, supports, gaskets, header joints, bolts, nuts and washers, all to form the complete mixing systems within the mixed liquor channels as shown on the drawings and herein specified.

2. Space diffusers evenly along the air headers to provide mixing in the channels and to prevent settling of solids.

2.4 OPERATING REQUIREMENTS:

A. Design equipment for the aeration basins for operation at the following conditions:

	Mixed Liquor Channel (Per Basin)	**Total (2 Basins)**
Minimum air flow rate, scfm	70	140
Number of diffusers (min)	6	12
Maximum head over diffusers, FT	13.5	N/A
Drop Piping Diameter, IN	4	N/A
Air Header diameter, IN	4	N/A
Maximum diffusion system head loss (at maximum water depth) from drop pipe through diffuser exclusive of static head, 0.50 psi, at maximum air flow rate.		

B. Provide minimum of six plugged ¾ IN taps along distribution header, in each mixed liquor channel, as shown on drawings.

2.5 FABRICATION

A. Air Header:

1. Fabricate air distribution header in sections up to 25 FT in length. Bottom elevation of the air distribution header should be the same throughout the tank.
   a. Removable end cap at header ends.
2. Furnish a dropleg from the air main connection at the top of the tank.
   a. Provide a slip joint connection between the drop leg and distribution header.
   b. Provide a loose follower flange top connection.
   c. Support the dropleg from the connection at the air header.
3. Design connections between sections of the air distribution header to allow individual header sections to rotate independently of adjacent header sections.
4. Header dimensions as shown on the drawings with dimensional tolerances conforming to ASTM A554-72 and ASTM A530-72.
5. Factory welding only; field welding not allowed.
6. Wire brushed outside weld area.
7. All discoloration and deposits left by welding remove by pickling.
8. Factory welded diffuser connections, located in accordance with the contract drawings.
   a. Diffuser connectors located on a common horizontal plane.
9. Stiffen diffuser connectors and headers to withstand a vertical load that results in a moment of 500 IN LBS at the diffuser connector without any permanent deformation.
10. Install diffusers to within +/- 3/8 IN of a common horizontal plane.

11. After fabrication passivate all stainless steel assemblies and parts by immersion in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid at 140 DegF for a minimum of 15 minutes.

B. Supports:
1. Provide stainless steel supports for manifold and droplegs with a maximum spacing of 8 FT between supports.
2. Design manifold, dropleg, connections and supports to resist thrust generated by thermal expansion or contraction of the piping system.
3. Manifold supports shall include manifold hold downstrap (U-bolt or Approved Equal), cross-tree and supporting structure.
4. Manifold supports to be adjustable to allow diffusers to be installed as the same level through the two trains.

C. Diffusers:
1. Sanitaire stainless steel Model D-24, or Aquarius stainless steel Mode WBD24, or Approved Equal.
2. 3/4 IN Sch. 80 nipple, no insert.

D. Dropleg pipe butterfly valves:
1. See Section 15114 (Miscellaneous Valves).

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Install per manufacturer recommendations.
B. See Section 11005 (Equipment: Basic Requirements).

3.2 FIELD QUALITY CONTROL

A. Leveling tests:
1. Introduce clear water into each channel to the top of the diffuser elements.
2. Check the level of the diffusers to document that all element horizontal surfaces are within 1/4 IN of a common horizontal plane and at the specified elevation.

B. Leakage and distribution of flow tests:
1. After successful completion of the leveling tests, raise the water level to 2 IN above the manifold.
2. Visually inspect the water surface to ensure that the airflow is uniformly distributed across the tank.
3. Repair any leaks in the elements holders, elements, pipes or the like.
4. Repeat the test until the installation is essentially void of air leaks.

END OF SECTION

SECTION 11373

SUBMERSIBLE MIXERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Furnish submersible mixers for use in the anaerobic and anoxic/swing zones as indicated on drawings.
2. Furnish all labor, materials, tools and equipment necessary for complete installation in the anaerobic and anoxic/swing zones of the aeration basins tanks as indicated on the Contract Drawings and specified herein.
3. Submersible power cable.
4. Single guide rail system.
5. Hoist base.
6. Lifting cable.
7. Support cable.
8. Motor protection unit.
9. All appurtenant equipment.

1.2 REFERENCES

A. ASTM A48	Standard Specification for Gray Iron Castings
B. ASTM A53	Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
C. ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates

1.3 SUBMITTALS

A. Product Data:
1. Complete performance data showing capacity and power input.
2. Electrical Data that includes:
   a. Motor rating, hp.
   b. Motor temperature rating.
   c. Motor full load rotational speed.
   d. Motor full load current.
   e. Motor locked rotor current.
   f. Power cable data.
   g. Motor performance curves showing speed, efficiency, current, power, etc.
   h. Moisture sensor protection characteristics and wiring diagram.

B. Shop Drawings:
   A. Submersible Mixer.
      1. Name of manufacturer.
      2. Type and model.
      3. Rotational speed.
      4. Major component materials of construction.
   B. Mixer specification describing construction details.
   C. Outline dimension drawing.
   D. Installation drawing with mounting details for mixer mast assembly and davit crane.
   E. Mixer Mast Assembly:

1. Hoist and mast assembly specification.
2. Hoist details and materials of construction.
3. Mast assembly details and materials of construction.

F. Engineering Calculations:
1. Prepared and stamped by a California registered civil or structural engineer.
2. Include:
a. Sizing of all anchors for securing hoist base.
b. Sizing of all anchors for mixer support mast assembly wall and base brackets.
c. Sizing of mixer support mast.
d. Provide equipment anchorage calculations as specified in Section 11005 (Equipment: Basic Requirements), demonstrating compliance with the applicable requirements in Section 11005 (Equipment: Basic Requirements).

G. Quality Assurance/Control Submittals:
1. Submit the following:
a. Manufacturer's Certificate of Proper Installation.
b. Functional Test Certification.
c. Factory performance test reports.
d. Special shipping, storage and protection, and handling instructions.
e. Manufacturer's printed installation instructions.
f. List of suggested spare parts to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance.
g. List of special tools, materials, and supplies furnished with equipment for use prior to and during startup.
h. Provide with first submittal a list of three (3) similar wastewater installations that have been in continuous operation for a minimum of three years.

H. Installation, Operation, and Maintenance Manual:
1. Provide operations and maintenance data for all equipment furnished for the project in accordance with Section 01330 (Submittal Procedures).

I. Tools: Special tools necessary for maintenance and repair of the equipment shall be furnished as a part of the Work hereunder; such tools shall be suitably stored in metal tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

1.4 SPARE PARTS

A. Each size and type of mixer shall be supplied with the following parts:
1. Two sets motor shaft bearings.
2. Two sets seals, gaskets, and O-rings.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Wilo-EMU USA.
2. Flygt 4000 Series.
3. Or Approved Equal.

2.2 GENERAL

A. Number of Mixers: 8. (Mixer, M-1A, Mixer, M-1B, Mixer, M-1C, Mixer, M-1D, Mixer, M-2A, Mixer, M-2B, Mixer, M-2C, Mixer, M-2D)
B. Liquid Mixed: Mixed Liquor Activated Sludge.
C. Design Liquid Suspended Solids concentration Range (mg/l): 3,200
D. Design Liquid Suspended Solids Concentration Range (mg/l): 2,000 - 4,000
E. Mixing Cycle (M-1A, M-2A, M-1B, M-2B): Continuous.
F. Mixing Cycle (M-1C, M-1D, M-2C, M-2D): Continuous.
G. Zone Configuration and Dimensions: See drawings.
H. Dimensions of Tank to be Mixed:
   1. Length (FT): 24
   2. Width (FT): 25
   3. Side Water Depth (FT): 14.0-14.5
I. Note: Manufacturer to review the drawings to verify the configuration of the basin and location of flows into the basin.

2.3 SUBMERSIBLE MIXERS

A. General
   1. Type: The motor shall drive the submersible mixer propeller through a planetary gear reduction drive system that locates the motor shaft in line with the propeller shaft. The propeller shall be capable of handling solids, fibrous materials, heavy sludge, and other matter found in wastewater applications
   2. Submergence: All components of the mixer, including motor, shall be capable of continuous underwater operation in both of the following conditions: (1) mixer blade completely submerged. In addition, all components of the mixer, including motor, shall be capable of continuous operation in air, completely unsubmerged, for 2 hours minimum.
   3. Mounting:
      a. Mixers shall be designed to be easily raised, lowered, and removed for inspection or service, and rotated horizontally without the need for personnel to enter the tank.
      b. A sliding guide bracket shall be an integral part of each mixer.
      c. Guide bracket shall guide the mixer into position and be capable of carrying the entire weight of the mixer and the maximum loads created by the mixer.
      d. Mixer, with its appurtenances and power cable, shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 130 FT.
      e. Provide stop clamp for mixers in Zones C and D as indicated on drawings.
   4. Mating Surface Seals: All mating surfaces where watertight sealing is required shall be machined and be fitted with a double set of nitrile rubber or Viton O-rings.
   5. Propeller:
      a. Propeller shall be non-clogging backward curved design, capable of handling solids, fibrous materials, heavy sludges, and other matter normally found in wastewater treatment applications.
      b. Propeller shall be dynamically balanced so the propeller imbalance does not exceed ISO 1940 G6.3 tolerances to prevent excessive vibrations.
      c. Propeller shall have two or three vanes and be of the diameter and of the blade angle, in degrees, as indicated.
      d. Each blade shall be laser cut and welded to the hub to ensure that the propeller is properly balanced.

6. Bearings:
   a. Shaft shall rotate on two or three permanently lubricated bearings.
   b. Outboard, propeller end, bearing shall be an angular contact or deep groove bearing.
   c. Inboard, motor end, bearings shall be an angular contact or deep groove to take up the axial loads and a radial bearing to take up the radial loads.
   d. Bearings shall be pre-loaded, if needed, by a bearing loading nut located on the motor end of the shaft in order to reduce shaft deflection and increase bearing and seal life.
   e. Bearings shall have a minimum L-10 rated life of 100,000 hours.
7. Shaft:
   a. The shaft connecting the propeller to the gear reducer shall be constructed of AISI 329 (1.4462) stainless steel.
   b. Minimum propeller shaft diameter (D), measured at the outermost bearing shall be: 1.77 IN (45 mm).
   c. The propeller shaft shall be supported such that the length (L) from the outermost bearing to the hub of the propeller shall not exceed 3.88 IN (98.5 mm). The shaft overhang ratio of the distance from the bearing to the hub of the propeller (L) divided by diameter of the shaft at the bearing shall not exceed 2.2.
8. Shaft Seals:
   a. Each mixer shall be provided with two sets of lapped end face type mechanical seals or an outside lapped end face type mechanical seal and inner lip seal running in an oil chamber for cooling and lubrication. Shaft seals without positively driven rotating members shall not be accepted. Only the seal faces of the outer seal assembly shall be exposed to the mixed media.
   b. Each mixer shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed for oil pressure compensation. The drain and inspection plugs with positive anti-leak seal, shall be easily accessible from the outside.
   c. The mechanical seal shall require neither maintenance nor adjustment, shall not be damaged when the mixer is run dry, shall be easy to check and replace, and shall be capable of running in either direction without damage. Shaft seals that rely on the tank fluid as a lubricant will not be considered acceptable or equal.

B. Performance Requirements:

Maximum Motor Speed (rpm)	
Maximum Propeller Speed (rpm)	900
Minimum Propeller Diameter (IN)	14 IN
Number of Propeller Blades	3
Drive Type	Gear Driven
Minimum Horsepower Rating (Output)	1
Maximum shaft Horsepower (Clear Water)	5
Maximum Motor Size (hp)	5
Voltage, Phase, Hertz	480, 3, 60, Fixed Speed
Minimum Number of Poles	4
Minimum thrust Produced, (N)	620
Flowrate produced (gpm)	7,300
Maximum Weight (pounds)	210

1. The mixers shall be selected to achieve uniform concentration of mixed liquor suspended solids in the liquid under the specified operating conditions and location as indicated in the drawings.
2. The mixers shall be positioned in each anaerobic and anoxic/swing zone in the approximate location indicated and elevations in the drawings. The exact location and elevation in each zone shall be determined by manufacturer to achieve uniform suspended solids concentrations in the zone.
3. Mixer systems shall be capable of providing mixing energy to each anoxic tank at no less than 0.5 horsepower per 1,000 cubic feet.

C. Materials of Construction:
1. Except as noted below, mixer components in contact with the liquid shall be of Type 316 stainless steel with smooth surfaces devoid of blow holes and other irregularities. All exposed nuts, bolts, fasteners, and hardware shall be of Type 316 stainless steel.
2. The propeller shall be of Polyurethane or Type 316 stainless steel.
3. The propeller shaft shall be of Type 420 stainless steel.
4. The mechanical seals shall contain a stationary face ring of silicon carbide and a rotating face ring of silicon carbide.
5. All anchor bolts nuts and washers shall be 316 stainless steel.
6. Motor housing and gear casing: cast iron, ASTM A48 40B, with two-component ceramic-based coating minimum 16 mils DFT, or Approved Equal.

D. Controls:
1. Each motor shall be provided with temperature and moisture protection system meeting the requirements below:
   a. Provide each motor with integral winding temperature sensors, one on each leg, which open on high temperature.
   b. Each mixer shall be equipped with an electrical probe to detect the presence of moisture before bearing and motor damage occurs.
   c. Control conductors for the sensors shall be integral with the motor power cable.
   d. Furnish loose for installation in field one Flygt Mini CAS 120, or Approved Equal, and mounting base for each mixer or equal protection for mixer actually supplied.

E. Motor and Power Cable:
1. General: The motor shall be a squirrel cage, induction, shell type design, housed in an air filled, sealed, watertight chamber. The motor shall be designed for continuous duty, capable of sustaining a maximum of at least ten evenly spaced starts per hour and have a minimum 1.15 service factor. The motor shall be suitable for service in a Class 1, Division 2 environment and bear UL or FM approval. The stator winding shall be insulated with moisture resistant Class H insulation which will resist a temperature of 180 DegC (356 DegF). The stator shall be dipped and baked three times in Class F varnish. The rotor bars and short circuit rings shall be made of aluminum.
2. Cable: Provide pump cable of sufficient length to connect to terminal junction box where indicated. Pump cable shall be sized according to the NEC and ICEA Standards, suitable for submersible service. The cable shall be rated for 600-volt and 90 DegC with a 40 DegC ambient temperature and shall be FM approved.
3. Cable entry: Cable entry seal design shall provide a watertight submersible seal. The cable entry housing shall be an integral part of the back plate or upper lid. The cable entry shall have a double set elastomer grommets or a single grommet with cable strain. The cable entry shall be comprised of one or two cylindrical elastomer grommets, each flanked by washers designed with a close tolerance fit against the cable outside diameter

and the entry inside diameter. The assembly shall bear against a shoulder and be compressed to form a watertight seal. The cable entry shall be designed to insure a watertight seal between the electrical junction chamber and the motor, preventing fluid leakage into the motor.

F. Mounting and Support System:
   1. Each mixer shall be equipped with a mounting assembly and vertical support mast designed to secure the mixer while in operation and guide it during installation and removal without entering or emptying the tank. The vertical support mast shall be supported from the basin floor and the basin walkway as appropriate, and at 10 FT vertical intervals along the basin wall.
   2. Wall components of the mounting assembly including mixer mounting base plate, vertical support mast, sliding bracket, and fastening hardware shall be Type 316 stainless steel.
   3. The vertical support mast section shall be a minimum of 4 IN by 4 IN by 3/16 IN if square or 4 IN diameter schedule 10, if round. The assembly shall permit horizontal and vertical changing of the mixer axis. The assembly shall be designed and constructed to securely support the mixer, including providing adequate thrust resistance under all mixer operating conditions, including both submerged and un-submerged operation and over the full range of mixer axis positions. The mast shall be provided with a cable holder that prevents the electric cable from being entangled with the mixer propeller during operation. The mast shall be constructed to positively lock the mast in place at all operating positions.
   4. Stop clamp: Provide a 316 stainless steel clamp for each mixer support system as indicated on the drawings to maintain clearance between mixers and diffuser grid. The clamp shall not prevent future adjustment of the mixer.
   5. Power cable support: Provide a minimum 1/4 IN diameter 316 stainless steel power cable support cable with each mixer permanently attached to the mixer shackle on one end and the upper guide bracket of the mounting system on the other end. The power cable shall be attached to the support cable using clamps at 5 FT intervals.
   6. Lifting cable: Provide a minimum 1/4 IN diameter, 316 stainless steel lifting cable shall be provided and securely attached to each mixer. The top of the cable shall end in an eye of sufficient strength to develop the strength of the cable. Provide a hook to secure the cable at the top of the mast.

G. Accessories:
   1. Adjustable hoists:
      a. Provide a total of four (4) as indicated on the drawings. Each having a 42 IN reach, a 109 IN mast height, and a lifting capacity equal to but not greater than 550 pounds. The hoist shall be mounted into a wall mount socket as described below. The hoist shall be easily removed from the hoist base to facilitate moving to another location or for storage. The boom, mast and base shall be of 316 stainless steel construction.
      b. The hand winch shall be of 316 stainless steel construction having cadmium plate finish. An anchor hole in the flange of the drum shall provide easy attachment and removal of the lifting cable to allow the cable assembly to be attached to a cleat while the hoist is moved to a new location. An automatic friction brake shall be provided to prevent the winch load from freewheeling. The winch handle shall be an integral part of the braking mechanism.
      c. The hoist shall be capable of rotating 360 degrees under load enabling the mixer to be removed from the tank in a single lifting and rotating motion.

d. The system shall be capable of lifting the mixer to sufficient height to clear the handrail.

2. Lifting lugs: Equipment weighting over 100 pounds shall be provided with lifting lugs.
3. Identification plate: an identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear the 1/4 IN die-stamped equipment identification number and equipment data.
4. Anchors: Concrete anchors shall be in conformance with Section 05505 (Metal Fabrications), and minimum 5/8 IN diameter Type 316 stainless steel. Coordinate required size and location with Shop Drawings. The mixer Manufacturer shall size and determine the proper location for anchors, and shall furnish the anchors.
5. Hoist wall mounting socket: Each submersible mixer shall be provided with a hoist wall mounting socket as shown on the Drawings. The wall mounting socket shall be capable of supporting the hoist described above and shall be installed on the edge of the walkway deck.

H. Protective Coating:

1. Shop and field painting shall be in accordance with requirements specified in Section 09905 (Painting and Protective Coating).

PART 3 EXECUTION

3.1 DELIVERY AND STORAGE

A. Care during storage and procedures for installation, lubrication, and startup of the equipment and motors shall be in strict conformance with the Manufacturer's instructions.

3.2 INSTALLATION

A. Install in accordance with the Manufacturer's printed instructions.

3.3 TESTING

A. Comply with Section 01650 (Facility Start-Up) and Section 11005 (Equipment: Basic Requirements).

B. Factory Testing: Mixers shall be tested at the factory. The Owner may, at Owner's discretion, witness the factory test. Testing shall include the following:

1. Verify that propeller, motor rating, and electrical connections comply with this Section.
2. Measure for moisture content and insulation defects in motor and cable, both before and after the submergence test below.
3. Run mixer dry to verify proper rotation and alignment.
4. Run mixer submerged at least 30 minutes under at least 6 FT of water to check for balance, unusual noise, and overheating. Verify proper pumping capacity.
5. Test motor for no-load current at rated voltage, high potential, and locked rotor current.
6. A factory test report showing that the above testing procedure has been performed and that the mixer successfully passed the tests shall be completed. The factory test report shall be supplied with the final documents.

C. Functional Testing: A functional wet test shall be conducted at pre-commissioning in accordance with Section 01650 (Facility Start-Up). The functional wet test should verify operation without excessive noise, vibration, cavitation, or overheating and document motor voltage and current draw.

D. Pre-Commissioning: A factory trained representative shall inspect the installation of the mixers before the tank is filled with treated effluent and before pre-commissioning to assure

the installation has been completed in accordance with the Manufacturer's recommendations. Start up of the mixers shall be in accordance with the Manufacturer's recommended start up procedures. An installation start up form shall be completed for each mixer and supplied with the final documents. Start up should take no more than 2-3 hours per mixer. A functional wet test shall be conducted at plant pre-commissioning in accordance with Section 01650 (Facility Start-Up). Verify operation without excessive noise, vibration, cavitation, or overheating. Document motor voltage and current draw.

E. Test MiniCAS protective relay and hoist.

3.4 TRAINING

A. Provide two (2) 4 hour training sessions. Schedule with Owner on separate days.

END OF SECTION

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13440

INSTRUMENTATION FOR PROCESS CONTROL: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Basic requirements for complete instrumentation system for process control.

1.2 REFERENCES

A. CSA	Canadian Standards Association
B. FM	FM Global
C. ISA 7.0.01	Quality Standard for Instrument Air
D. ISA S5.1	Instrumentation Symbols and Identification
E. ISA S5.3	Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems
F. ISA S5.4	Standard Instrument Loop Diagrams
G. ISA S20	Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves
H. NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
I. NFPA 70	National Electrical Code (NEC)
J. NIST	National Institute of Standards and Technology
K. UL 913	Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Instrumentation subcontractor:
      a. Experience:
         1) Have satisfactorily provided a control system for a minimum of five (5) projects of similar magnitude and function within the past three (3) years.
         2) Experience in Allen Bradley Compactlogix PLC.
B. Miscellaneous:
   1. Comply with electrical classifications and NEMA enclosure types as indicated.

1.4 DEFINITIONS

A. Non-architecturally finished area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.
B. Outdoor Area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
C. Calibrate: To standardize a device so that it provides a specified response to known inputs.

1.5 SYSTEM DESCRIPTION

A. Control System Requirements:
   1. The instrument and control system consists of all primary elements, transmitters, switches, controllers, computers, recorders, indicators, panels, signal converters, signal

boosters, amplifiers, special power supplies, special or shielded cable, special grounding or isolation, auxiliaries, software, wiring, and other devices required to provide complete control of the planned improvements as specified in the Contract Documents.

B. All signals shall be directly linearly proportional to measured variable unless specifically noted otherwise.

C. Single Instrumentation Subcontractor:
   1. Furnish and coordinate instrumentation system through a single instrumentation subcontractor.
      a. The Contractor shall be responsible for functional operations of all systems, performance of control system engineering, supervision of installation, final connections, calibrations, preparation of Drawings and Operation and Maintenance Manuals, start-up, training, demonstration of substantial completion and all other aspects of the control system.
   2. Ensure coordination of instrumentation with other Work to ensure that necessary wiring, conduits, contacts, relays, converters, and incidentals are provided in order to transmit, receive, and control necessary signals to other control elements, to control panels, and to receiving stations.
   3. Provide PLC programming and configuration.

1.6 SUBMITTALS

A. Shop Drawings:
   1. Product technical data including:
      a. Equipment catalog cut sheets.
      b. Instrument data sheets:
         1) ISA S20 or Approved Equal.
         2) Separate data sheet for each instrument.
      c. Materials of construction.
      d. Physical limits of components including temperature and pressure limits.
      e. Size and weight.
      f. Electrical power requirements and wiring diagrams.
      g. NEMA rating of housings.
      h. Submittals shall be marked with arrows to show exact features to be provided.
   2. Loop diagrams per ISA S5.4.
   3. Comprehensive set of wiring diagrams.
   4. PLC equipment drawings.
   5. Nameplate layout drawings.
   6. Drawings, systems, and other elements are represented schematically in accordance with ISA S5.1 and ISA S5.3.
      a. The nomenclature, tag numbers, equipment numbers, panel numbers, and related series identification contained in the Contract Documents shall be employed exclusively throughout submittals.
   7. All Shop Drawings shall be modified with as-built information/corrections.
   8. All panel and wiring drawings shall be provided in both hardcopy and softcopy.
      a. Furnish electronic files on CD-ROM or DVD-ROM media.
      b. Drawings in AUTO CAD format.
   9. Provide a parameter setting summary sheet for each field configurable device.

10. Certifications:
    a. Documentation verifying that calibration equipment is certified with NIST traceability.
    b. Approvals from independent testing laboratories or approval agencies, such as UL, FM or CSA.
        1) Certification documentation is required for all equipment for which the specifications require independent agency approval.
11. Testing reports: Source quality control reports.

B. Installation, Operation, and Maintenance Manuals:
1. List of factory authorized service agents.
2. Trouble shooting tables.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not remove shipping blocks, plugs, caps, and desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent connections are made.

1.8 SITE CONDITIONS

A. Unless indicated otherwise, area designations are as follows:
1. Outdoor area:
    a. Wet.
    b. Subject to temporary submergence when specifically indicated.
2. Non-architecturally finished areas: Dry unless indicated otherwise.

PART 2 PRODUCTS

2.1 NEMA TYPE REQUIREMENTS

A. Provide enclosures/housing for control system components in accordance with the following:
1. Areas designated as wet: NEMA Type 4X.
2. Dry area: NEMA Type 12.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. System Operating Criteria:
1. Performance: All instruments and control devices shall perform in accordance with manufacturer's specifications.

2.3 ACCESSORIES

A. Provide identification devices for instrumentation system components.

PART 3 EXECUTION

3.1 INSTALLATION

A. Wherever feasible, use bottom entry for all conduit entry to instruments and junction boxes.
B. Install electrical components per Division 16.
C. Panel-Mounted Instruments:
1. Mount and wire so removal or replacement may be accomplished without interruption of service to adjacent devices.

2. Locate all devices mounted inside enclosures so terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.

3.2 FIELD QUALITY CONTROL

A. Maintain accurate daily log of all startup activities, calibration functions, and final setpoint adjustments.
   1. Documentation requirements include the utilization of the forms located at the end of this Section 13440. Instrumentation Certification Sheets shall include calibration points at 10% and 90% in addition to points shown.
      a. Loop Check-out Sheet.
      b. Instrument Certification Sheet.
      c. Final Control Element Certification Sheet.
B. Instrumentation Calibration:
   1. Verify that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.
   2. Calibrate all field-mounted instruments, other than local pressure and temperature gages, after the device is mounted in place to ensure proper installed operation.
   3. Calibrate in accordance with the manufacturer's specifications.
   4. Replace any instrument which cannot be properly adjusted.
   5. Calibration equipment shall be certified by an independent agency with traceability to NIST.
      a. Certification shall be up-to-date.
      b. Use of equipment with expired certifications shall not be permitted.
   6. Calibration equipment shall be at least three (3) times more accurate as the device being calibrated.
C. Loop check-out requirements are as follows:
   1. Check control signal generation, transmission, reception and response for all control loops under simulated operating conditions by imposing a signal on the loop at the instrument connections.
      a. Use actual signals where available.
      b. Closely observe controllers, indicators, transmitters, HMI displays, recorders, alarm and trip units, remote setpoints, ratio systems, and other control components.
         1) Verify that readings at all loop components are in agreement.
         2) Make corrections as required.
            (a) Following any corrections, retest the loop as before.
   2. In addition to any other as-recorded documents, record all setpoint and calibration changes on all affected Contract Documents and turn over to the Owner.
D. Provide verification of system assembly, power, ground, and I/O tests.
E. Verify existence and measure adequacy of all grounds required for instrumentation and controls.

END OF SECTION

SECTION 13441

CONTROL LOOP DESCRIPTIONS

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. The control loop descriptions provide the functional requirements of the control loops represented in the Contract Documents.
B. The control loop descriptions are not intended to be an inclusive listing of all elements and appurtenances required to execute loop functions, but are rather intended to supplement and complement the drawings and other specification sections. The control loop descriptions shall not be considered equal to a bill of materials.
C. Provide instrumentation hardware and software as necessary to perform control functions specified herein and shown on Drawings.
D. Related Sections:
   1. Section 13440 (Instrumentation for Process Control: Basic Requirements).

1.2 SUBMITTALS

A. Product Data:
   1. Secure from instrumentation Subcontractor and include with submittals control loop descriptions for each loop in system. Ensure that tag numbers cross reference with loop diagrams and tag numbers shown on instrument specification forms. Where tag numbers are not assigned, the control integrator shall assign tag numbers. Describe each element and include appropriate tag number in parenthesis. When additional elements are necessary, use and assign tag number not in conflict with others and in accordance with ISA procedures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL LOOPS

A. General:
   1. All analog values to have a minimum of 3 configurable alarm or control points adjustable over full range of analog point.
   2. Loss of power will cause all drives to shut down. Upon restoration of power drives in Auto shall start in sequence to state prior to power failure and then return to normal control.
   3. If a drive is called to start or valve to open and fails to start or open with in a preset time an alarm shall be generated and the next drive in sequence shall be started where applicable.
   4. If a drive is running in Auto and stops while still called, the next drive in sequence shall be started and an alarm generated.
   5. If a drive is called to stop or valve to close and fails to stop or close with in a preset time an alarm shall be generated.

B. Specific Loops:
   1. Mixers and recirculation pumps:
      a. Drives are started and stopped manually, locally, or from SCADA.
      b. Monitor the points shown in input/output list.
   2. Blower control (Blower main control panel PLC):
      a. User shall be able to set up sequence of blowers; lead, lag and standby.
      b. Lead blower shall run continuously at variable speed as outlined in the following strategy.
      c. The aeration control shall have a single mode of operation as all blowers are connected to a common low pressure air header.
      d. There are two aeration basins and user can select Basin 1, Basin 2 or both in service. If only one basin is selected, the D.O. control valves for the other basin shall be closed.
      e. Dissolved oxygen (D.O.) control will be provided for basin zones E and F for each basin that is in service. The D.O. control for each controlled zone consists of a D.O. measurement and a modulating motor actuated butterfly valve for control. Each of the 4 D.O. control loops shall be a very slow acting PID loop or a deadband type control.
      f. The position of each of the active D.O. control valves shall be monitored, the most open valve (2 valves if one basin is used or 4 valves if both basins are used) will be determined and its position compared to predetermined setpoints. If the most open valve exceeds the setpoint "high most open position" it indicates the header pressure is too low so the header pressure setpoint shall be increased in small increments with delays. If the most open valve position drops below the setpoint "low most open position", decrease the header pressure in small increments after delay. If the most open valve position is within the deadband between the high and low setpoint no header pressure changes are to be made. Each aeration basin zone control valve shall have a minimum valve position setpoint below which it can not go to provide adequate air flow for minimum zone mixing.
      g. The header pressure shall be controlled by blower speed and shall have a minimum header pressure setpoint below which it can not be driven.
      h. Parameters shall be provided for adjustment to prevent blower surge or undesirable operating points for blowers.
      i. The aeration system shall be started up and shut down manually, but will normally operate continuously. Upon startup the blower speed shall start at full speed and then control from that point.
      j. Only two blowers can operate at a time. The second blower shall be called to start if the on line blower speed reaches 100 percent for a preset time. The second blower shall be taken off line if the blowers' speed reaches a preset low speed for a preset time. When two blowers are running they shall run at the same speed.

END OF SECTION

SECTION 13442

PRIMARY ELEMENTS AND TRANSMITTERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pressure components.
   2. Analytical components.
B. Related Sections:
   1. Section 13440 (Instrumentation for Process Control: Basic Requirements).

1.2 REFERENCES

A.	AISI	American Iron and Steel Institute
B.	ANSI	American National Standards Institute
C.	ASME B16.5	Pipe Flanges and Flanged Fittings
D.	ASME B31.1	Power Piping
E.	ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
F.	ASTM B124	Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes
G.	ASTM B283	Standard Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed)
H.	ASTM B453	Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Rod, Bar, and Shapes
I.	NEMA250	Enclosures for Electrical Equipment (1000 Volts Maximum)
J.	USDIBR	Water Measurement Manual

1.3 SYSTEM DESCRIPTION

A. The instruments specified in this section 13442 are the primary element components required.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 13440 (Instrumentation for Process Control: Basic Requirements).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the manufacturers listed in the Articles describing the elements are acceptable.

2.2 PRESSURE COMPONENTS

A. Pressure Transmitters:
   1. Acceptable manufacturers:
      a. Rosemount, Model 3051, no substitutions.
   2. Materials:
      a. Isolating diaphragm: 316 stainless steel.
      b. Process flanges and adapters: 316 stainless steel.

c. Housing: Aluminum.
d. Vent/drain valve: 316 stainless steel.
e. Fill fluid:
1) Utilize halocarbon fill for process applications involving strong oxidizing agents.
(a) Agents include but are not limited to: Cl2, KMN04, FeCl, Na0H, and Na0Cl.
2) Utilize manufacturer's standard fill for other applications.
(a) Ensure fill is suitable for application temperatures.

3. Design and fabrication:
a. Smart transmitters utilizing microprocessor based electronics.
b. Output: 4-20 mA DC proportional to pressure.
c. Nonvolatile EEPROM memory.
d. Power supply: 24 Vdc.
e. Adjustable zero and span.
f. Temperature limits: -20 to 180 DegF.
1) -4 to 175 DegF for LCD indicators.
g. Overpressure limits: Withstand 150 percent of stated maximum service pressure without damage.
h. Humidity limits: 0 to 100 percent relative humidity.
i. Damping: Adjustable between 0 and 32 seconds.
j. Inaccuracy (includes effects of linearity, repeatability and hysteresis): +/-0.10 percent of calibrated span for 15:1 rangeability.
k. Stability: +/-0.2 percent of upper range limit for 12 months.
l. Temperature effect:
1) Total effect including span and zero errors: +/-0.2 percent of upper range limit per 100 DegF for minimum 15:1 rangeability.
m. Minimum 1/2 IN pressure connection.
n. Equip with test jacks or accessible terminals for testing output.
o. Equip with isolation valve and test connections with isolation valves and/or plugs.

4. Schedule:

TAG NUMBER	SERVICE	SPAN
PIT-1	LP Air	0 - 10 psi

2.3 ANALYTICAL ELEMENTS

A. DO Sensor and Transmitter:
1. Acceptable manufacturers:
a. Hach Instruments, Advanced LDO. No substitutions.
2. Materials:
a. Wetted materials: Foamed Noryl and 316 SST.
3. Design and fabrication:
a. Modbus communication.
b. Temperature range: 0 - 50 DegC.
c. Range: 0 - 20 mg/l.
d. 1 year calibration interval.
e. Air calibration.
f. No membrances.
g. Transmitter: Hach SC-200, 120 VAC input, 4-20 ma out.

h. Mounting: Guard rail pole mount adjustable arm, aluminum or stainless steel.
i. Provide replacement sensor cap.

4. Schedule:

TAG NUMBER	SERVICE	MOUNTING TYPE
AE/AIT-1A, 1B, 2A & 2B	Mixed Liquor	Guardrail Arm

B. Nitrate Sensor:
1. Acceptable manufacturer:
   a. Hach Instruments, Model Nitratax Plus SC.
   b. Or Approved Equal.
2. Design and fabrication:
   a. Submersible up to 10 FT.
   b. Minimum of 40 FT of cable.
   c. Accuracy; 5 percent measured value ± 0.2 mg/l.
   d. Calibrated sensor cartridge.
   e. Low selective electrode.
   f. To connect into Hac SC-200 transmitter.
   g. Self cleaning probe with wiper.
3. Schedule:

TAG NUMBER	SERVICE	MOUNTING TYPE
AE-2C	Mixed Liquor	Guardrail Arm

2.4 PIPE, TUBING, AND FITTINGS

A. Acceptable Manufacturers:
1. Tube fittings:
   a. Parker CPI.
   b. Swagelok.
   c. Or Approved Equal.

B. Instrument Tubing and Fittings:
1. Material:
   a. Tubing: ASTM A269, Grade TP 316 stainless steel.
   b. Straight fittings: 316 stainless steel per ASME SA-479 or ASTM A276.
   c. Shaped bodies: ASME SA-182 F316 stainless steel.
2. Design and fabrication:
   a. Tubing:
      1) Seamless.
      2) Fully annealed.
      3) Maximum hardness: 80 Rb.
      4) Free from surface scratches and imperfections.
      5) Diameter: 1/2 IN OD unless specified otherwise.
      6) Wall thickness:
         (a) Meet requirements of ASME B31.1, Paragraph 122.3.
         (b) Minimum 0.049 IN for 1/2 IN OD tubing.
   b. Fittings:
      1) Flareless.

2) Compression type.

C. Instrument Piping:
1. For applications where the instrument is supported solely by the sensing line, (e.g., pressure gauge directly mounted to process line) utilize piping as specified below.
   a. Diameter: 1/2 IN unless specified otherwise.
   b. Schedule 80.
   c. 316 stainless steel.

2.5 INSTRUMENT VALVES

A. Process instrument multi-valve manifolds, isolation, vent and blow-down valves:
1. Acceptable manufacturers:
   a. Whitey Co.
   b. Anderson-Greenwood USA, Inc.
   c. Or Approved Equal.
2. Materials:
   a. Packing:
      1) 450 DegF and above: Graphite.
      2) Below 450 DegF: Graphite or Teflon.
   b. Body: 316 stainless steel per ASTM A479.
   c. Stem: 316 stainless steel per ASTM A276.
   d. Ball: 316 stainless steel per ASTM A276.
   e. Support rings: 316 stainless steel per ASTM A276.
   f. Seats:
      1) Metal:
         (a) 316 stainless steel per ASTM A276.
      2) Soft:
         (a) Teflon, Delrin.
         (b) Only utilized on applications where manufacturer's temperature and pressure ratings exceed process design conditions.
3. Design and fabrication:
   a. Either of the following:
      1) Ball valve with 1/4 turn activation.
      2) Free-swiveling ball stem.
   b. Provide body wall thickness sufficient for process design conditions per ASME B31.1.
   c. Temperature: Manufacturer's temperature rating for all components shall exceed process design conditions.

2.6 ACCESSORIES

A. Furnish all mounting brackets, hardware and appurtenances required for mounting primary elements and transmitters.
1. Materials, unless otherwise specified, shall be as follows:
   a. Bolts, nuts, washers, expansion anchors: 316 stainless steel.
   b. Mounting brackets:
      1) Standard: 316 stainless steel.
   c. Mounting plates, angles:
      1) Standard: Galvanized carbon steel.
      2) Wet and corrosive areas: 316 stainless steel.

d. Instrument pipe stands:
   1) Standard: Hot-dip galvanized 2 IN schedule 40, ASTM A106, Grade B carbon steel.
   2) Wet and corrosive areas: 316 stainless steel.

B. Tubing Support Angles and Brackets: Type 316 stainless steel.

C. Tubing Tray or Channel:
   1. Aluminum.
   2. Provide dielectric material between tray or channel and tubing.

D. Cable lengths between sensors and transmitters shall be continuous (without splices) and as required to accommodate locations as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install instrument mounting pipe stands level and plumb.

C. Instrument Valves:
   1. Orient stems for proper operation.
   2. Install arrays orderly and neat in appearance with true horizontal and vertical lines.
   3. Provide a minimum of 2 IN clearance between valve handle turning radii where there are multiple valve handles appearing in a straight line.
   4. Valves shall have bonnets and any soft seals removed during welding or soldering into the line.
      a. When cool, reassemble the valves.
   5. Support each valve individually.
      a. The tubing system does not qualify as support for the valve.

D. Locate instrument piping and tubing so as to be free of vibration and interference with other piping, conduit, or equipment.

E. Keep foreign matter out of the system.

F. Remove all oil on piping and tubing with solvent before piping and tubing installation.

G. Plug all open ends and connections to keep out contaminants.

H. Tubing Installation:
   1. General:
      a. Install such that tube shows no sign of crumpling, bends of too short a radius, or flattening, etc.
      b. Make tube runs straight and parallel or perpendicular to the floor, equipment and piping runs.
      c. For liquid and steam applications, slope continuously from the process to the instrument with a minimum slope of 0.50 IN per foot.
      d. For gas and air applications, slope continuously from the instrument to the process with a minimum slope of 0.50 IN per foot.
      e. If the sensing line cannot be continuously sloped, install high point vents and low point drains.
      f. Keep instrument tubing clean during all phases of work.
      g. Blow out with clean, dry, oil-free air immediately before final assembly.
      h. Cut by sawing only and debur.
   2. Bending:
      a. Make each bend with tube bender of the correct size for the tube.

b. Make all bends smooth and continuous.
c. Rebending is not permitted.
d. Make bends true to angle and radius.
e. Maintain a true circular cross section of tubing without buckling or undue stretch of tube wall.
f. Allowable tolerance for flattening out of tubing bends: Maximum of 8 percent of the OD for stainless steel tubing.
g. Minimum bending radius for stainless steel tubing:

TUBE OD, INCHES	MINIMUM BENDING RADIUS, INCHES
1/4	9/16
3/8	15/16
1/2	1-1/2

h. Minimum bending radius for type L, hard (drawn) copper:

TUBE OD, INCHES	MINIMUM BENDING RADIUS, INCHES
3/8	1-3/4
1/2	2-1/2

3. Tubing support:
   a. Intermittently support by clamping to support angle.
   b. Install supports to be self-draining, supported by hangers, or cantilevered from walls or structural beams.
   c. Support at 5 FT-0 IN maximum spans for horizontal or vertical runs.
   d. Use tubing trays in areas where spans between supports are greater than 5 FT and for all signal tubing support.
   e. Support each tubing tray at 10 FT maximum spans.
   f. Align tubing in orderly rows and retain in the tray by bolted clips.
      1) The use of spring or speed clips is not acceptable.
   g. Maintain order of the tubing throughout the length of the tray.
   h. Locate angle, channel and tray installation to protect tubing from spills and mechanical damage.
   i. Locate support members to clear all piping, conduit, equipment, hatchways, monorails, and personnel access ways and allow access for equipment operation and maintenance.
   j. Support trays to prevent torsion, sway or sag.
   k. Permanently attach supports to building steel or other permanent structural members.
   l. Arrange supports and trays so that they do not become a trough or trap.
4. Routing and orientation:
   a. Route to maintain a minimum headroom clearance of 8 FT.
   b. Locate and orient valves and specialties so that they are accessible for operation and maintenance from the operating floor.
      1) Do not route through or over equipment removal areas, below monorails or cranes nor above or below hatches.

5. Expansion and vibration provisions:
   a. Provide horizontal expansion loops at the process connections.
   b. Route tubing parallel to relative motion through sleeved supports that allow linear tube movement.
   c. Cold springing of tubing to compensate for thermal expansion is prohibited.

I. Threaded Connection Seals:
1. Use Tite-Seal or acceptable alternate.
2. Use of lead base pipe dope or Teflon tape is not acceptable.
3. Do not apply Tite-Seal to tubing threads of compression fittings.

J. Instrument Mounting:
1. Mount all instruments where they will be accessible from fixed ladders, platforms, or grade.
2. Mount all local indicating instruments with face forward toward the normal operating area, within reading distance, and in the line of sight.
3. Mount instruments level, plumb, and support rigidly.
4. Mount to provide:
   a. Protection from heat, shock, and vibrations.
   b. Accessibility for maintenance.
   c. Freedom from interference with piping, conduit and equipment.

3.2 TRAINING

A. Provide on-Site training.

END OF SECTION

SECTION 13446

CONTROL AUXILIARIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Signal modules.
   2. Pilot devices.
      a. Selector switches.
      b. Pushbuttons.
      c. Indicating lights.
   3. Relays/timers.
      a. Control relay.
      b. Time delay relays.
   4. Termination equipment.
      a. Terminal blocks.
      b. Fuse holders.
   5. Power supplies.
      a. DC power supplies.
   6. Voltage surge protection devices.
   7. Running time indicator.
   8. Digital indicator.

B. Related Sections:
   1. Section 16491 (Low Voltage Surge Protection Devices (SPD)).

1.2 REFERENCES

A.	ISA S18.1	Annunciator Sequences and Specifications
B.	NEMA ICS 2-125	
C.	NEMA ICS 2-216.22	Standards for Industrial Control Devices, Controllers and Assemblies
D.	NEMA ICS 2-218	
E.	NEMA ICS 6	Enclosures for Industrial Controls and Systems

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 13441 (Instrumentation for Process Control: Basic Requirements).
   2. See Section 16491 (Low Voltage Surge Protective Devices (SPD)).

B. Installation, Operation and Maintenance Manuals:
   1. Loop isolators.
   2. Relays.
   3. Timers.
   4. Pilot Devices.
   5. Digital Indicators.

1.4 QUALITY ASSURANCE

A. Ensure units comply with electrical area classifications and NEMA enclosure type indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the manufacturers as listed in the articles describing the devices are acceptable.
B. Provide similar components from the same manufacturer for uniformity of appearance, operations, and maintenance.

2.2 SIGNAL MODULE

A. Loop Isolators:
   1. Acceptable manufacturers:
      a. AGM Electronics.
      b. Moore Industries.
      c. Or Approved Equal.
   2. Design and fabrication:
      a. Solid state electronics.
      b. Transmit analog output signal directly proportional to measured input signal.
      c. Power source: 24 V DC.
      d. Analog input: 4-20 mA DC.
      e. Output signal: 4-20 mA DC into 1400 ohms.
      f. Impedance:
         1) Voltage input: 10 Meg.
         2) Current input: 50 ohms.
         3) Voltage output: 1 ohm.
         4) Current output: 1650 ohms.
      g. Accuracy: Better than ± 0.10 percent of span.
      h. Isolation: Up to 500 V rms (input, output and case).
      i. Temperature effect: ±0.0025 percent of span per DegF.
      j. Ambient temperature range: 0-140 DegF.
      k. Factory calibrated.

2.3 PILOT DEVICES

A. Selector Switches:
   1. Acceptable manufacturers:
      a. Cutler Hammer.
      b. Allen-Bradley.
      c. Or Approved Equal.
   2. Design and fabrication:
      a. Heavy-duty type.
      b. Oiltight.
      c. Rotary cam units conforming to NEMA ICS 2-216.22.
      d. Supply switches having number of positions required with contact blocks to fulfill functions shown and specified.
      e. UL listed.
      f. Maintained contact type.
      g. Knob type operators.
      h. Black colored operators.
      i. Designed with cam and contact block with approximate area of 2 IN SQ.
      j. Legend plate marked per Contract Documents.

k. Contact block requirements:
   1) Dry and indoor locations: Standard contact blocks rated for 10 A continuous current.
   2) Wet or outside locations: Hermetically sealed contact blocks.

B. Pushbuttons:
1. Acceptable manufacturers:
   a. Cutler Hammer.
   b. Allen-Bradley.
   c. Or Approved Equal.
2. Materials:
   a. Backing diaphragm: Buna-N.
3. Design and fabrication:
   a. Heavy-duty type.
   b. Oiltight.
   c. Conforming to NEMA ICS 2-216.22.
   d. Diaphragm backed.
   e. UL listed.
   f. Emergency stop pushbuttons to have mushroom head operator and maintained contact.
   g. Non-illuminated type:
      1) Momentary contact with necessary contact blocks.
      2) Molded, solid color melamine buttons.
      3) Standard flush operators with full shroud.
      4) Red colored buttons for START or ON and green color for STOP or OFF.
      5) Appropriate contact blocks to fulfill functions shown or specified.
   h. Contact block requirements:
      1) Dry and indoor locations: Standard contact blocks rated for 10 A continuous current.
      2) Wet or outside locations: Hermetically sealed contact blocks.
      3) Legend plate marked per Contract Documents.
   i. Illuminating type:
      1) Momentary contact with necessary contact blocks.
      2) Serves as both pushbutton control and indicating light.
      3) Red colored lenses for START or ON and green for STOP or OFF.
      4) LED full voltage light unit with lens and panel gasket.
      5) Legend plate marked per Contract Documents.
      6) Appropriate contact blocks to fulfill functions shown or specified.

C. Indicating Lights:
1. Acceptable Manufacturers:
   a. Cutler Hammer.
   b. Allen-Bradley.
   c. Or Approved Equal.
2. Design and fabrication:
   a. Heavy duty type.
   b. Oiltight.
   c. Type allowing replacement of bulb without removal from control panel.
   d. UL listed.
   e. Legends marked per Contract Documents.

f. Nominal 2 IN SQ face.
g. Glass lens, LED lamp.
h. Color code lights as follows:
   1) Red: ON or running; valve open.
   2) Blue: Standby; auto mode; ready.
   3) Green: OFF or stopped; valve closed.
   4) Dark grey: Fail or off-line.
   5) Yellow: Alarm or error.
   6) Orange: Manual mode.
   7) Purple: Transition.
i. Legend plate engraved for each light.

2.4 RELAYS/TIMERS

1. Control Relays:
2. Acceptable manufacturers:
   a. Idec.
   b. Potter & Brumfield.
   c. Allen-Bradley.
   d. Or Approved Equal.
3. Design and fabrication:
   a. Plug-in general purpose relay.
   b. Blade connector type.
   c. Switching capacity: 10 A.
   d. Contact material: Silver cadmium oxide.
   e. Provide relays with a minimum of 3 SPDT contacts.
   f. Coil voltage: 120 V AC or 24 V DC.
   g. Relay sockets are DIN rail mounted.
   h. Internal neon or LED indicator is lit when coil is energized.
   i. Clear polycarbonate dust cover with clip fastener.
   j. Check button.
   k. Temperature rise:
      1) Coil: 85 DegF max.
      2) Contact: 65 DegF max.
   l. Insulation resistance: 100 Meg min.
   m. Frequency response: 1800 operations/hour.
   n. Operating temperature: -20 to +150 DegF.
   o. Life expectancy:
      1) Electrical: 500,000 operations or more.
      2) Mechanical: 50,000,000 operations or more.
   p. UL listed or recognized.

B. Time Delay Relays:
   1. Acceptable manufacturers:
      a. Eagle Signal Controls.
      b. Idec.
      c. Or Approved Equal.
   2. Design and fabrication.
      a. Melt design test and performance requirements of NEMA ICS 2-218.
      b. Heavy-duty.

c. Solid-state construction.
d. External adjusting dial.
e. Auxiliary relays as required to perform functions specified or indicated.
f. Operates on 117 V AC (±10 percent) power source.
g. Contact rating: A150 per NEMA ICS 2-125.
h. Furnish with "on" and "timing out" indicators.

2.5 TERMINATION EQUIPMENT

A. Terminal Blocks:
1. Acceptable manufacturers:
a. Phoenix Contact.
b. Allen-Bradley.
c. Or Approved Equal.
2. Design and fabrication:
a. Modular type with screw compression clamp.
b. Screws: Stainless steel.
c. Current bar: Nickel-plated copper allow.
d. Thermoplastic insulation rated for -40 to +90 DegC.
e. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
f. Spacing: 6 mm.
g. Wire size: 22-12 AWG.
h. Rated voltage: 600 V.
i. Din rail mounting.
j. UL listed.
3. Standard-type block.
a. Rated current: 30 A.
b. Color: Gray body.
4. Bladed-type block:
a. Terminal block with knife blade disconnect which connects or isolated the two sides of the block.
b. Rated current: 10 A.
c. Color:
1) Panel control voltage leaves enclosure - normal: Gray body, orange switch.
2) Foreign voltage entering enclosure: Orange body, orange switch.
5. Grounded-type block:
a. Electrically grounded to mounting rail.
b. Use to terminal ground wires and analog cable shields.
c. Color: Green and yellow body.

B. Fuse Holders:
1. Acceptable manufacturers:
a. Phoenix Contact.
b. Allen-Bradley.
c. Or Approved Equal.
2. Design and fabrication:
a. Modular-type with screw compression clamp.
b. Screws: Stainless steel.
c. Current bar: Nickel-plated copper alloy.
d. Thermoplastic insulation rated for -40 to +105 DegC.

e. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
f. Blocks can be ganged for multi-pole operation.
g. Spacing: 9.1 mm.
h. Wire size: 30-12 AWG.
i. Rated voltage: 300 V.
j. Rated current: 12 A.
k. Fuse size: 1/4 x 1-1/4.
l. Blown fuse indication.
m. DIN rail mounting.
n. UL listed.

2.6 POWER SUPPLIES

A. DC Power Supplies:
1. Acceptable manufacturers:
   a. Condor.
   b. International Power.
   c. Or Approved Equal.
2. Design and fabrication:
   a. Converts 120 V AC input to DC power at required voltage.
   b. Linear, open-frame power supply.
   c. Sized as required by the load. Minimum 2.4 A output.
   d. AC input: 120 V AC +10 percent -13 percent; 47 to 63 HZ.
   e. Line regulation: ±0.05 percent for a 10 percent change.
   f. Load regulation: ±0.05 percent for a 50 percent load change.
   g. Output ripple: 3 mV +0.05 percent of output voltage, peak to peak maximum.
   h. Transient response: Less than 50uS for 50 percent load change.
   i. Short circuit protection: Automatic current limit/foldback.
   j. Stability: ±0.05 percent for 24 HRS after warm-up.
   k. Temperature rating: 0 to 50 DegC full rated, derated linearly to 40 percent at 70 DegC.
   l. Temperature coefficient: +0.01 percent/DegC maximum.

2.7 VOLTAGE SURGE PROTECTION DEVICES

A. See Section 16491 (Low Voltage Surge Protection Devices (SPD)).

2.8 RUNNING TIME INDICATORS:

A. Acceptable Manufacturers:
1. Eagle Signal Controls.
2. Cramer.
3. Or Approved Equal.

B. Design and Fabrication:
1. Six-digit wheels including a 1/10 digit.
2. Non-reset type.
3. Time range in hours.
4. Automatic recycle at zero.
5. Accuracy: 1 percent.
6. Sealed against dirt and moisture.
7. Tamperproof.

2.9 DIGITAL INDICATOR

A. Design and Fabrication:
   1. Line or 120 VAC powered.
   2. Configurable to read in engineering units.
   3. Four - 1/2 IN high LED or LCD digits with decimal.
   4. Front panel flush mount.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Mount control auxiliaries on separate subpanel in control panel.
C. Install end sections and end stops at each end of terminal strip.
D. Install machine-printed terminal markers on both sides of block.
E. Install end sections and end stops at each end of terminal strip.
F. Install machine-printed terminal markers on both sides of block.

END OF SECTION

SECTION 13448

CONTROL PANELS AND ENCLOSURES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
   1. Section 10405 (Identification, Stenciling, and Tagging Systems).
   2. Section 13441 (Instrumentation for Process Control: Basic Requirements).
   3. Section 13455 (Programmable Logic Controller (PLC) Control System).

1.2 REFERENCES

A.	ASTM A269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
B.	NEMA ICS 4	Terminal Blocks for Industrial Use
C.	NEMA ICS 6	Enclosures for Industrial Controls and Systems
D.	NEMA 250	Enclosures for Electrical Equipment (1000 V Maximum)
E.	UL 508	Industrial Control Equipment

1.3 DEFINITIONS

A. Panel: Any control panel or enclosure listed in the schedule included in this Section 13448 (Control Panels and Enclosures).
B. Foreign voltages: Voltages present in circuit even when the panel main power is disconnected.

1.4 SUBMITTALS

A. See Section 13441 (Instrumentation for Process Control: Basic Requirements).
B. Product Data:
   1. Statement of panel wiring methods including wire type, insulation colors, insulation rating, wire sized, wire routing, and wire labeling strategy to be implemented during panel fabrication.
   2. Letter documenting UL 508 capabilities.
   3. Scaled panel face and subpanel face instrument and nameplate layout drawings.
   4. Panel and subpanel materials of construction.
   5. Panel and subpanel dimensions and weights.
   6. Panel access openings.
   7. Conduit and wiring access locations.
   8. Internal wiring and terminal block drawings.
   9. Internal component layout to scale.
   10. Nameplate text.
   11. Total electrical load of panels and enclosures.
C. Shop Drawings:
   1. As-Built Drawings:
      a. Update the control panel drawings and ship at least one copy with the control panel to the Site.
D. Quality Assurance
   1. Obtain approved control panel layouts prior to installation of conduit feeds
   2. Provide completely matching color tones for any individual color specified.

3. Provide panel with the required NEMA rating per NEMA Publication No. 250 to meet classifications indicated or specified.
4. Approved supplier of Industrial Control Equipment under provisions of UL 508. Entire assembly shall be affixed with a UL 508 label "Listed Enclosed Industrial Control Panel" prior to shipment to the Site. Any control panel which arrives to the Site without an UL 508 label shall be rejected and sent back to the panel shop.

E. Installation, Operation, and Maintenance Manual:
1. Control panel and all control devices in panel.
2. As built wiring diagrams and panel layout.

1.5 MAINTENANCE

A. Extra Materials:
1. Replacement Bulbs. Provide minimum 25 percent for replacement indicating light bulbs for each type of indicator furnished in this Project.

B. Paint Touch-Up Kit: Provide for field repair of coating damaged during shipment and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Enclosures:
a. Hoffman Engineering Co.
b. Circle AW.
c. Or Approved Equal.

2.2 MATERIALS

A. Front Panel, Subpanel or Front Door: Steel or stainless steel as required.
B. Frame and Bottom Angles: Steel or stainless steel as required.
C. Top, Sides, Back, Sides, and Back Door: Steel or stainless steel as required.
D. Hinges: Stainless steel.
E. Nameplates: Phenolic.

2.3 ACCESSORIES

A. Panel Nameplates and Identification:
1. See Section 10405 (Identification, Stenciling, and Tagging Systems).

2.4 FABRICATION

A. General:
1. Fabricate panels with instrument arrangements as indicated.
2. Prime control panels with rust inhibitive shop applied primer and paint with two coats of ANSI 61 gray.
3. Finish interior of panel with epoxy glass white.
4. Provide control panel which meets the following requirements:
a. Enclosure sheet metal thickness per UL 508, subpart 7.3.
b. Bonding for continuity of grounding per UL 508, subpart 7.6.
c. Enclosure openings per UL 508, subparts 7.8 through 7.11.
d. Observation windows, if utilized, per UL 508, subpart 7.12.

e. Constructed in accordance with NEMA type per UL 508, subpart 7.15.
f. Corrosion protected per UL 508, subpart 8.
g. Tapped holes for conduit in a cast metal enclosure per UL 508, subpart 27.3
h. Knockouts in sheet-metal enclosure per UL 508, subpart 27.4

5. Provide cautionary markings, if required, in accordance with UL 508, subpart 59.
   a. Locate cautionary markings per UL 508, subparts 59.1, 59.3.
   b. Prefix the cautionary marking with the word "CAUTION" or "WARNING" utilizing letters sized per UL 508, subpart 59.2.
   c. If more than one disconnect switch is required to disconnect all power within a panel or enclosure, provide a cautionary marking with the word "CAUTION" and the following or equivalent, "Risk of Electric Shock-More than one disconnect switch required to de-energize the equipment before servicing."
      1) Locate the cautionary marking on the outside of the equipment or on a stationary fixed, nonremovable part inside the equipment where easily and clearly seen.

B. Free-Standing Panels:
1. Welded construction.
2. Completely enclosed, self-supporting, and gasketed dusttight.
3. Edges turned back minimum of 2 IN.
4. Seams and corners welded and ground smooth to touch and smooth in visual appearance.
5. Provide full length flush pan doors.
6. Provide full length piano hinges rated for 1.5 times door plus instrument weight.
7. Provide doors with keyed alike locking handles and three point catch.
8. Provide appropriate conduit, wiring, and instrument openings in accordance with best panel design.
9. After cutouts have been made, finish opening edges to smooth and true surface condition.
10. Provide each panel with lifting eyebolts. Furnish hot-dipped galvanized steel base channels.
11. Slotted bolt holes in base, 1 1/2 long for field adjustment.

C. Wall Mounted Panels:
1. Seams continuously welded and ground smooth.
2. Rolled lip around all sides of enclosure door opening.
3. Gasketed dust tight.
4. Three-point latching mechanism operated by oil tight key-locking handle.
5. Key doors alike.
6. Continuous heavy GA hinge pin on doors.
   a. Hinges rated for 1.5 times door plus instrument weight.
7. After cutouts have been made, finish opening edges to smooth and true surface condition.
8. Front full opening door.
9. Brackets for wall mounting.

D. Panel Front Construction:
1. Welded construction.
2. Edges turned and ground smooth to touch and visual appearance.
3. At joints where panel face meets side walls, provide dustproof sponge rubber gasket entire height and face.
4. Use full length piano hinges rated for 1.5 times door weight for panel access door.

5. Equip doors with locking devices and handle and three point catches.
6. Finish all instrument cutouts smooth and true.

E. Panel Wiring and Piping:
1. See Section 13455 (Programmable Logic Controller (PLC) Control System) for PLC/field terminal wiring. Wire all PLC I/O points to terminal blocks, including all spare points.
2. Factory wire panels to identified terminal blocks equipped with screw type lugs.
3. Install all wiring without splicing in factory in plastic wire duct:
   a. Do not exceed manufacturer's recommended fill limits.
   b. Size raceways per NEC Article 362.
   c. Ducts shall have removable covers.
4. Splicing and tapping of wires allowed only at terminal blocks.
5. Wire bending space shall be in accordance with Tables 307B, C in NEMA ICS 6. Wire bunches to doors shall be secured at each end so that bending or twisting will be around longitudinal axis of wire. Protect bend area with sleeve.
6. Keep AC power lines separate from low-level DC lines, I/O power supply cables, and all I/O rack interconnect cables. Separate by at least 6 IN, except at unavoidable crossover points and at device terminations.
7. Arrange circuits on terminal blocks plus any spare conductors on adjacent terminals.
8. Provide necessary power supplies for control equipment.
9. Equip each panel with a main thermal magnetic circuit breaker. Limit load to maximum of 80 percent of circuit breaker rating.
10. Provide all necessary stabilizing voltage transformers, balancing potentiometers and rectifiers as necessary for specific instrument requirements.
11. Ensure each panel mounted device is bonded or otherwise grounded to panel or panel grounding system by means of locknuts or pressure mounting methods.
    a. Equip panel with grounding terminals.
    b. All sub-panels and hinged doors shall be bonded to ground.
12. Arrange wiring with sufficient clearance for all leads. Arrange wire neatly, cut to proper length, and remove surplus wire.
13. Wiring to subpanels or rotary switches shall be individually bundled and installed with a "flexible loop" of sufficient length to permit the component to be removed from panel for maintenance without disconnecting wiring.
14. AC and DC circuit conductors shall be type MTW stranded copper suitable for operation at 600 V as specified in the NEC. Conductor size shall be as required for load and 16 AWG minimum.
15. Analog signal cables shall be of 600 V, stranded copper, twisted-shielded pairs of 18 AWG minimum. Ground analog cable drain conductors on grounded terminal blocks at one end of the cable only.
16. Use only high precision 250 ohm resistors with 0.25 percent accuracy to convert 4-20 mA analog signals to 1-5 V DC analog signals. Resistor leads shall be landed under terminal clamp by itself and not with any other wires.
17. Analog signals for devices in separate enclosures shall not be wired in series. Loop isolators shall be used where analog signals are transmitted between control enclosures.
18. Identify all wires with plastic sleeve type (heat-shrinkable) wire markers at each end. Markers shall:
    a. Identify circuit numbers.
    b. Identify function and polarity.

19. Provide at least 6 IN of separation between all circuits and intrinsically safe devices and wires.
20. Termination requirements:
    a. Terminal block markings, mechanical characteristics and electrical characteristics shall be in accordance with NEMA ICS 4.
    b. Terminals shall facilitate wire sizes as follows:
        1) 120 V AC applications: Wire size 12 AWG and smaller.
        2) Other: Wire size 14 AWG and smaller.
    c. Provide terminal blocks with continuous marking strip.
    d. Tag each I/O terminal to indicate tag number of the connected device.
    e. Provide terminals for individual termination of each signal shield.
    f. Provide 20 percent excess terminals for future expansion.
    g. Use terminal blocks with bladed switch where control voltages enter or leave the control panel. Bladed terminal block body to be orange where foreign voltages connect to the panel.
    h. Use fused terminal blocks where the control circuit is energizing a solenoid valve or where providing DC power to loop-powered transmitter. Blown fuse indicators to be utilized on all fused terminal blocks.
    i. Install DIN rail along entire terminal strip area to facilitate future expansion.
    j. Utilize busses for DC and AC control voltages within panel. Include space for expansion.
    k. Provide marked field terminal strip for all PLC I/O connections.
21. Wire lugs to be full ring type.

F. Panel Lighting and Power:
1. Receptacles:
    a. Panels less than 4 FT long:
        1) One electrical GFCI outlet.
        2) One incandescent light fixture with switch(es) and separate circuit breakers.
    b. Panels or panel faces greater than 4 FT long:
        1) One electrical GFCI outlet per 6 FT of length.
        2) Continuous fluorescent lighting strip with switches and separate circuit breakers.

G. Environmental Controls:
1. Furnish circulation fans near hot spots where required to prevent temperature from exceeding instrument rating.
    a. Circulation fans shall utilize coil windings which resist the absorption of moisture via impregnating, dipping in, or brushing with varnish, or by other acceptable means.
        1) Film coated coil wires need not have additional treatment to resist moisture absorption.
    b. Circulation fans shall incorporate locked rotor protection per UL 508, subpart 26.
2. Over-temperature switches shall be utilized to provide special cooling if required to maintain operating temperatures within the manufacturer's specified range.
3. Air conditioning applications shall include means of preventing moisture condensation.
4. For panels or control cabinets located outside, or in area classification requiring a NEMA 4 or 4X rating:
    a. Install thermostatically controlled condensation protection heaters in enclosures housing electronic equipment.

5. Each control panel and control station shall be furnished with industrial corrosion inhibitors.
    a. The inhibitor contains a chemical that vaporizes and condenses on all surfaces in the enclosure.
    b. The amount of inhibitor shall be according to manufacturer recommendation for the size of the enclosure.
    c. Inhibitor shall be installed prior to shipment to the Site.

H. Transitent Noise Protection:
1. Each control panel with PLC components shall be furnished with power protection in the form of a surge suppressor followed by an isolation transformer.
2. The control components within the control panel shall be powered from the protected power. The convenience receptacles, lighting, and cooling power need not be from the protected power.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install free-standing panels on concrete pads as indicated.
B. Anchor panel fronts rigidly into wall system with approved anchorage devices.
C. Anchor panels in a manner to prevent the enclosure from racking, which may cause the doors to become misaligned.
D. Anchor all panels in accordance with criteria for applicable seismic zone 4.

3.2 SCHEDULE

A. Submersible Pump/Mixer Terminal Cabinet:
1. NEMA 4X stainless steel.
2. Front door devices:
    a. Nameplate.
    b. LOS switch and run light with legend plates.
3. Rear panel devices:
    a. 480 volt terminal block.
    b. 120 volt/TSP terminal block.
4. See drawings for details.

B. Existing Blower Building VFD Panel Upgrade:
1. Add fourth VFD.
2. Change nameplates to read “ML Recirculation Pump, PMP-1”; “ML Recirculation Pump, PMP-2”; “ML Recirculation Pump, PMP-3” and “ML Recirculation Pump PMP-4”.
3. Rewire in accordance with the drawings.

C. Existing Blower Building RTU/PLC Panel Upgrade.
1. Remove existing PLC and all existing input/output.
2. Install replacement PLC and connect new input/output to existing field wiring terminals. Add any needed field wiring terminals.
3. Add any accessories needed for operating system.
4. Program and configure PLC for I/O and SCADA.
5. Owner will provide drawings of existing RTU/PLC panel.

END OF SECTION

SECTION 13455

PROGRAMMABLE LOGIC CONTROLLER (PLC) CONTROL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Programmable logic controller (PLC) control system and RTU/PLC panel modifications, including software and programming, startup and training and replacement PLC.
2. Connection of PLC into existing plant Lookout SCADA using Ethernet data link.
3. Connection and configuration of existing HMI for replacement PLC.
4. Development of up to 6 screens.
5. Contractor to provide PLC register addresses to Owner.

1.2 REFERENCES

A.	ANSI/IEEE C37.90.2	Trail-Use Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
B.	ANSI/IEEE C62.41	IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
C.	ANSI/IEEE C62.45	IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
D.	EIA TIA-232-E	Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
E.	EIA 422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits
F.	ISO 9001	Quality Systems-Model for Quality Assurance in Design, Development, Production, Installaltion and Servicing
G.	NEMA ICS 1	General Standards for Industrial Control and Systems
H.	NEMA ICS 4	Terminal Blocks for Industrial Use
I.	NEMA ICS 6	Enclosures for Industrial Controls and Systems
J.	NEMA LS1	Low Voltage Surge Protection Devices
K.	NEMA Publication No. 250	Enclosures for Electrical Equipment (1000 V maximum)
L.	UL 1283	Standard for Safety-Electromagnetic Interference Filters
M.	ML 1449	Standard for Transient Voltage Surge Suppressors

1.3 SUBMITTALS

A. Product Data:
1. Data sheets on each product to be used.
2. Panel drawings.
3. Panel wiring diagrams.
4. Full size diagrams of all process control displays with identification of actual colors.
   a. Owner will provide copies of example screens for other processes at plant.
5. List of all recommended spares for maintenance purposes with each item separately priced.
6. Annoted hard copies of PLC software programs.

a. Submit program for logic in ladder diagram format as used for the specific PLC system. Annotate program listing to include the following:
   1) Written description of each rung's function.
   2) Reference to control loop number for each rung where applicable.
   3) Reference to instrumentation tag number of I/O devices for each rung where applicable.
b. Provide written descriptions completely defining all function blocks used in program.
c. Provide list of all addresses referenced in logic diagram with description of data associated with each address.

7. All operator interface screens.
8. Programming software to be used.

B. Quality Assurance/Control Submittals:
1. Test Reports:
   a. Results of factory testing procedures.
2. Certificates:
   a. Upon satisfactory completion of startup, secure written statement from supplier that system is installed in accordance with requirements, is properly started up and is ready for operation by the Owner's personnel. Also certify that required operation and maintenance training has been fully satisfied.
   b. Programming software license.

C. Contractor shall complete a field review of the existing blower building RTU/PLC panel prior to preparation of shop drawings.

D. Installation, Operation, and Maintenance Manuals:
1. Include:
   a. PLC components.
   b. Surge protectors.
   c. Power supplies.
   d. Configuration and software manual.
   e. Operator interface screens for HMI.
   f. Final licensed version of software on CD or other Owner approved format including PLC, PLC programming software and HMI software.
   g. Internal register addresses.
   h. Copies of all operator interface screens.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturer is acceptable:
1. PLC: Allen Bradley Compact logix 1769L32E, no substitutions.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. See Section 13440 (Instrumentation for Process Control: Basic Requirements).

B. The PLC system shall accomplish the control requirements of the loop descriptions, Drawings, and Specifications.

C. PLC programming shall be documented and factory tested.

D. The PLC system shall operate in ambient conditions of 32 to 140 degrees F temperature and 5 to 95 percent relative humidity without the need for purging or air conditioning.
E. Utilize a power turn-on time delay circuit when powering up or down DC power supplies to ensure power supply output voltage has reached the proper value prior to application of power to solid state logic and output circuits.
F. Environmental Controls:
   1. Furnish circulation fans in solid state control system enclosures.
   2. Over-temperature switches shall be utilized to provide special cooling if required to maintain operating temperatures within the manufacturer's specified range.
   3. Air conditioning applications shall include means of preventing moisture condensation.
G. Where the PLC is utilized to control multiple trains of equipment, the PLC components (I/O modules, power supplies, etc.) shall be assigned so that the failure of one component does not affect equipment on all trains. I/O modules shall be segregated on a train basis unless required otherwise for safety reasons.
H. All PLC control system components shall be capable of meeting or exceeding electromagnetic interference tests per ANSI/IEEE C37.90.2.
I. Incorporate the following minimum safety measures:
   1. Watchdog function to monitor:
      a. Internal processor clock failure.
      b. Processor memory failure.
      c. Loss of communication between processor and I/O modules.
      d. Processor ceases to execute logic program.
   2. Safety function wiring:
      a. Emergency shutdown switches shall not be wired into the controller.
   3. An emergency power disconnect shall be placed in the power circuit feeding the power supply as a means of removing power from the entire PLC system.
   4. Safe wiring:
      a. Unless otherwise specified, activation of alarms and stopping of equipment shall result from the de-energization of control circuits, rather than the energization of control circuits.
      b. Low voltage control signal wires:
         1) Place in conduit segregated for that purpose only.
         2) Twisted shielded wire pair.
         3) Not located in the same conduit or bundle with power wiring.
   5. Initial safety conditions:
      a. Utilize program module to dictate output states in a known and safe manner prior to running of control program.
      b. Utilize program each time PLC is re-initiated and the control program activated.
   6. Monitoring of internal faults and display:
      a. Internal PLC system status and faults shall be monitored and displayed. Monitored items shall include:
         1) Memory ok/loss of memory.
         2) Processor ok/processor fault.
         3) Scan time overrun.

7. Control of programs:
   a. Protect access to PLC program loading with password protection.
8. Design PLC system with high noise immunity to prevent occurrence of false logic signals resulting from switching transients, relay and circuit breaker noise or conducted and radiated radio frequency interference.
9. Incorporate noise suppression and inductive load suppression design into input, output, and logic modules.
   a. Provide surge suppressors directly across the coils of all inductive devices which are energized by PLC outputs. Install the surge suppressor at location of the inductive device.
10. Operator intervention:
    a. Logic system failure shall not preclude proper operator intervention.
    b. Safety shutdown of equipment or a system shall require manual operator intervention before the equipment or system operation may be reestablished.
    c. PLC shall not be password protected.

2.3 COMPONENTS

A. PLC System Central Processor Unit (CPU):
   1. CPU shall provide communications with other control systems and HMI interfaces as specified.
   2. Memory:
      a. Battery-backed RAM.
      b. EEPROM program back-up:
         1) Automatically download to RAM in the event RAM is corrupted.
   3. Memory battery backup shall be capable of 60 days memory retention with fresh battery.
      a. Provide visual indication of battery status and alarm low battery voltage.
      b. Memory battery backup shall be capable of 14 days memory retention after the "Battery Low" indicating LED is on.
   4. Plug-in card design to allow quick field replacement of faulty devices.
      a. Provide unit designed for field replacement and expansion of memory without requiring rewiring or use of special tools.
   5. 20 percent minimum spare useable memory capacity after all required programming is in place and operating.
   6. Capable of executing all control functions required by the Specifications and Drawings.
   7. Built-in three-mode (proportional-integral-derivative) control capabilities.
      a. As directly selectable algorithms requiring no user knowledge of programming languages.
   8. On line reconfigurable.
   9. Lighted status indicators for "RUN" and "FAILURE."
   10. Capable of manual or automatic control mode transfer from the operating console stations or from within the control strategy. Transfer shall be bumpless and balanceless.
B. Communications to plant Lookout SCADA. Provide Ethernet data port at PLC for communications to existing plant SCDA. Provide all necessary configuration for data link.
C. Input/output (I/O) Modules.
   1. Provide plug-in modular-type I/O racks with cables to connect to all other required PLC system components.

2. Provide I/O system with:
   a. I/O solid state boards with status lights indicating I/O status.
   b. Electric isolation between logic and field device.
   c. Capability of withstanding low energy common mode transient to 1000 V without failure.
   d. Incorporate noise suppression design.
   e. Capable of meeting or exceeding electrical noise tests, NEMA ICS1-109.60-109.66.
   f. Capable of being removed and inserted into the I/O rack under power, without affecting any other I/O modules in the rack.
   g. Install 20 percent spare I/O points.
   h. Modules shall be Owner standard.
3. Input/output connection requirements:
   a. Make connections to I/O subsystem by terminating all field wiring on terminal blocks within the I/O enclosure.
   b. Prewire I/O modules to terminal blocks.
   c. Provide terminal blocks with continuous marking strip.
   d. Size terminals to accommodate all active data base points and spares.
   e. Provide terminals for individual termination of each signal shield.
   f. Field wiring shall not be disturbed when removing or replacing an I/O module.
4. Discrete I/O modules:
   a. Interface to ON/OFF devices.
   b. I/O status indicator on module front.
   c. Voltage rating to match circuit voltage.
   d. Output module current rating:
      1) Match maximum circuit current draw.
      2) Minimum 1.0 continuous A/point for 120 V AC applications.
   e. Isolated modules for applications where one module interfaces with devices utilizing different sources of power.
5. Discrete output shall be fused:
   a. Provide one fuse per common or per isolated output.
   b. Provide blown fuse indication.
   c. External fusing shall be provided if output module does not possess internal fusing.
   d. Fuses provided external to output model shall:
      1) Be in accordance with module manufacturer's specifications.
      2) Be installed at terminal block.
6. Analog I/O modules:
   a. Input modules to accept signals indicated on Drawings or Specifications.
   b. Minimum 12 bit resolution.
   c. I/O chassis supplied power for powering connected field devices.
   d. Differential inputs and outputs.
   e. User configurable for desired fault-response state.
   f. Provide output signals as indicated on Drawings and Specifications.
   g. Individual D/A converter for each output module.
   h. Individual A/D converter for each input module.

D. Power Supply Units:
1. Provide regulated power units:
   a. Designed to operate with PLC system and shall provide power to:
      1) All components of PLC system.

2) All two-wire field instruments.
3) Other devices as indicated on Drawings or Specifications.

b. Capable of supplying PLC system when all of the specified spare capacity is utilized.
c. Each power supply shall be sized such that it will carry no more than 75 percent of capacity under normal loads.

2. Electrical service to PLC system is 105 to 125 V, 60 HZ, +1 percent, 1 PH power.
3. Separate AC circuit breakers shall be provided for each power supply.
4. If the PLC system is field expandable beyond the specified spare capacity, and if such expansion requires power supply modification, note such requirements in the submittals and allow room for power supply modification in the PLC system enclosure.
5. Capable of meeting or exceeding electrical noise tests, NEMA ICS1-109.60-109.66.
6. Power distribution:
   a. Immune to transients and surges resultant from noisy environment.
   b. Shall provide constant voltage level DC distribution to all devices.

E. Data Line Surge Protection:
1. Acceptable manufacturer:
   a. Innovative Technology, Model D2S, D4S, or D6S.
   b. Only manufacturers with ISO 9001 certification are acceptable.
2. Install surge suppressor at PLC terminations for discrete I/O wiring applications where signal line extends outside of building.
3. Install surge suppressor at both ends of data lines where data line extends outside of building.
4. Series wired.
5. All mode protection (normal and common).
6. Less than 1 nanosecond response time.
7. Maximum let through voltage when exposed to a B3/C1 impulse wave (per ANSI/IEEE C62.41) of 6,000 volts and 3,000 amps:

Max Continuous Voltage	Max Let-Through Voltage
7.5 L-L	20
7.5 L-G	30
7.5 SHD-G	170
15 L-L	30
15 L-G	40
15 SHD-G	170
36 L-L	70
36 L-G	70
36 SHD-G	170

F. PLC System Software and Programming:
1. Provide programming to accomplish all control and monitoring requirements of the Contract Documents.
2. Provide two copies of control logic program on CD and hard copy.

3. Full documentation capability.
   a. The PLC programming software shall be the latest release of Allen Bradley software. Submit data identifying the programming software product name and version to be used on the project for approval.
   b. All PLC programming shall be clearly documented, including but not limited to, inputs, outputs, registers, instructions, rungs, branches, subroutines, sections, objectives, unusual procedures, descriptions of rungs, comments, etc. Documentation shall be provided via the programming software visually during the programming mode (online and offline), and documentation shall be provided separately using "Adobe pdf" format on a CDROM and a printed document both of which shall be provided in the form of a submittal. Any programming documentation deficiencies shall be remedied by Contractor at no additional cost.
   c. The Contractor shall provide an original copy "As-built" backup of all PLC programming, PLC related configuration and programming, HMI configuration and programming, and related documentation in the form of two (2) sets of CDROMS and printed documents.
   d. The PLC programming software shall be provided by the Contractor and registered in the name of Sonoma County Water Agency, and verification of registration shall be provided in a submittal for approval before substantial completion. Provide two software licenses for each PLC and OIT software that is used. Provide list of instrument settings. All programmed and/or configured software related to this project shall become the property of Sonoma County Water Agency and shall be labeled as such with full-rights thereto. No software/document related to this project shall be labeled as proprietary or copyright protected or similar declaration.
4. On/off line programming.
5. Offline simulation prior to download.
6. Two step commands requiring operator verification prior to deletion of any programming.
7. Provide register data to Owner for Owner configuration of remote SCADA at least 1 month prior to scheduled start-up.
8. Develop all screens for operator interface per Owner standards.
9. Screens to be approved during Submittal review.
10. Blower and aeration control screens shall match the attached samples to the extent possible.

G. HMI Screens:
   1. Screens to be active color screens to allow monitoring and secondary control of the blowers and aeration process. Primary control of blowers and aeration process resides in blower main control panel according to strategy in Section 13441 (Control Loop Descriptions).
   2. From HMI screens operator shall be able to:
      a. Set sequence of blowers.
      b. Set system setpoints.
      c. Start and stop blowers.
      d. Initiate automatic startup.
      e. Monitor all I/O.

2.4 ACCESSORIES

A. Provide all accessories required to furnish a complete PLC control system to accomplish the requirements of the Drawings and Specifications.

2.5 SOURCE QUALITY CONTROL

A. Provide a performance test after factory completion and prior to shipment.
   1. Conduct a test where the system is operated continuously and checked for correct operation including loop controls, displays, printing, keyboard functions, alarm responses, and on/off sequencing control.
   2. Conduct testing with dummy I/Os to verify each control loop operation.
   3. Allow for Owner to witness testing program. Provide minimum of 15 days notice prior to testing.
   4. Do not ship prior to successful completion of this testing program.

2.6 MAINTENANCE MATERIALS

A. Furnish OWNER with the following extra materials:
   1. One spare I/O card of each card type for every 10 cards or fraction thereof installed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install PLC control system in accordance with manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

A. Employ and pay for services of equipment manufacturer's field service representative(s) to:
   1. Inspect equipment covered by these Specifications.
   2. Supervise adjustments and installation checks.
   3. Maintain and submit an accurate daily or weekly log of all commissioning functions.
      a. All commissioning functions may be witnessed by Owner.
      b. All reports shall be cosigned by Contractor and Owner if witnessed.
   4. Conduct startup of equipment and perform operational checks.
   5. Provide Owner with a written statement that manufacturer's equipment has been installed properly, started up, and is ready for operation by Owner's personnel.

3.3 DEMONSTRATION

A. On-Site Training:
   1. Provide employee of the manufacturer or certified representative to provide 2 Days of operating and maintenance training at the Site after the system has successfully undergone all field testing and acceptance procedures.
      a. As a minimum, training shall cover:
         1) Hardware overview.
         2) Software overview.
         3) Program overview.
         4) Maintenance.
         5) Trouble shooting.
         6) Operation, including changing set points, and passwords.

3.4 OPERATION

A. The aeration system shall not be placed in service or operated until the following conditions are met.
   1. Provide written notice to Owner 72 hours prior to the equipment or system startup.
   2. For the replacement PLC, provide PLC register addressing and HMI programming code to the Owner as the Contractor develops and establishes PLC and HMI functionality. Permit the Owner to communicate with any PLC and/or HMI during the development or activation of the project.
   3. Verify that the analog signals for the physical parameters are calibrated to the accuracy specified.

B. The Contractor shall be responsible for providing and installing signal isolation devices as required or as specified.

C. Maintain the analog signal and signal accuracy for the duration of contract completion and during the warranty period.

3.5 DIGITAL INPUT/OUTPUT LIST

A. Blower Building RTU/PLC.
   1. Digital Input:
      a. Pump, PMP 1, Run.
      b. Pump, PMP 1, Fail.
      c. Pump, PMP 1, Auto.
      d. Pump, PMP 2, Run.
      e. Pump, PMP 2, Fail.
      f. Pump, PMP 2, Auto.
      g. Pump, PMP 3, Run.
      h. Pump, PMP 3, Fail.
      i. Pump, PMP 3, Auto.
      j. Pump, PMP 4, Run.
      k. Pump, PMP 4, Fail.
      l. Pump, PMP 4, Auto.
      m. Mixer, M-1A, Run.
      n. Mixer, M-1A, Fail.
      o. Mixer, M-1A, Auto.
      p. Mixer, M-1B, Run.
      q. Mixer, M-1B, Fail.
      r. Mixer, M-1B, Auto.
      s. Mixer, M-1C, Run.
      t. Mixer, M-1C, Fail.
      u. Mixer, M-1C, Auto.
      v. Mixer, M-1D, Run.
      w. Mixer, M-1D, Fail.
      x. Mixer, M-1D, Auto.
      y. Mixer, M-2A, Run.
      z. Mixer, M-2A, Fail.
      aa. Mixer, M-2A, Auto.
      bb. Mixer, M-2B, Run.
      cc. Mixer, M-2B, Fail.
      dd. Mixer, M-2B, Auto.

ee. Mixer, M-2C, Run.
ff. Mixer, M-2C, Fail.
gg. Mixer, M-2C, Auto.
hh. Mixer, M-2D, Run.
ii. Mixer, M-2D, Fail.
jj. Mixer, M-2D, Auto.
kk. Power Fail.

2. Digital Output:
   a. Pump, PMP-1, Start/Stop.
   b. Pump, PMP-2, Start/Stop.
   c. Pump, PMP-3, Start/Stop.
   d. Pump, PMP-4, Start/Stop.
   e. Mixer, M-1A, Start/Stop.
   f. Mixer, M-1B, Start/Stop.
   g. Mixer, M-1C, Start/Stop.
   h. Mixer, M-1D, Start/Stop.
   i. Mixer, M-2A, Start/Stop.
   j. Mixer, M-2B, Start/Stop.
   k. Mixer, M-2C, Start/Stop.
   l. Mixer, M-2D, Start/Stop.
3. Analog Input:
   a. Pump, PMP-1, Speed.
   b. Pump, PMP-2, Speed.
   c. Pump, PMP-3, Speed.
   d. Pump, PMP-4, Speed.
   e. PIT-1, Air Header Pressure.
   f. AIT-1A, Zone 1E DO.
   g. AIT-1B, Zone 1F DO.
   h. AIT-2A, Zone 2E DO.
   i. AIT-2B, Zone 2F DO.
   j. AIT-2C, Basin 2 Nitrate.
4. Analog Output:
   a. Pump, PMP-1, Speed Command.
   b. Pump, PMP-2, Speed Command.
   c. Pump, PMP-3, Speed Command.
   d. Pump, PMP-4, Speed Command.
5. Data links:
   a. Ethernet link from blower main control panel to blower building PLC.
   b. Replace existing data link to SCADA with Ethernet.

B. Blower Main Control Panel, see Section 11081 (High Speed Turbo Aeration Blowers).
1. Digital Input:
   a. MOV-1A, Remote Mode.
   b. MOV-1B, Remote Mode.
   c. MOV-2A, Remote Mode.
   d. MOV-2B, Remote Mode.
2. Digital Output: None.
3. Analog Input:
   a. MOV-1A, Position.

   b. MOV-1B, Position.
   c. MOV-2A, Position.
   d. MOV-2B, Position.
   e. PIT-1, Air Header Pressure.
   f. AIT-1A, Zone 1E DO.
   g. AIT-1B, Zone IF DO.
   h. AIT-2A, Zone 2E DO.
   i. AIT-2B, Zone 2F DO.
4. Analog Output:
   a. MOV-1A, Position Command.
   b. MOV-1B, Position Command.
   c. MOV-1C, Position Command.
   d. MOV-1D, Position Command.
5. Data links:
   a. Ethernet to each blower LCP.
   b. Ethernet to blower building PLC.

3.6 GRAPHIC SCREEN AND INDICATOR LIGHT COLOR SCHEME

Color	Status (Indication/Output)	Operation (Pushbutton/Switch/Input)
Green	Equipment Stopped and Ready/Valve Closed	Stop Equipment
Red	Equipment Running/Valve Open	Start Equipment
Yellow	Alarm/Error	N/A
Blue	Auto Mode	Auto
Orange	Manual/Hand/Local	Manual/Hand/Local
Gray	Locked-out/Failed Condition	N/A
Black	N/A	Reset
White	Test/Analog Data/Discrete Data/Equipment Power Energized	N/A
Purple	Transition	N/A

END OF SECTION

DIVISION 15

MECHANICAL

SECTION 15061

PIPE AND PIPE FITTINGS: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Process piping systems.
   2. Utility piping systems.
   3. Plumbing piping systems.

B. Related Sections:
   1. Section 09905 (Painting and Protective Coatings).
   2. Section 13442 (Primary elements and Transmitters).
   3. Section 15100 (Valves: Basic Requirements).

1.2 REFERENCES

A.	ANSI/AWWA C110/A21.10	Ductile Iron and Gray Iron Fittings, 3 IN through 48 IN for Water and Other Liquids
B.	ANSI/AWWA C151	Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sand-Lined Molds for Water or Other Liquids
C.	ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3 IN Through 16 IN, for Water and Other Liquids
D.	ASTM C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 IN - 144 IN (100 mm through 3600 mm)
E.	ASTM C900	PVC Pipe and Fabricated Fittings 4 IN Through 12 IN
F.	ASTM C905	PVC Pipe and Fittings 14 IN - 48 IN
G.	ASTM D1785	Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
H.	ASTM D2466	Socket Type (PVC) Plastic Pipe Fittings, Schedule 40
I.	ASTM D2467	Socket Type (PVC) Plastic Pipe Fittings, Schedule 80
J.	AWWA C111	Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
K.	AWWA C200	Steel Water Pipe 6 IN and Larger
L.	AWWA C207	Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN
M.	AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
N.	AWWA C606	Grooved and Shouldered Joints

1.3 SYSTEM DESCRIPTION

A. Piping Systems Organization and Definition:
   1. Piping services are grouped into designated systems according to the chemical and physical properties of the fluid conveyed, system pressure, piping size and system materials of construction.
   2. Table A below defines each service classification, its symbol, and the designated system classification number of each service.

TABLE A. PIPING SERVICES		
SYMBOL	SERVICE	SYSTEM
BWW	Backwash Waste	2
LPA	Low Pressure Air	4
ML	Mixed Liquor	1
PI	Primary Influent	3

3. See PIPING SPECIFICATION SCHEDULES in PART 3 of this Section 15061.

1.4 SUBMITTALS

A. Product Data:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Copies of manufacturer's written directions regarding material handling, delivery, storage and installation.
   3. Separate schedule sheet for each piping system scheduled in this Section 15061 showing compliance of all system components. Attach technical product data on gaskets, pipe, fittings, and other components.

B. Shop Drawings:
   1. Fabrication and/or layout drawings:
      a. Exterior yard piping drawings (minimum scale 1 IN equals 10 FT) with information including:
         1) Dimensions of piping lengths.
         2) Invert or centerline elevations of piping crossings.
         3) Acknowledgement of bury depth requirements.
         4) Details of fittings, tapping locations, thrust blocks, restrained joint segments, harnessed joint segments, hydrants, and related appurtenances.
         5) Acknowledge designated valve tag numbers, instrument tag numbers, pipe and line numbers.
         6) Line slopes and vents.
      b. Schedule of interconnections to existing piping and method of connection.

C. Test Reports:
   1. Copies of pressure test results on all piping systems.
   2. Reports defining results of dielectric testing and corrective action taken.
   3. Disinfection test report.
   4. Notification of time and date of piping pressure tests.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe coating during handling using methods recommended by manufacturer. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is not permitted.

B. Prevent damage to pipe during transit. Repair abrasions, scars, and blemishes. If repair of satisfactory quality cannot be achieved, as determined by Owner, replace damaged material immediately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Insulating unions:
      a. "Dielectric" by Epco.
   2. Dirt strainers (Y type):
      a. Mueller (#351).
      b. Sarco.
      c. Armstrong.
      d. Or Approved Equal.
   3. Dry disconnect couplings:
      a. Kamlock.
      b. Or Approved Equal.
   4. Dielectric flange kit:
      a. PSI.
      b. Maloney.
      c. Central Plastics.
      d. Or Approved Equal.
   5. Pipe saddles (for gage installation):
      a. Dresser Style 91 (steel and ductile iron systems).
      b. Dresser Style 194 (non-metallic systems).
      c. Or Approved Equal.

2.2 PIPING SPECIFICATION SCHEDULES

A. Piping system materials, fittings and appurtenances are subject to requirements of specific piping specification schedules located at the end of PART 3 of this Section 15061.

2.3 COMPONENTS AND ACCESSORIES

A. Insulating Components:
   1. Dielectric flange kits:
      a. Flat faced.
      b. 1/8 IN thick dielectric gasket, phenolic, non-asbestos.
      c. Suitable for 175 psi, 210 DegF.
      d. 1/32 IN wall thickness bolt sleeves.
      e. 1/8 IN thick phenolic insulating washers.
   2. Dielectric unions:
      a. Screwed end connections.
      b. Rated at 175 psi, 210 DegF.
      c. Provide dielectric gaskets suitable for continuous operation at union rated temperature and pressure.

B. Dirt Strainers:
   1. Y-type.
   2. Composition bronze.
   3. Rated for test pressure and temperature of system in which they are installed.
   4. 20 mesh monel screen.
   5. Threaded bronze plug in the blowoff outlet.
   6. Threaded NPT end connections.

C. Reducers:
   1. Provide appropriate size reducers and reducing fittings to mate pipe to equipment connections. Connection size requirements may change from those indicated depending on equipment furnished.
D. Protective Coating and Lining:
   1. Include pipe, fittings, and appurtenances where coatings, linings, paint, tests and other items are specified.
   2. Field paint pipe in accordance with Section 09905 (Painting and Protective Coatings).
E. Pressure Gages:
   1. See Section 13442 (Primary Elements and Transmitters).
F. Dry Disconnect Couplings:
   1. Adapters:
      a. Male adapters: As indicated.
      b. Adapters:
         1) Female NPT end connection for sludge and flush applications.
         2) Male NPT end connection for chemical applications.
      c. Construct adapters for sludge applications from cast iron or steel.
      d. Construct adapters for chemical and PVC system applications 3 IN and below from polypropylene. Above 3 IN size, provide stainless steel units.
   2. Couplers:
      a. Built-in valve and spring loaded poppet which close automatically when disconnected.
      b. Designed to remain with only one arm locked in closed position.
      c. Construct couplers for sludge applications fabricated from material utilized for adapters.
      d. Construct couplers for chemical and PVC system applications 3 IN and less from polypropylene with stainless steel arms and pins. Above 3 IN, provide stainless steel units.
      e. Gasket: Compatible with conveyed liquid.
   3. Dust caps: For all adapters.
G. Valves:
   1. See schematics and details for definition of manual valves used in each system under 4 IN in size. See Drawings for valve types 4 IN and above and for automatic valves used in each system.
   2. See Section 15100 (Valves: Basic Requirements).

PART 3 EXECUTION

3.1 GENERAL

A. Coordinate flange dimensions and drillings between piping, valves, and equipment.

3.2 EXPOSED EXTERIOR PIPING INSTALLATION

A. Install piping in vertical and horizontal alignment as indicated.
B. Alignment of piping smaller than 4 IN may not be shown. However, install according to drawing intent and with clearance and allowance for:
   1. Expansion and contraction.
   2. Operation and access to equipment, doors, windows, hoists, moving equipment.
   3. Headroom and walking space for working areas and aisles.

4. System drainage and air removal.

C. Enter and exit through structure walls, floor and ceilings using penetrations and seals as indicated.
D. Install vertical piping runs plumb and horizontal piping runs parallel with structure walls.
E. Pipe Support:
1. Use methods of piping support as indicated.
2. Where pipes run parallel and at same elevation or grade, they may be grouped and supported from common trapeze-type hanger, provided hanger rods are increased in size as specified for total supported weight. The pipe in the group requiring the least maximum distance between supports shall set the distance between trapeze hangers.
3. Size pipe supports with consideration to specific gravity of liquid being piped.

F. Locate and size sleeves and castings required for piping system. Arrange for chases, recesses, inserts or anchors at proper elevation and location.
G. Use reducing fittings throughout piping systems. Bushings will not be allowed unless specifically approved.
H. Unions:
1. Install in position which will permit valve or equipment to be removed without dismantling adjacent piping.
2. Mechanical type couplings may serve as unions.
3. Additional flange unions are not required at flanged connections.

I. Install expansion devices as necessary to allow expansion/contraction movement.
J. Provide full face gaskets on all systems.
K. Anchorage and Blocking:
1. Block, anchor, or harness exposed piping subjected to forces in which joints are installed to prevent separation of joints and transmission of stress into equipment or structural components not designed to resist those stresses.

L. Provide insulating components where dissimilar metals are joined together.
M. Instrument Connections:
1. See drawing details.

3.3 CONNECTIONS WITH EXISTING PIPING

A. Where connection between new work and existing work is made, use suitable and proper fittings to suit conditions encountered.
B. Undertake connections in fashion which will disturb system as little as possible.
C. Provide suitable equipment and facilities to dewater, drain, and dispose of liquid removed without damage to adjacent property.
D. Where connections to existing systems necessitate employment of past installation methods not currently part of trade practice, utilize necessary special piping components.

3.4 ACCESS PROVISIONS

A. Provide access doors or panels in walls, floors, and ceilings to permit access to valves, piping and piping appurtenances requiring service.
B. Size of access panels to allow inspection and removal of items served, minimum 10 x 14 IN size.
C. Fabricate door and frame of minimum 14 GA, stretcher leveled stock, cadmium plated or galvanized after fabrication and fitted with screw driver lock of cam type.
D. Provide with key locks, keyed alike, in public use areas.
E. Provide panels with prime coat of paint.
F. Style and type as required for material in which door installed.

3.5 CATHODIC PROTECTION

A. Isolate, dielectrically, all piping from all other metals including reinforcing bars in concrete slabs, other pipe lines, and miscellaneous metal.
B. Make all connections from wire or cable by Thermit Cadwelding accomplished by operators experienced in this process.
C. Install all cables with a loop and overhead knot around each pipe and slack equal to at least 50 percent of the straight line length.
D. After cadwelding, coat all exposed metallic surfaces with hot applied tape.

3.6 FIELD QUALITY CONTROL

A. Pipe Testing - General:
   1. Test piping systems as follows:
      a. Test exposed, non-insulated piping systems upon completion of system.
      b. Test exposed, insulated piping systems upon completion of system but prior to application of insulation.
      c. Test concealed interior piping systems prior to concealment and, if system is insulated, prior to application of insulation.
   2. Utilize pressures, media and pressure test durations as specified on Piping Specification Schedules.
   3. Isolate equipment which may be damaged by the specified pressure test conditions.
   4. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring equipment to determine leakage rates.
      a. Select each gage so that the specified test pressure falls within the upper half of the gage's range.
      b. Notify the Owner 24 HRS prior to each test.
   5. Completely assemble and test new piping systems prior to connection to existing pipe systems.
   6. Acknowledge satisfactory performance of tests and inspections in writing to Owner prior to final acceptance.
   7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.
B. Pressure Testing:
   1. Testing medium: Unless otherwise specified in the Piping Specification Schedules, utilize the following test media.
      a. Liquid systems:

PIPE LINE SIZE (DIA)	GRAVITY OR PUMPED	SPECIFIED TEST PRESSURE	TESTING MEDIUM
Up to and including 48 IN	Gravity	25 psig or less	Air or water
All sizes	Pumped	250 psig or less	Water

   2. Allowable leakage rates:
      a. All exposed piping systems, all pressure piping systems and all buried, insulated piping systems which are hydrostatically pressure tested shall have zero leakage at the specified test pressure throughout the duration of the test.

b. For low pressure (less than 25 psig) air testing, the acceptable time for loss of 1 psig of air pressure shall be:

PIPE SIZE (IN DIA)	TIME, MINUTES/100 FT
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6

3. Hydrostatic pressure testing methodology:
   a. General:
      1) All joints, including welds, are to be left exposed for examination during the test.
      2) Provide additional temporary supports for piping systems designed for vapor or gas to support the weight of the test water.
      3) Provide temporary restraints for expansion joints for additional pressure load under test.
      4) Isolate equipment in piping system with rated pressure lower than pipe test pressure.
      5) Do not paint or insulate exposed piping until successful performance of pressure test.
   b. Soil, waste, drain and vent systems:
      1) Test at completion of installation of each stack or section of piping by filling system with water and checking joints and fittings for leaks.
      2) Eliminate leaks before proceeding with work or concealing piping.
      3) Minimum test heights shall be 10 FT above highest stack inlet.
4. Air testing methodology:
   a. General:
      1) Ensure air is ambient temperature.
   b. Low pressure air testing:
      1) Place plugs in line and inflate to 25 psig.
      2) Check pneumatic plugs for proper sealing.
      3) Introduce low pressure air into sealed line segment until air pressure reaches 4 psig greater than ground water that may be over the pipe.
         (a) Use test gage conforming to ANSI B40.1 with 0 to 15 psi scale and accuracy of 1 percent of full range.
      4) Allow 2 minutes for air pressure to stabilize.
      5) After stabilization period (3.5 psig, minimum pressure in pipe) discontinue air supply to line segment.
      6) Record pressure at beginning and end of test.

C. Dielectric Testing Methods and Criteria:
   1. Provide electrical check between metallic non-ferrous pipe or appurtenances and ferrous elements of construction to assure discontinuity has been maintained.

2. Wherever electrical contact is demonstrated by such test, locate the point or points of continuity and correct the condition.

3.7 CLEANING, DISINFECTION AND PURGING

A. Cleaning:
   1. Clean interior of piping systems thoroughly before installing.
   2. Maintain pipe in clean condition during installation.
   3. Before jointing piping, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
   4. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system.
   5. At completion of work and prior to Final Acceptance, thoroughly clean work installed under these Specifications. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sludge which may have accumulated by operation of system, from testing, or from other causes. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner.

3.8 SCHEDULES

A. PIPING SPECIFICATION SCHEDULE - SYSTEM 1
   1. General:
      a. Piping symbol and service:
         1) ML - Mixed Liquor.
      b. Test requirements:
         1) Test medium: Water.
         2) Pressure: 30 psig.
         3) Duration: 6 HRS.
      c. Gaskets and O-rings:
         1) O-rings: Neoprene or rubber.
   2. System components:
      a. Pipe size: 3 through 24 IN.
         1) Exposed service and piping in aeration basins:
            (a) Material: Steel, fabricated pipe.
            (b) Reference: AWWA C200.
            (c) Lining: Fusion bonded epoxy.
            (d) Coating: Fusion bonded epoxy.
            (e) Fittings: AWWA C208.
            (f) Joints:
               (i) Flanged.
               (ii) Compression sleeve coupling (fusion bonded epoxy coated).
               (iii) No field welding of joints.

B. PIPING SPECIFICATION SCHEDULE - SYSTEM 2
   1. General:
      a. Piping symbol and service:
         1) BWW - Backwash Waste.
      b. Test requirements:
         1) Test medium: Water.
         2) Pressure: 25 psig.
         3) Duration 6 HRS.

c. Gaskets:
1) Flanged, push-on, and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.

2. System components:
a. Pipe size 3 IN through 48 IN:
1) Exposed service:
(a) Material:
(i) Flanged: Ductile iron, Class 150.
(ii) Grooved type joint system: Use pipe thickness per AWWA C606.
(b) Reference: AWWA/ANSI C115/A21.15.
(c) Lining: Cement.
(d) Coating: Paint.
(e) Fittings: Either AWWA/ANSI C110/A21.10 ductile or gray iron.
(f) Joints: AWWA/ANSI C115/A21.15 flanged joints with flanges at valves and structure penetrations.

C. SPECIFICATION SCHEDULE - SYSTEM 3
1. General:
a. Piping symbol and service:
1) PI - Primary Influent.
b. Test requirements:
1) Test medium: Water.
2) Pressure 125 psig.
3) Duration: 6 HRS.
c. Gaskets:
1) Flanged, push-on and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.
2) Grooved coupling joints (ductile): Rubber, AWWA C606.

2. System components:
a. Pipe size 3 IN through 24 IN:
1) Exposed service:
(a) Material:
(i) Flanged: Ductile iron, Class 150.
(ii) Grooved type joint system: Use pipe thickness per AWWA C606.
(b) Reference: AWWA/ANSI C115/A21.15.
(c) Lining: Cement.
(d) Coating: Paint.
(e) Fittings: Either AWWA/ANSI C110/A21.10 ductile or gray iron.
(f) Joints:
(i) Flanged or grooved type mechanical coupling (AWWA C606) joints.
(ii) With both systems, provide screwed-on flanges at equipment, valves and structure penetrations.

D. SPECIFICATION SCHEDULE - SYSTEM 4
1. General:
a. Piping symbol and service:
1) LPA - Low Pressure Air.
b. Test requirements:
1) Test medium: Air.
2) Pressure: 20 psig.

3) Duration: 6 HRS.

c. Gaskets and O-rings:
   1) O-rings and flanged joints: Neoprene, 250DegF.

d. Temperature:
   1) Normal: 70 DegF.
   2) Maximum: 120 DegF.

2. System components:
   a. Pipe size through 2 IN:
      1) Exposed service:
         (a) Material: Stainless steel 304L, Schedule 40.
         (b) Reference: ASTM A778.
         (c) Lining: None.
         (d) Coating: None.
         (e) Fittings: Seamless steel 304L meeting ASTM A774.
         (f) Joints:
            (i) Butt welded with unions at equipment and valves.
            (ii) Harnessed compression sleeve couplings where indicated on drawings.

   b. Pipe size above 2 IN:
      1) Exposed service (including Blower Building interior):
         (a) Material: Stainless steel 304L, Schedule 10.
         (b) Reference: ASTM A778.
         (c) Lining: None.
         (d) Coating: None.
         (e) Fittings: Seamless steel 304L meeting ASTM A774.
         (f) Joints:
            (i) Butt welded with flanges at equipment and valves.
            (ii) Harnessed compression sleeve couplings where indicated on drawings.

3. Aeration equipment:
   a. See Specification Section 11088 (Aeration Equipment: Fine Bubble Type) and Section 11089 (Aeration Equipment: Coarse Bubble Type) for limits of responsibility and materials specification.

END OF SECTION

SECTION 15062

PIPE: STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel pipe, fittings, and appurtenances.
B. Related Sections:
   1. Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

1.2 REFERENCES

A.	ANSI B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
B.	ANSI B2.1	Gages and Gaging for Unified Inch Screw Threads
C.	ANSI B16.3	Malleable Iron Threaded Fittings
D.	ANSI B16.5	Pipe Flanges and Flanged Fittings
E.	ANSI B16.9	Factory-Made Wrought Steel Butt-Welding Fittings
F.	ANSI B16.11	Forged Steel Fittings, Socket Welding and Threaded
G.	ANSI B31.1	Power Piping
H.	ANSI B31.3	Chemical Plant and Petroleum Refinery Piping
I.	ANSI B31.9	Building Services Piping
J.	ASTM A36	Standard Specification for Carbon Structural Steel
K.	ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
L.	ASTM A181	Standard Specification for Forgings, Carbon Steel, for General-Purpose Piping
M.	ASTM A234	Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
N.	ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates
O.	ASTM A570	Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
P.	ASTM A572	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
Q.	ASTM B695	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
R.	AWWA C200	Steel Water Pipe 6 IN and Larger
S.	AWWA C203	Coat Tar Protective Coatings and Linings for Steel water Pipeline - Enamel and Tape - Hot Applied
T.	AWWA C206	Field Welding of Steel Water Pipe
U.	AWWA C207	Steel Pipe Flanges for Waterworks Service, Sizes 4 IN through 144 IN
V.	AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
W.	AWWA C213	Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
X.	AWWA C606	Grooved and Shouldered Joints
Y.	AWWA Manual M11	Steel Pipe - A Guide for Design and Installation

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 15061 (Pipe and Pipe Fittings: Basic Requirements).
   2. Factory test reports.
   3. If mechanical grooved type coupling system is used, submit piping, fittings, and appurtenant items which will be utilized.
   4. Coating manufacturer's qualifications.
   5. Welders certificates.

B. Quality Assurance:
   1. Qualifications:
      a. Application of lining and coating materials including preparation of surfaces, priming, and lining and coating of pipe, fittings, and specials, in shop, repairs of any damage to lining or coating occurring during shipment or any other time, and field lining and coating of ends where linings or coatings have been held back for welded field joints, shall be done by established and recognized pipe company acceptable to Owner.
      b. Use only certified welders meeting procedures and performance outlined in Section 9 of the ASME, Section 3.3.3 of AWWA C200.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Flanged adaptors:
      a. Smith-Blair (Style 913 (steel)).
      b. Dresser (Style 128 (steel)).
      c. Or Approved Equal.
   2. Insulating couplings:
      a. Smith-Blair (Style 416).
      b. Dresser (Style 39).
      c. Or Approved Equal.
   3. Reducing couplings:
      a. Smith-Blair (Style 415).
      b. Dresser (Style 62).
      c. Or Approved Equal.
   4. Transition coupling:
      a. Smith-Blair (Style 413).
      b. Dresser (Style 62).
      c. Or Approved Equal.
   5. Compression sleeve coupling:
      a. Smith-Blair (Style 411 (steel)).
      b. Dresser (Style 38 (steel)).
      c. Or Approved Equal.
   6. Mechanical couplings and fittings:
      a. Victaulic (Style 07 or 77).
      b. S.P. Fittings.
      c. Or Approved Equal.

7. Factory-applied plastic or epoxy coatings:
   a. "Encoat" Division of Energy Coating Company.
   b. "Scotchkote" Division of 3M Company.
   c. Or Approved Equal.

2.2 MATERIALS

A. All materials used in steel piping systems defined in Section 15061 (Pipe and Pipe Fittings: Basic Requirements), shall meet or exceed pressure test requirements specified for each respective system.
B. Steel Pipe (Fabricated Type):
   1. AWWA C200:
      a. ASTM A36, Grade C Steel Plate.
      b. ASTM A283, Grade D Steel Plate.
      c. ASTM A570, Steel Sheet.
      d. ASTM A572, Steel Plate.
C. Steel Pipe (Mill Type):
   1. ASTM A53, Type E or S.
D. Fittings (For Fabricated Pipe):
   1. AWWA C208.
E. Fittings (For Mill Type Pipe):
   1. ASTM A234.
   2. ANSI B16.3.
   3. ANSI B16.5.
   4. ANSI B16.9.
   5. ANSI B16.11.
F. Flanges (Fabricated Pipe):
   1. Flange material: ASTM A283, Grade C or D, ASTM A181 Grade 1.
   2. Flange finish: Flat faced.
G. Flanges (Mill Type Pipe):
   1. ANSI B16.5.
   2. Flat faced.
   3. Slip-on flanges.
H. Nuts and Bolts:
   1. Mechanical galvanized ASTM B695, Class 40.
   2. Heads and dimensions per ANSI B1.1.
   3. Threaded per ANSI B1.1.
   4. Project ends 1/4 to 1/2 IN beyond nuts.
I. Gaskets: See individual piping systems in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

2.3 MANUFACTURED UNITS

A. Couplings:
   1. Flanged adaptors:
      a. Steel or carbon steel body sleeve, flange, followers and Grade 30 rubber gaskets.
      b. Flanges meeting standards of adjoining flanges.
      c. Entire assembly to be rated for test pressure specified on Piping Schedule for each respective application.
   2. Compression sleeve coupling:
      a. Steel sleeve, followers Grade 30 and rubber gaskets.

b. Flanges meeting standards of adjoining flanges.
c. Entire assembly to be rated for test pressure specified on Piping Schedule for each respective application.
d. Provide field coating for buried couplings per AWWA C203.

3. Mechanical coupling joint:
   a. Use of mechanical grooved (AWWA C606) type couplings and fittings in lieu of flanged joints is acceptable where specifically specified in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

2.4 FABRICATION

A. Provide piping (mill or fabricated) for use in this Project with minimum wall thicknesses as follows:
   1. 1/8 - 5 IN DIA pipe: Schedule 40.
   2. 6 - 10 IN DIA pipe: 3/16 IN.
   3. 12 - 14 IN DIA pipe: 7/32 IN.
   4. 16 - 48 IN DIA pipe: 1/4 IN.
   5. Sizes through 24 IN are nominal OD. Sizes greater than 24 are ID.
   6. Wall thicknesses indicated are for standard weight pipe. Design pipe in accordance with operating pressures shown in Piping Schedules for a design stress limited to 50 percent of yield.

B. Furnish cast parts with lacquer finish compatible with finish coating.

C. Furnish without outside coating of bituminous material any exposed pipe scheduled to be painted.

D. Fabricated Fittings:
   1. AWWA C208.
   2. Ensure ratio of radius of bend to diameter of pipe equal to or greater than 1.0.

E. Taper cement mortar linings as required for valve interfacing.

F. Protective Coatings and Linings:
   1. Fusion bonded epoxy lined and coated in accordance with AWWA C213.
   2. Fusion bonded epoxy lining and coating required on all fittings.
   3. No field cutting and repair of fusion bonded epoxy lined and coated steel pipe is allowed.

2.5 SOURCE QUALITY CONTROL

A. Testing:
   1. Shop hydrostatic test fabricated steel pipe and fittings.
   2. Field hydrostatic test all pipe as specified in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Joining Methods - Flanges:
   1. Facing method:
      a. Insert slip-on flange on pipe.
      b. Ensure maximum tolerances for flange faces from normal with respect to axis of pipe is 0.005 IN per foot of flange diameter.

c. Test flanges after welding to pipe for true to face condition and reface, if necessary, to bring to specified tolerance.

2. Joining method:
   a. Leave 1/8 to 3/8 IN of flange bolts projecting beyond face of nut after tightening.
   b. Coordinate dimensions and drillings of flanges with flanges for valves, reservoir, and other interconnecting piping systems.
   c. When bolting flange joints, exercise extreme care to assure that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket compression or cause unnecessary stress, bending or torsional strains being applied to cast flanges or flanged fittings. Allow one flange free movement in any direction while bolts are being tightened.
   d. Do not assemble adjoining flexible coupled, mechanical coupled or welded joints until flanged joints in piping system have been tightened.
   e. Gradually tighten flange bolts uniformly to permit even gasket compression.
   f. Do not overstress bolts to compensate for poor installation.

C. Joining Method - Welded Joints:
   1. Perform welding in accordance with AWWA C206 and this Section 15062.
   2. For flange attachment perform in accordance with AWWA C207.
   3. Have each welding operator affix an assigned symbol to all his welds. Mark each longitudinal joint at the extent of each operator's welding. Mark each circumferential joint, nozzle, or other weld into places 180 degrees apart.
   4. Welding for all process piping shall conform with ANSI B31.3. Welding of utility piping 125 psi and less shall be welded per ANSI B31.9. Utility piping above 125 psi shall conform to ANSI B31.1.
   5. Provide caps, tees, elbows, reducers, etc. manufactured for welded applications.
   6. Weldolets may be used for 5 IN and larger pipe provided all slag is removed from inside the pipe.
   7. Weld-in nozzles may be used for branch connections to mains and where approved by Owner.
   8. Use all long radius welding elbows for expansion loops and bends.
   9. Use long radius reducing welding elbows 90 degree bends and size changes are required.

D. Joining Method-Couplings:
   1. Compression sleeve:
      a. Install coupling to allow space of not less than 1/4 IN but not more than 1 IN.
      b. Provide harnessed joint. Use joint harness arrangements detailed in AWWA M11.
      c. Design harness assembly with adequate number of tie rods for test pressures indicated in Section 15061 (Pipe and Pipe Fittings: Basic Requirements) and allow for expansion of pipe.
      d. Provide ends to be joined or fitted with compression sleeve couplings of the plain end type.
      e. Grind smooth welds the length of one coupling on either side of joint to be fitted with any coupling.
      f. Ensure that outside diameter and out-of-round tolerances are within limits required by coupling manufacturer.
   2. Mechanical coupling:
      a. Arrange piping so that pipe ends are in full contact.

b. Groove and shoulder ends of piping in accordance with manufacturer's recommendations.
c. Provide coupling and grooving technique assuring a connection which passes pressure testing requirements.

E. Joining Method-Threaded and Coupled (T/C):
1. Provide T/C end conditions that meet ANSI B2.1 requirements.
2. Furnish pipe with factory-made T/C ends.
3. Field cut additional threads full and clean with sharp dies.
4. Leave not more than three pipe threads exposed at each branch connection.
5. Ream ends of pipe after threading and before assembly to remove burrs.
6. Use teflon thread tape on male thread in mating joints.

F. Support exposed piping in accordance with Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

G. Install buried piping per Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

3.2 FIELD QUALITY CONTROL

A. Test piping systems in accordance with Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

END OF SECTION

SECTION 15063

PIPE: DUCTILE IRON

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ductile iron piping, fittings, and appurtenances.
B. Related Sections:
   1. Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

1.2 REFERENCES

A.	ANSI B1.1	Standard for Unified Coarse Thread
B.	ASTM B265	Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate
C.	ASTM B695	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
D.	ASTM C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
E.	AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
F.	AWWA C110	Standard for Ductile-Iron and Gray-Iron Fittings
G.	AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
H.	AWWA C115	Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
I.	AWWA C150	Standard for Thickness Design of Ductile-Iron Pipe
J.	AWWA C151	Standard for Ductile-Iron Pipe, Centrifugally Cast
K.	AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines--Enamel and Tape--Hot-Applied
L.	AWWA C606	Grooved and Shouldered Joints

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 15062 (Pipe and Pipe Fittings: Basic Requirements).
   2. Certification of factory hydrostatic testing.
   3. If mechanical coupling system is used, submit piping, fittings, and appurtenant items which will be utilized to meet system requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents the following manufacturers are acceptable:
   1. Flanged adapters:
      a. Smith-Blair (Style 912 (cast)).
      b. Dresser (Style 127 (cast)).
      c. Or Approved Equal.

2. Compression sleeve coupling:
   a. Smith-Blair (Style 441 (cast)).
   b. Dresser (Style 153 (cast)).
   c. Or Approved Equal.
3. Mechanical coupling:
   a. Victaulic (Style 31).
   b. Tyler.
   c. Or Approved Equal.
4. Insulating couplings:
   a. Smith-Blair (Style 416).
   b. Dresser (Style 39).
   c. Or Approved Equal.
5. Reducing couplings:
   a. Smith-Blair (Style 415).
   b. Dresser (Style 62).
   c. Or Approved Equal.
6. Transition coupling:
   a. Smith-Blair (Style 413).
   b. Dresser (Style 62).
   c. Or Approved Equal.
7. Polyethylene encasement tape:
   a. Chase (Chasekote 750).
   b. Kendall (Polyken 900).
   c. 3 M (Scotchrap 50).
   d. Or Approved Equal.
8. Restrained joints:
   a. American (Lock Fast) - 12 IN and below.
   b. US Pipe (TR-Flex) - 4 IN to 54 IN.
   c. American (Lock Fast) - Above 12 IN.
   d. EBAA Iron Inc. (Megalug) - 3 IN - 48 IN.
   e. Or Approved Equal.

2.2 MATERIALS

A. Ductile Iron Pipe:
   1. AWWA C115.
   2. AWWA C150.
   3. AWWA C151.
B. Fittings and Flanges:
   1. AWWA C110.
   2. AWWA C115.
   3. Flanges drilled and faced per ANSI B16.1 for both 125 and 250 psi applications.
C. Nuts and Bolts:
   1. Mechanical galvanized ASTM B695, Class 40.
   2. Heads and dimensions per ANSI B1.1.
   3. Threaded per ANSI B1.1.
   4. Project ends 1/4 to 1/2 IN beyond nuts.
D. Gaskets: See individual piping system requirements in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

E. If mechanical coupling system is used, utilize pipe thickness and grade in accordance with AWWA C606.
F. Polyethylene Encasement: See AWWA C105.
G. See Piping Schedules in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

2.3 MANUFACTURED UNITS

A. Couplings:
   1. Flanged adapters:
      a. Unit consisting of steel or carbon steel body sleeve, flange, followers, Grade 30 rubber gaskets.
      b. Supply flanges meeting standards of adjoining flanges.
      c. Rate entire assembly for test pressure specified on piping schedule for each respective application.
   2. Compression sleeve coupling:
      a. Unit consisting of steel sleeve, followers, Grade 30 rubber gaskets.
      b. Supply flanges meeting standards of adjoining flanges.
      c. Entire assembly to be rated for test pressure specified on piping schedule for each respective application.
      d. Provide field coating for buried couplings per AWWA C203.
   3. Mechanical couplings:
      a. Use of mechanical couplings and fittings in lieu of flanged joints is acceptable where specifically specified in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

2.4 FABRICATION

A. Provide without outside coatings of bituminous material any exposed pipe scheduled to be painted.
B. Furnish cast parts with lacquer finish compatible with finish coat.

2.5 LININGS AND COATINGS

A. Where specified in piping schedule, provide linings and coatings as follows:
   1. Interior coating:
      a. Cement mortar lining per AWWA C104.
   2. Outside coatings:
      a. Buried piping: Bituminous with polyethylene encasement.
      b. Exposed: Paint per Section 09905 (Painting and Protective Coverings).
      c. Provide an outside pipe coating of bituminous material approximately one mil thick except for exposed pipe scheduled to be painted.
         1) Ensure that final coating is continuous and smooth, neither brittle when cold nor sticky when exposed to sunlight, and strongly adherent to pipe at all temperatures.
            (a) Special coatings:
               (i) Provide any exposed pipe scheduled to be painted without outside coatings of bituminous material.
               (ii) Where required, install polyethylene encasement in compliance with ANSI A21.5 (AWWA C105).

2.6 SOURCE QUALITY CONTROL

A. Factory Test:
   1. Subject pipe to hydrostatic test of not less than 500 psi with the pipe under the full test pressure for at least 10 seconds.

PART 3 EXECUTION

3.1 INSTALLATION

A. Joining Method - Push-On Mechanical (Gland-Type) Joints:
   1. Install in accordance with AWWA C111.
   2. Assemble mechanical joints carefully according to manufacturer's recommendations.
   3. If effective sealing is not obtained, disassemble, thoroughly clean, and reassemble the joint.
   4. Do not overstress bolts.
   5. Where piping utilizes mechanical joints with tie rods, align joint holes to permit installation of harness bolts.
B. Joining Method - Push-On Joints:
   1. Install in accordance with AWWA C151.
   2. Assemble push-on joints in accordance with manufacturer's directions.
   3. Bevel and lubricate spigot end of pipe to facilitate assembly without damage to gasket. Use lubricant that is non-toxic, does not support the growth of bacteria, has no deteriorating effects on the gasket material, and imparts no taste or odor to water in pipe.
   4. Ensure the gasket groove is thoroughly clean.
   5. For cold weather installation, warm gasket prior to placement in bell.
   6. Taper of bevel shall be approximately 30 degrees with centerline of pipe and approximately 1/4 IN back.
C. Joining Method - Flanged Joints:
   1. Install in accordance with AWWA C115.
   2. Extend pipe completely through screwed-on flanged and machine flange face and pipe in single operation.
   3. Make flange faces flat and perpendicular to pipe centerline.
   4. When bolting flange joints, exercise extreme care to ensure that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress, bending or torsional strains to be applied to cast flanges or flanged fittings.
   5. Allow one flange free movement in any direction while bolts are being tightened.
   6. Do not assemble adjoining flexible joints until flanged joints in piping system have been tightened.
   7. Gradually tighten flange bolts uniformly to permit even gasket compression.
D. Joining Method - Mechanical Coupling Joint:
   1. Arrange piping so that pipe ends are in full contact.
   2. Groove and shoulder ends of piping in accordance with manufacturer's recommendations.
   3. Provide coupling and grooving technique ensuring a connection which passes pressure testing requirements.
E. Flange Adapters 12 IN and Less:
   1. Locate and drill holes for anchor studs after pipe is in place and bolted tight.

2. Drill holes not more than 1/8 IN larger than diameter of stud projection.

F. Cutting:
1. Do not damage interior lining material during cutting.
2. Use abrasive wheel cutters or saws.
3. Make square cuts.
4. Bevel and free cut ends of sharp edges after cutting.

G. Support exposed pipe in accordance with Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

H. Install buried piping in accordance with Sections 15061 (Pipe and Pipe Fittings: Basic Requirements).

I. Install restrained joint systems where specified in Section 15061 (Pipe and Pipe Fittings: Basic Requirements) under specific piping system.

3.2 FIELD QUALITY CONTROL

A. Test piping systems in accordance with Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

END OF SECTION

SECTION 15064

PIPE: PLASTIC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic pipe.
B. Related Sections:
   1. Section 09905 (Painting and Protective Coatings).
   2. Section 15061 (Pipe and Pipe fittings: Basic Requirements).

1.2 REFERENCES

A.	ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe
B.	ASTM D2241	(PVC) Plastic Pipe (SDR-PR and Class T)
C.	ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
D.	ASTM D2564	Solvent Cements for (PVC) Plastic Pipe, Tubing, and Fittings
E.	ASTM D2665	(PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
F.	ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
G.	ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
H.	ASTM D3212	Standard Specification for Joints to Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
I.	ASTM F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs
J.	ASTM F679	Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
K.	ASTM F794	Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
L.	AWWA C900	Polyvinyl Chloride (PVC) pressure pipe 4 through 12 IN for Water
M.	AWWA C905	Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameter 14 IN through 36 IN

1.3 SUBMITTALS

A. See Section 15061 (Pipe and Pipe Fittings: Basic Requirements).
B. Quality Assurance:
   1. See Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

PART 2 PRODUCTS

2.1 PVC DRAINAGE, SEWER PIPING AND UNDERGROUND AIR DUCTS

A. Materials: Furnish materials in full compliance to the following material specification. PVC pipe shall be rigid, unplasticized polyvinyl chloride (PVC) made of PVC plastic having a cell classification of 12454-B or 12454-C as described in specification ASTM D1784. The requirements of this Section 15064 are intended to provide for pipe and fittings suitable for non-pressure drainage of wastewater and surface water. Joining systems shall consist of an elastomeric gasket joint meeting requirements of ASTM D3212.
   1. Supply to Owner all information and sample of joining method for his evaluation. Only jointing methods acceptable to Owner will be permitted.
   2. Provide pipe and fittings meeting or exceeding the following requirements:
      a. 4-27 IN DIA - ASTM D3034 and F679, SDR 35.
      b. 8-30 IN DIA - ASTM F794.
   3. Ensure impact strengths and pipe stiffnesses in full compliance to this Section 15064.

B. Infiltration and Exfiltration: The maximum allowable infiltration measured by test shall not exceed 100 GAL per inch of pipe diameter per mile per 24 HRS. For exfiltration all the pipe and fittings shall exceed performance requirements by an air test procedure as specified in Section 15061 (Pipe and Pipe Fittings: Basic Requirements).
   1. Observe full instructions of Owner for carrying of testing procedures. Perform tests only during presence of Owner.
   2. Should any test on any section of pipe line disclose either infiltration rates greater than allowed or disclose air loss rate greater than that permitted, locate and repair the defective joints or pipes at no cost to Owner and retest until requirements stated are met.

PART 3 EXECUTION

3.1 IDENTIFICATION

A. Identify each length of pipe clearly at intervals of 5 FT or less. Include manufacturer's name and trademark. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications, and "NSF" approvals when applicable.

3.2 INSTALLATION

A. Installation: Install pipe and fittings in accordance with ASTM D2321 and as recommended by the manufacturer.
   1. Provide for a maximum deflection of not more than 5 percent.

B. Deflection: After backfilling, each section of pipe shall be checked for deflection by pulling a mandrel through the pipe. Pipe with deflection exceeding 5 percent of the inside diameter shall have backfill removed and replaced to provide a deflection of less than 5 percent. Any repaired pipe shall be retested.

END OF SECTION

SECTION 15090

PIPE SUPPORT SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe support and anchor systems.

1.2 REFERENCES

A.	ANVIL	ANVIL International
B.	ASME B31.1	Power Piping
C.	ASME B31.3 Piping	Process Piping
D.	ASTM A36	Standard Specification for Carbon Structural Steel
E.	ASTM A510	Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
F.	ASTM A575	Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
G.	ASTM A576	Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
H.	AWS D1.1	Structural Welding Code - Steel
I.	MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture
J.	MSS SP-69	Pipe Hangers and Supports - Selection and Application

1.3 SUBMITTALS

A. Product technical data including:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Manufacturer's installation instructions.
   3. Itemized list of wall sleeves, anchors, support devices and all other items related to pipe support system.
   4. Scale drawings showing guides, hangers, supports, anchors, structural members and appurtenances to describe the pipe support system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

2.2 MANUFACTURED UNITS

A. Hanger Rods:
   1. Material:
      a. Type 316 stainless steel.
   2. Continuously threaded.
   3. Load limit:

NOMINAL ROD DIAMETER	MAXIMUM SAFE LOAD, (LBS)
3/8 IN DIA (min)	610
1/2 IN DIA	1,130
5/8 IN DIA	1,810
3/4 IN DIA	2,710
7/8 IN DIA	3,770
1 IN DIA	4,960

B. Hangers:
   1. Hangers for use directly on copper pipe: Copper or cadmium plated.
   2. Hangers for use other than directly on copper pipe: Type 316 stainless steel.
C. Trapeze Hangers for Suspended Piping:
   1. Material: Type 316 stainless steel.
   2. Angles, channels, or other structural shapes.
   3. Curved roller surfaces at support point corresponding with type of hanger required.
D. Pipe Support Saddle:
   1. As indicated.
E. Wall Brackets:
   1. For pipe located near walls and 8 FT or more above floor elevation or as otherwise indicated on the Drawings.
   2. As indicated.
F. Seismic Restraints:
   1. Stainless steel aircraft cables or steel angles or channels.
   2. Stainless steel aircraft cables shall be prestretched to establish a certified minimum modulus of elasticity.
      a. Cable restraints shall be designed to resist seismic tension loads and steel restraints shall be designed to resist both tension and compression loads with a minimum safety factor of 2.
   3. Restraint and connections shall be stainless steel assemblies that swivel to the final installation angle.
   4. Do not mix cable and stainless steel angle restraints to brace the same system.
   5. Stainless steel angles shall be clamped to the threaded hanger rods at the seismic sway restraint locations utilizing a minimum of two (2) ductile iron clamps.
   6. Transverse bracing shall be provided at 40 FT-0 IN maximum spacing unless noted otherwise.
   7. Longitudinal bracing shall be provided at 80 FT-0 IN maximum spacing unless noted otherwise.
   8. At vertical pipe risers, wherever possible, support the weight of the riser at a point or points above the center of gravity of the riser.
      a. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 30 FT-0 IN OC.

2.3 DESIGN REQUIREMENTS

A. Supports capable of supporting the pipe for all service and testing conditions.
   1. Provide 5 to 1 safety factor.

B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.
C. Design supports and hangers to allow for proper pitch of pipes.
D. Check all physical clearances between piping, support system and structure.
   1. Provide for vertical adjustment after erection.
E. Support vertical pipe runs in pipe chases at base of riser.
   1. Support pipes for lateral movement with clamps or brackets.
F. Place hangers on outside of pipe insulation.
   1. Use a pipe covering protection saddle for insulated pipe at support point.
   2. Insulated piping 1-1/2 IN and less: Provide a 9 IN length of 9 LB density fiberglass insulation at saddle.
   3. Insulated piping over 1-1/2 IN: Provide a 12 IN length of 9 LB density fiberglass insulation on saddle.
G. Pipe Support Spacing:
   1. General:
      a. Factor loads by specific weight of liquid conveyed if specific weight is greater than water.
      b. Locate pipe supports at maximum spacing scheduled unless indicated otherwise on the Drawings.
      c. Provide at least one (1) support for each length of pipe at each change of direction and at each valve.
   2. Steel, stainless steel, cast-iron pipe support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
1-1/2 and less	5
2 thru 4	10
5 thru 8	15
10 and greater	20

   3. Copper pipe support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
2-1/2 and less	5
3 thru 6	10
8 and greater	15

   4. PVC pipe support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
1-1/4 and less	3
1-1/2 thru 3	4
4 and greater	5

* Maximum fluid temperature of 120 DegF.

5. Support each length and every fitting:
    a. Bell and spigot piping:
        1) At least one (1) hanger.
        2) Applied at bell.
    b. Mechanical coupling joints:
        1) Place hanger within 2 FT of each side of fittings to keep pipes in alignment.
6. Space supports for soil and waste pipe and other piping systems not included above every 5 FT.
7. Provide continuous support for nylon tubing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide piping systems exhibiting pulsation, vibration, swaying, or impact with suitable constraints to correct the condition.
    1. Included in this requirement are movements from:
        a. Trap discharge.
        b. Water hammer.
        c. Similar internal forces.
B. Seismic Restraints:
    1. Provide seismic restraints on all piping with the exception of the following:
        a. Piping less than 1 IN DIA when used for gas and compressed air.
        b. Piping less than 2-1/2 IN DIA for all other cases.
        c. Piping suspended by individual hangers where the distance from the top of the pipe to the bottom of the support for the hanger is 12 IN or less.
        d. Fuel gas piping shall have transverse bracing 20 FT-0 IN OC maximum and longitudinal bracing 40 FT-0 IN OC maximum.
        e. These restraints shall be capable of resisting seismic loads as defined in the California Building Code.
C. Weld Supports:
    1. AWS D1.1.
    2. Weld anchors to pipe in accordance with ASME B31.3.
D. Locate piping and pipe supports as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.
E. Inspect hangers for:
    1. Design offset.
    2. Adequacy of clearance for piping and supports in the hot and cold positions.
    3. Guides to permit movement without binding.
    4. Adequacy of anchors.
F. Inspect hangers after erection of piping systems and prior to pipe testing and flushing.
G. Install individual or continuous slot concrete inserts for use with hangers for piping and equipment.
    1. Install concrete inserts as concrete forms are installed.
H. Welding:
    1. Welding rods: ASTM and AWS standards.
    2. Integral attachments:
        a. Include welded-on ears, shoes, plates and angle clips.

b. Ensure material for integral attachments is of good weldable quality.

3. Preheating, welding and postheat treating: ASME B31.3, Chapter V.

I. Field Painting:

1. Comply with Section 09905 (Painting and Protective Coatings).

END OF SECTION

SECTION 15100

VALVES: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Valving, actuators, and valving appurtenances.
B. Related Sections:
   1. Section 09905 (Painting and Protective Coatings).
   2. Section 15061 (Pipe and Pipe Fittings: Basic Requirements).

1.2 REFERENCES

A.	ANSI B1.20.1	Pipe Threads, General Purpose
B.	ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings
C.	ANSI B16.18	Cast Copper Alloy Solder Joint Pressure Fittings
D.	ANSI B6.34	Valves-Flanged, Threaded and Welding End
E.	AWWA C111	Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
F.	AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN
G.	AWWA C500	Gate Valves for Water and Sewerage Systems
H.	AWWA C504	Rubber-Seated Butterfly Valves
I.	AWWA C507	Ball Valves, 6 IN through 48 IN (150 MM through 1200 MM)
J.	AWWA C509	Resilient-Seated Gate Valves 3 through 12 NPS, for Water and Sewage Systems
K.	AWWA C540	Power-Actuating Devices for Valves and Sluice Gates
L.	AWWA C550	Protective Epoxy Interior Coatings for Valves and Hydrants
M.	AWWA C606	Grooved and Shouldered Joints
N.	AWWA D648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load
O.	ASTM D256	Standard Test Method for Determining the Izod Pendulum Impact Resistance Of Plastics
P.	ASTM D638	Standard Test Method for Tensile Properties of Plastics
Q.	ASTM D648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
R.	ASTM D695	Standard Test Method for Compressive Properties of Rigid Plastics
S.	ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
T.	MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

1.3 DEFINITIONS

A. The following are definitions of abbreviations used in this section or one of the individual valve sections.
   1. CWP: Cold water working pressure.
   2. SWP: Steam working pressure.

3. WOG: Water, oil, gas working pressure.
4. WWP: Water working pressure.

1.4 SUBMITTALS

A. Shop Drawings:
1. Product technical data including:
   a. Acknowledgement that products submitted meet requirements of standards referenced.
   b. Manufacturer's installation instructions.
   c. Valve pressure and temperature rating.
   d. Valve material of construction.
   e. Special linings.
   f. Valve dimensions and weight.
   g. Valve flow coefficient.
   h. Wiring and control diagrams for electric or cylinder actuators.
2. Test reports.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Refer to individual valve specification sections.

2.2 MATERIALS

A. Refer to individual valve specification sections.

2.3 VALVE ACTUATORS

A. Valve Actuators - General:
1. Provide actuators as indicated or specified.
2. Counter clockwise opening as viewed from the top.
3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum pressure rating of the valve provided and withstand without damage a pull of 200 LB on handwheel or chainwheel or 300 foot-pounds torque on the operating nut.
5. Unless otherwise specified, actuators for valves to be buried, submerged or installed in vaults or manholes shall be sealed to withstand at least 20 FT of submergence.
6. Extension Stem:
   a. Install where indicated or specified.
   b. Solid steel with actuator key and nut, diameter not less than stem of valve actuator shaft.
   c. Pin all stem connections.
   d. Center in valve box or grating opening band with guide bushing.

B. Exposed Valve Manual Actuators:
1. Provide for all exposed valves not having electric or cylinder actuators.
2. Provide handwheels for gate and globe valves.
   a. Size handwheels for valves in accordance with AWWA C500.
3. Provide lever actuators for plug valves, butterfly valves and ball valves 3 IN DIA and smaller.
   a. Lever actuators for butterfly valves shall have a minimum of 5 intermediate lock positions between full open and full close.

b. Provide at least two levers for each type and size of valve furnished.

4. Gear actuators required for plug valves, butterfly valves, and ball valves 4 IN DIA and larger.
5. Provide gearing for gate valves 20 IN and larger in accordance with AWWA C500.
6. Gear actuators to be totally enclosed, permanently lubricated and with sealed bearings.
7. Provide chain actuators for valves 6 FT or higher from finish floor to valve centerline.
   a. Cadmium-plated chain looped to within 3 FT of finish floor.
   b. Equip chain wheels with chain guides to permit rapid operation with reasonable side pull without "gagging" the wheel.
8. Provide cast iron floor stands where indicated. Stands to be furnished by valve manufacturer with actuator.
   a. Stand or actuator to include thrust bearings for valve operation and weight of accessories.

C. Electric Actuators (480 V, 3 PH):

1. Provide electric valve actuators with integral control devices and integral control station.
2. Furnish electric actuator integral with valve consisting of:
   a. Motor.
   b. Gearing.
   c. Handwheel.
   d. Limit and torque switches.
   e. Integral control station.
   f. Heating element.
   g. Wiring.
   h. Terminals for motor power and controls.
   i. Drive nut.
3. Housing/enclosure:
   a. Provide cast iron gear housing and cast iron load bearing enclosure.
   b. Non load bearing enclosure and housing: Aluminum or cast iron.
   c. Rated for area classification shown on drawings.
   d. Provide O-ring seals for covers and entries.
   e. Terminal and limit switch compartment covers are to be fastened to gear housing by stainless steel fasteners with capture device to prevent loss.
4. Motors:
   a. Provide motors that are totally enclosed, high torque design made expressly for valve actuator service and capable of operating the valve under full differential pressure for complete open-close and reverse cycle of travel at least twice in immediate succession without overheating.
   b. Design motors in accordance with NEMA MG 1 standards, with Class B insulation, and to operate successfully at any voltage within 10 percent above or below rated voltage.
   c. Provide positive method to ensure motor bearings are permanently lubricated.
   d. Motor housing:
      1) Aluminum or cast iron.
      2) Totally enclosed nonventilated with cooling fins.
   e. Provide motor capable of operating in any position.
   f. Provide motor sealed from gearcase to allow any mounting position.
   g. Provide motors suitable for 480 V, 3 PH, 60 Hz.

5. Gearing:
   a. Provide power gearing consisting of heat treated steel helical gears, carburized and hardened alloy steel worm, and alloy bronze worm gear, all grease or oil bath lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter.
   b. Provide gearing mechanism constructed to permit field changes of reduction gear ratio.
   c. Design actuators so that motor comes up to speed before stem load is encountered in either opening or closing operation.
   d. Limit switch gearings and feedback device reduction gearing:
      1) Steel or bronze.
   e. Support rotating shafts with anti-friction bearings.
   f. Provide separate drive nut/thrust bearing assembly:
      1) Mounted to base of actuator.
      2) High tensile bronze.
      3) Quarter turn actuator: Provide 90 degree mounting intervals.
      4) Provide grease fitting on drive assembly.
6. Handwheel:
   a. Permanently attached for manual operation.
   b. Positive declutch mechanism to engage and disengage handwheel.
   c. Handwheel shall not rotate during motor operation.
   d. Inoperable motor shall not prevent manual operation.
7. Limit torque and thrust loads in both closing and opening directions by torque limit switches.
   a. Provide torque switches with micrometer adjustment and reference setting indicator.
      1) Assure adjustment variation of approximately 40 percent in torque setting.
   b. Provide switches having rating of not less than 6 A at 120 Vac and 2.2 A at 115 Vdc.
   c. Limit and torque switches shall have totally sealed contacts.
8. Furnish electric actuator with two (2) geared limit switch assemblies with each switch assembly having four (4) separate limit switches:
   a. Assure each limit switch assembly is geared to driving mechanism and is independently adjustable to trip at any point at and between the fully open and fully closed valve position.
   b. Provide minimum of two (2) normally open contacts and two (2) normally closed contacts at each end of valve travel.
   c. Provide switches with inductive contact rating of not less than 6 A at 120 Vac, 3 A at 240 Vac, 1.5 A at 480 Vac, 2.2 A at 115 Vdc and 1.1 A at 230 Vdc.
   d. Limit switches shall be fully adjustable when power is applied to actuator.
9. Provide space heating elements sized to prevent condensation in both motor and geared limit switch compartment(s).
   a. Furnish heating elements rated at 120 Vac with heaters continuously energized.
10. Controls:
   a. Provide controls for valve operation.
      1) Wire all external connections to an internal terminal strip and include mounted wiring diagram inside enclosure.
   b. Integral control station:
      1) Open pushbutton.
      2) Close pushbutton.

3) Stop pushbutton.
4) Remote/local switch.
5) Full open light.
6) Full close light.

11. Modulating valve actuators:
    a. Proportional position servo-amplifier mounted integral with the actuator control compartment.
    b. Positioning of valve shall be proportional to a 4-20 mA signal input to the position servo-amplifier when remote control has been selected.
    c. Servo-amplifier adjustments shall include zero, span, gain, and dead-band.
    d. Provide isolated 4-20 mA signal output proportional to valve position.
12. Valve shall have remote configuration so valve can be setup with hand held remote.

2.4 FABRICATION

A. End Connections:
    1. Provide the type of end connections for valves as required in the Piping Schedules presented in Section 15061 (Pipe and Pipe Fittings: Basic Requirements) or as indicated.
    2. Comply with the following standards:
        a. Threaded: ANSI B1.20.1.
        b. Flanged: ANSI B16.1 Class 125 unless otherwise noted or AWWA C207.
        c. Bell and spigot or mechanical (gland) type: AWWA C111.
        d. Soldered: ANSI B16.18.
        e. Grooved: Rigid joints per Table 5 of AWWA C606.
B. Refer to individual valve sections for specifications of each type of valve on Project.
C. Nuts, Bolts, and Washers:
    1. Wetted or internal to be bronze or stainless steel. Exposed to be zinc or cadmium plated.
D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.
E. Epoxy Interior Coating:
    1. Provide epoxy interior coating for all ferrous surfaces in accordance with AWWA C550.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Painting Requirements:
    1. Comply with Section 09905 (Painting and Protective Coatings).
C. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.
D. For threaded valves, provide union on one side within 2 FT of valve to allow valve removal.
E. Install valves accessible for operation, inspection, and maintenance.

3.2 ADJUSTING

A. Adjust valves, actuators and appurtenant equipment. Operate valve, open and close at system pressures.

END OF SECTION

SECTION 15103

BUTTERFLY VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Butterfly valves.

1.2 REFERENCES

A. ASME B16.5	Pipe Flanges and Flanged Fittings - NPS ½ Through NPS 24.
B. ASTM A48	Standard Specification for Gray Iron Castings.
C. ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
D. ASTM A276	Standard Specification for Stainless Steel Bars and Shapes.
E. ASTM A395	Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
F. ASTM A536	Standard Specification for Ductile Iron Castings.
G. AWWA C504	Standard for Rubber-Seated Butterfly Valves.
H. MSS SP-67	Butterfly Valves.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 15100 (Valves: Basic Requirements).
   2. For valves 8 IN and larger, furnish "Affidavit of Compliance" with Owner in accordance with AWWA C504.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. DeZURIK
B. Clow
C. Mueller
D. Pratt
E. Or Approved Equal

2.2 BUTTERFLY VALVES (AWWA C504)

A. Comply with AWWA C504.
   1. Materials:
      a. Valve bodies:
         1) ASTM A126, Class B or ASTM A536 Grade 65-45-12 ductile iron.
         2) Lug and flange body acceptable. Wafer style not acceptable.
   2. Valve shafts:
      a. Stainless steel, 18-8, Type 304 or 316.
   3. Valve discs:
      a. Air and similar applications: ASTM A48, Class 40 cast iron.
   4. Valve seats:
      a. Air below 180 DegF:

1) Buna-N.
b. Heating water and air 180 to 250 DegF.
1) EPDM.
5. Mating surfaces:
a. Valves less than 30 IN: ASTM A276, 18-8, stainless steel or bronze.
b. Valves 30 IN and larger: ASTM A276, 18-8, stainless steel.

B. Design Requirements:
1. Seat type:
a. Resilient.
b. Comply with AWWA C504.
2. Exposed valves 3 through 20 IN.
a. Body type: Short body flange (laying length may vary from AWWA C504).

2.3 BUTTERFLY VALVES (MSS SP-67)

A. Comply with MSS SP-67.
1. Materials:
a. Valve bodies:
1) Lug body: Ductile iron, ASTM A395.
2. Valve shaft or stem:
a. Stainless steel, ASTM A276, Type 316.
3. Valve disc:
a. Ductile iron, ASTM A395, nickel plated.
4. Valve seat:
a. Air below 180 DegF:
1) Buna-N.
5. Air 180 to 250 DegF:
a. EPDM.
b. Valve seat shall be a full body seat isolating stem and body from flow.

B. Design Requirements:
1. Exposed valves 3 IN through 20 IN.
a. Body type: Lug.
b. Working pressure: Rated for 150 psi.
c. Equip with fully tapped anchor lugs drilled per ASME B16.5.

2.4 ACCESSORIES

A. Refer to Drawings and/or valve schedule for type of actuators.
1. Furnish actuator integral with valve.

B. Refer to Section 15100 (Valves: Basic Requirements) for actuator requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. See Section 15100 (Valves: Basic Requirements).

END OF SECTION

SECTION 15106

CHECK VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Check valves.

1.2 REFERENCES

A.	ASME B16.1	Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125 and 250)
B.	AWWA C508	Standard for Swing-Check Valves for Waterworks Service, 2 IN through 24 IN NPS

1.3 DEFINITIONS

A. PVDF: Polyvinylidene fluoride.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 15100 (Valves: Basic Requirements).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, manufacturers listed under the valve types are acceptable.

2.2 SWING CHECK VALVES: 3 IN TO 24 IN

A. Swing Check Valves (Wastewater):
   1. Comply with AWWA C508.
   2. Acceptable manufacturers:
      a. APCO 100 Series rubber flapper swing check.
      b. Crispin RF Series rubber flapper check valve.
      c. Or Approved Equal.
   3. Materials:
      a. Body and cover: Cast iron A126 Grade B.
      b. Rubber flapper: ASTM A36 steel reinforced Buna-N.
      c. Gasket: Lexide.
      d. Bolts: A307 Grade B steel.
      e. Provide two coats of epoxy coating on exterior of valve.
         1) Epoxy coating: Amerlock 400 or Approved Equal.
   4. Design requirements:
      a. Minimum working pressure: 150 psi.
      b. Average operating temperature: 70 DegF.
      c. Maximum operating temperature: 120 DegF.

PART 3 EXECUTION

3.1 INSTALLATION

A. See Section 15100 (Valves: Basic Requirements).
B. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 15114

MISCELLANEOUS VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ball valves.
   2. Butterfly valves.
   3. Knife gate valves.
   4. Shear gates.

1.2 REFERENCES

A.	ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings - Classes 25, 125 and 250
B.	AWWA C550	Standard for Protective Interior Coatings for Valves and Hydrants
C.	NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 15100 (Valves: Basic Requirements).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the manufacturers listed under the specific valve types are acceptable.

2.2 BALL VALVES

A. Acceptable Manufacturers:
   1. APCO.
   2. Apollo.
   3. Or Approved Equal.
B. Ball and Body Material: 316 stainless steel.
C. Seat Material: RPTFE (reinforced Teflon).
D. Valve Size: As indicated on Drawings.
E. Maximum Working Pressure: 150 psi.

2.3 BUTTERFLY VALVES

A. Materials:
   1. Valve bodies: Stainless steel, ASTM A351, Type 316.
   2. Valve shafts: Stainless steel, ASTM A479, Type 17-4.
   3. Valve discs: Stainless steel, ASTM A351, Type 316.
   4. Valve seats: PTFE.
B. Design Requirements:
   1. Minimum working pressure: 175 psi.
   2. Average operating temperature: 70 DegF.

3. Maximum operating temperature: 120 DegF.

2.4 KNIFE GATE VALVE

A. Acceptable Manufacturers:
   1. Dezurik.
   2. Or Approved Equal.
B. Valve Style: GKU.
C. Valve Size: As indicated on drawings.
D. Body Material: 304 stainless steel.
E. Gate Material: 304 stainless steel.
F. Seat: Acrylogitrile Butadiene (NBR).

2.5 SHEAR GATES

A. Acceptable Manufacturers:
   1. Waterman Industries, Inc.
   2. Or Approved Equal.
B. Model: GC-16 Shear Gate.
C. Valve Size: As indicated on drawings.
D. Lift Rod: Provide 5 FT long lift rod.
E. Materials:
   1. Frame: Cast Iron ASTM A126 Class B.
   2. Cover: Cast Iron ASTM A126 Class B.
   3. Hinge bolt: Bronze ASTM B98.
   4. Lift rod: Schedule 40 Steel.
   5. Lift lug: Cast Iron ASTM A126 Class B.
   6. Bronze seats: ASTM B-21 Alloy 482.

2.6 ACCESSORIES

A. Furnish any accessories required to provide a completely operable valve.

2.7 FABRICATION

A. Completely shop assemble unit including any interconnecting piping, speed control valves, control isolation valves and electrical components.

2.8 SOURCE QUALITY CONTROL

A. Shop hydrostatically test to test pressure.

2.9 MAINTENANCE MATERIALS

A. Provide one (1) set of any special tools or wrenches required for operation or maintenance for each type valve.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: See Section 11005 (Equipment: Basic Requirements) and Section 15100 (Valves: Basic Requirements).

3.2 FIELD QUALITY CONTROL

A. Clean, inspect, and operate valve to ensure all parts are operable and valve seats properly.

B. Check and adjust valves and accessories in accordance with manufacturer's instructions and place into operation.

END OF SECTION

SECTION 15183

PIPE INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Insulation:
      a. Piping insulation.

1.2 REFERENCES

A. ASTM C553	Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
B. ASTM C665	Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
C. ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials.
D. ASTM F25	Standard Test Method for Sizing and Counting Airborne Particulate Contamination in Cleanrooms and Other Dust-Controlled Areas.
E. NFPA 255	Standard Method of Test of Surface Burning Characteristics of Building Materials.
F. UL 723	Standard for Test for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Product Data:
   1. Acknowledgement that products submitted meet requirements of standards referenced.
   2. Manufacturer's installation instructions.
   3. Submit complete specification of insulation materials, adhesives, cement, together with manufacturer's recommended methods of application and coverage for coatings and adhesives.
B. Submit itemized schedule by building of proposed insulation systems showing density, thermal conductivity, thickness, adhesive, jackets and vapor barriers.
C. Certifications: Products meet the requirements of the Contract Documents.

PART 2 PRODUCTS

2.1 PIPING INSULATION - FIBERGLASS

A. Pipe and Fitting Insulation:
   1. Preformed fiberglass pipe insulation:
      a. Density: 4 LBS/CF.
      b. Temperature rated: 650 DegF.
      c. Average thermal conductivity not to exceed 0.22 (Btu-IN)/(HR-FT2-DegF) at mean temperature of 75 DegF.
   2. Moisture adsorption:

a. ASTM C553.
b. Not greater than 0.5 percent moisture by volume when exposed to moisture laden air at 120 DegF and 96 percent RH.

3. Fungi and bacteria resistance:
   a. ASTM C665.
   b. Does not breed or promote growth.
   c. Flame attenuated glass fibers bonded with thermosetting resin.
4. Piping jackets low pressure air (LPA):
   a. Aluminum: 16 mil embossed aluminum.
   b. Piping jacket not required on concealed piping.
5. Provide minimum insulation thickness conforming to schedules.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. General:
   1. Consider ductwork, piping and equipment as exposed, except as otherwise indicated.
   2. Consider ductwork, piping and equipment in walls, partitions, floors, pipe chases, pipe shafts and duct shafts as concealed.
      a. Consider ductwork, piping and equipment above ceilings as concealed.
   3. Provide release for insulation application after installation and testing is complete.
      a. Apply insulation on clean, dry surfaces after inspection.
   4. Provide insulation continuous through wall, roof and ceiling openings, pipe hangers, supports and sleeves.
   5. Provide insulation with vapor barrier for piping, ductwork and equipment where surfaces may be cooler than surrounding air temperatures.
      a. Provide vapor barrier (0.17 perm-IN; ASTM C553) continuous and unbroken.
      b. Hangers, supports, anchors, and related items that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.
   6. Apply specified adhesives, mastics and coatings at the manufacturer's recommended coverage per unit volume.
C. Piping Insulation - Fiberglass:
   1. Apply over clean dry pipe.
      a. Butt all joints together firmly.
   2. Seal joints, slits, miter-cuts and other exposed edges of insulation as recommended by the insulation manufacturer.
   3. Insulate fittings, valves, and flanges with insulation thickness equal to adjacent pipe.
   4. Aluminum pipe jacket:
      a. Field-applied aluminum jacket with vapor-sealed longitudinal and butt joints.
      b. Provide smooth and straight joint with a minimum 2 IN overlap.
      c. Secure joints with corrosion-resistant screws spaced 0.25 to 0.50 IN back from edge.
      d. Center spacing of screws 5 IN maximum or as required to provide smooth tight-fitted joints.
      e. Place joints on least exposed side of piping to obtain neat appearance.

3.2 REPAIR

A. Whenever any factory applied insulation or job-applied insulation is removed or damaged, replace with the same quality of material and workmanship.

3.3 SCHEDULES

A. Pipe, Fittings and Valves:
   1. Fiberglass.

APPLICATION	PIPE SIZE	THICKNESS	JACKET
Low Pressure Air (LPA)	1 IN and less	1 IN	Alum
	1-1/4 IN to 4 IN	1-1/2 IN	
	Over 4 IN	2 IN	

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16010

ELECTRICAL: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Basic requirements for electrical systems.
B. Related Sections:
   1. Section 05500 (Metal Fabrications).
   2. Section 16130 (Raceway and Boxes).

1.2 REFERENCES

A.	ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
B.	ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
C.	IEEE C2	National Electrical Safety Code (NESC)
D.	NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
E.	NFPA 70	National Electrical Code (NEC)

F. Where Underwriters Laboratories, Inc. (UL) test procedures have been established for the product type, use UL or ETL Testing Laboratories (ETL) approved electrical equipment and provide with the UL or ETL label.

1.3 DEFINITIONS

A. For the purposes of providing materials and installing electrical work the following definitions shall be used.
   1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures.
   2. Non-architecturally finished interior area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.
   3. Shop fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

1.4 SUBMITTALS

A. Shop Drawings:
   1. General requirements:
      a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
      b. Include data sheets that include manufacturer's name and product model number.
         1) Clearly identify all optional accessories.
      c. Acknowledgement that products are UL or ETL listed or are constructed utilizing UL or ETL recognized components.
      d. Manufacturer's delivery, storage, handling and installation instructions.
      e. Product installation details.
      f. See individual specification sections for any additional requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment from damage.
B. Protect nameplates on electrical equipment to prevent defacing.

1.6 AREA DESIGNATIONS

A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
   1. Outdoor areas:
      a. Wet.
   2. Indoor areas:
      a. Dry, unless indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, refer to specific Division 16 Specification Sections and specific material paragraphs below for acceptable manufacturers.
B. Provide all components of a similar type by one (1) manufacturer.

2.2 MATERIALS

A. Electrical Equipment Support Pedestals and/or Racks:
   1. Approved manufacturers:
      a. Modular strut:
         1) Unistrut Building Systems.
         2) B-Line.
         3) Globe Strut.
         4) Or Approved Equal.
   2. Material requirements:
      a. Modular strut:
         1) Galvanized steel: ASTM A123 or ASTM A153.
         2) Stainless steel: AISI Type 316.
         3) PVC coated galvanized steel: ASTM A123 or ASTM A153 and 20 mil PVC coating.
      b. Mounting hardware:
         1) Galvanized steel.
         2) Stainless steel.
      c. Anchorage per Section 05500 (Metal Fabrications).
B. Field touch-up of galvanized surfaces.
   1. Zinc-rich primer.
      a. One (1) coat, 3.0 mils, ZRC by ZRC Products.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install and wire all equipment, including prepurchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specification Sections and ensure that equipment is ready and safe for energization.

B. Install equipment in accordance with the requirements of:
   1. NFPA 70 (NEC).
   2. IEEE C2.
   3. The manufacturer's instructions.
C. In general, conduit routing is not indicated.
   1. The Contractor is responsible for routing all conduits including those indicated on one-line and control block diagrams and home runs shown on floor plans.
   2. Conduit routings and stub-up locations that are indicated are approximate; exact routing to be as required for equipment furnished and field conditions.
D. Do not use equipment that exceed dimensions or reduce clearances indicated or required by the NFPA 70 (NEC).
E. Install equipment plumb, square and true with construction features and securely fastened.
F. Install electrical equipment, including pull and junction boxes, minimum of 6 IN from process, gas, air and water piping and equipment.
G. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operating and maintenance requirements of other equipment.
H. Provide electrical equipment support system per the following area designations:
   1. Dry areas:
      a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
      b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
   2. Wet areas:
      a. Stainless steel system and fasteners.
I. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.
   1. Do not cut, or weld to, building structural members.
   2. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.
J. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.
K. Identify electrical equipment and components with identification nameplates.

3.2 FIELD QUALITY CONTROL

A. Verify exact rough-in location and dimensions for connection to electrified equipment, provided by others.
B. Replace equipment and systems found inoperative or defective and re-test.
C. Cleaning:
   1. Clean all equipment.
D. The protective coating integrity of support structures and equipment enclosures shall be maintained.
   1. Repair galvanized components utilizing a zinc rich paint.
   2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.

3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
4. Repair surfaces which will be inaccessible after installation prior to installation.
5. See Section 16130 (Raceway and Boxes), for requirements for conduits and associated accessories.

E. Replace nameplates damaged during installation.

3.3 DEMONSTRATION

A. Demonstrate equipment for proper operation.

END OF SECTION

SECTION 16012

SEISMIC BRACING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The design and installation of seismic bracing and anchorage required for electrical equipment, conduit, cable tray, and bus ducts.

1.2 REFERENCES

A.	ASTM A36	Standard Specification for Carbon Structural Steel
B.	ASTM A307	Standard Specification Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
C.	ASTM F1554	Standard Specification for Anchor Bolts, Steel 36, 55, and 105-ksi Yield Strength

1.3 SUBMITTALS

A. Product Data:
   1. Seismic control devices.
B. Shop Drawings:
   1. Fabrication and/or layout drawings:
      a. Layout and mounting detail drawings showing system and proposed brace locations for all systems including pre-engineered systems.
      b. The specific detail for each type of brace or anchor must be referenced on a plan that identifies the required location.
      c. Supplying a book of details without referencing the proper detail to a specific location on a plan is not acceptable.
      d. Structural calculations for required lateral force level for each component.
      e. All submittals, including pre-approved systems, shall be signed and sealed by a licensed engineer, licensed in the state in which the project is located.
C. System Description:
   1. Contractor is responsible for design and installation of seismic bracing and anchorage systems.
   2. Description of Systems:
      a. Transverse and longitudinal bracing for seismic forces on suspended electrical systems including conduit, cable tray, bus duct, and equipment.
      b. Anchorage of floor and roof mounted electrical equipment.
   3. Seismic Design Requirements:
   4. Seismic design criteria: Provide bracing and anchoring for equipment, conduit, cable tray, bust duct, designed, constructed, and installed to resist stresses produced by lateral forces.
   5. Design and install seismic anchorage and bracing for all floor or roof mounted equipment weighing 400 LBS or more and all suspended or wall mounted equipment weighing 20 LBS or more.
   6. The following components are exempt from the requirements of this Specification Section:

a. Electrical components in structures assigned to Seismic Design Category C provided that the importance factor (I_p) is equal to 1.0.
b. Electrical components in Seismic Design Categories D, E, and F where I_p = 1.0 and flexible connections between the components and associated ductwork, piping, and conduit are provided and that are mounted at 4 FT (1.22 m) or less above a floor level and weigh 400 LBS (1780 N)or less.
c. Electrical components in Seismic Design Categories D, E, and F weighing 20 LBS (95 N) or less where I_p = 1.0 and flexible connections between the components and conduit are provided, or for distribution systems, weighing 5 LBS/FT (7 N/m) or less.

7. Seismic forces shall be presumed to act through the center of mass of the equipment in a direction that will produce the largest single anchor force.

1.4 PROJECT CONDITIONS

A. Seismic (Earthquake) Loads: See Section 11005 (Equipment: Basic Requirements), paragraph 1.5.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Pre-engineered suspended bracing systems:
a. International Seismic Application Technology (ISAT) "Engineered Seismic Bracing of Suspended Utilities".
b. Unistrut.
c. Tolco.
d. B-Line.
e. Or Approved Equal.
2. Custom engineered systems designed using specified criteria and common building materials.

2.2 EQUIPMENT ANCHORS AND SUPPORTS

A. Drilled-in-place concrete anchors shall have an approved ICBO Evaluation Services Report.
B. Cast-in-place anchors shall comply with ASTM A36, ASTM A307, or ASTM F1554, 36 ksi.
C. Anchors permanently exposed to weather or corrosive environments shall be stainless steel or hot-dipped galvanized.
D. Structural steel for supports: ASTM A36.
E. Cold formed metal and connection material: Strut.
F. Any details provided are based on assumed equipment and arrangement.
1. Contractor shall be responsible for design and acquiring approval for support and anchorage of equipment and arrangement which varies from equipment and arrangement assumed in detail provided.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Every run which requires bracing shall have a minimum of two (2) transverse braces and one (1) longitudinal brace.
   1. A "run" is defined as suspended pipe, conduit, cable tray, bus ductor trapeze rack having a minimum 5 FT straight run length.

B. Brace spacing shall not exceed the maximum allowable brace spacing as engineered by the manufacturer or custom bracing designer.

C. Bracing may be omitted from conduit, cable tray and bus duct runs less than 5 FT in length.

D. Bracing may be omitted from conduit, cable tray and bus duct runs where rod hung supports of less than 12 IN. (305mm) in length are required.
   1. All unbraced suspended utility systems having 2 IN conduit and larger or systems weighing more then 5 LBS/FT shall be installed with a minimum 6IN clearance to suspended ceiling vertical hanger wires.
   2. The conduit, cable tray, or bus duct shall be installed such that the lateral motion of the members will not cause damaging impact with other systems or structural members or loss of vertical support.

E. A longitudinal brace at a 90 degree change in direction may act as a transverse brace if it is located within 2 FT of the change in direction.

F. A transverse brace may act as a longitudinal brace if it is located within 2 FT of a change in direction and if the brace arm and anchorage have been sized to meet or exceed the requirements of the longitudinal brace.

G. When bracing equipment or a utility system that is suspended from an overhead deck, brace back to the overhead deck or to the supporting structure supporting the deck.
   1. Do not brace to another element of the structure which may respond differently during a seismic event.

H. Obtain approval from the Owner prior to attaching any brace elements to structural steel or wood framing.

I. When utilizing cable bracing, tension the cable to remove slack without inducing uplift of the suspended element.
   1. Tension seismic bracing system prior to system start-up and adjust if necessary after equipment start-up.

J. As a general rule, do not mix rigid bracing with cable bracing in the same run.
   1. However, once bracing has transitioned a 90 degree change in run direction, the bracing may switch from rigid to cable or vice versa if required due to a significant change in overhead deck elevation or to provide an implementable bracing scheme in a congested area.

K. Install brace members at an angle of 45 degrees from horizontal within a tolerance of plus 2 1/2 degrees or minus 45 degrees provided the brace length is accounted for in design.
   1. Brace angle may be increased to 60 degrees provided the brace spacing is reduced to 1/2 that required for a 45 degree brace.

L. Seismic bracing may not pass through a building separation joint.
   1. Utility systems that pass through a separation joint must be seismically restrained no greater than 5 FT from the point of connection.
   2. Any hardware designed to accommodate seismic movement across the span of the separation joint shall be installed per manufacturer's installation and listing instructions.

M. With approval of the Owner, utility systems that are suspended from the overhead deck may be braced to load bearing concrete or CMU (concrete masonry) walls provided that the walls and the overhead decks will respond similarly during a seismic event.
N. Each layer of a multiple layer trapeze rack shall be braced individually based on the weight of the individual layer.
O. Conduit, cable tray, or bus duct constructed of non ductile material (plastic or fiberglass), shall have brace spacing reduced to 1/2 of the spacing allowed for ductile materials.
P. Where brace elements are through-bolted, the mounting hole in the element is to be no more than 1/16 IN in diameter larger then the bolt or threaded rod.
Q. Seismic braces shall directly brace the system and not the hanger.

3.2 SUSPENDED ELECTRICAL SYSTEMS

A. Install seismic bracing for all conduits 2-1/2 IN trade size or greater.
B. All trapeze assemblies supporting conduits, cable trays or bus ducts shall be braced considering the total weight of the elements on the trapeze.
C. For the purposes of calculating weight, all conduits are to be treated as full.
D. Brace all trapeze racks which support conduit 2-1/2 IN trade size or larger.
   1. Brace all other conduit rack, cable tray or bus duct trapezes having a minimum weight in excess of 10 LBS/LF.
   2. Include a minimum 10 percent additional capacity for future additions.
E. Seismic bracing may be omitted from cable trays, conduit and bus ducts suspended by rod hung supports 12 IN or less in length form the top of the element to the bottom of the structural attachment of the hanger provided lateral motion will not cause damaging impacts to other systems or loss of system vertical support.
F. All vertical risers involving conduit 2-1/2 IN in diameter or larger shall include lateral restraint at maximum 30 FT intervals and at the top and bottom of the riser.

3.3 FLOOR OR ROOF MOUNTED EQUIPMENT

A. Provide one (1) anchor on each leg or corner.
   1. Support with a minimum of three (3) 3/8 IN DIA anchors.
B. Friction shall be neglected when designing anchors for shear.
C. Vertical seismic forces, when required, shall be presumed to act concurrently with horizontal seismic forces.

END OF SECTION

SECTION 16065

GROUNDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Material and installation requirements for grounding system(s).
B. Related Sections:
   1. Section 16010 (Electrical).
   2. Section 16125 (Wire and Cable: 600 Volt and Below).
   3. Section 16130 (Raceway and Boxes).

1.2 REFERENCES

A.	ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
B.	IEEE 837	Standard for Qualifying Permanent Connections Used in Substation Grounding
C.	NFPA 70	National Electrical Code (NEC), Article 250, Grounding and Bonding
D.	UL 467	Grounding and Bonding Equipment

E. Ensure ground continuity is continuous throughout the entire Project.

1.3 SUBMITTALS

A. Product data.
   1. Provide submittal data for all products specified in PART 2 of this Specification Section except:
      a. Grounding clamps, terminals and connectors.
      b. Exothermic welding system.
   2. See Section 16010 (Electrical: Basic Requirements), for additional requirements.
B. Quality Assurance/Control Submittals:
   1. Test Reports:
      a. Report of ground test.
         1) Grounding system resistance and continuity test reports signed by project supervising electrical forman.
         2) Include test reports in installation, Operations and Maintenance manual.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Ground rods and bars and grounding clamps, connectors and terminals:
      a. Burndy.
      b. Harger Lightning Protection.
      c. Heary Brothers.
      d. Joslyn.

e. Robbins Lightning Protection.
f. Thomas & Betts (Blackburn).
g. Thompson.
h. Or Approved Equal.

2. Exothermic weld connections:
   a. Erico Products Inc., Cadweld.
   b. Harger Lightning Protection.
   c. Thermoweld.
   d. Or Approved Equal.

2.2 COMPONENTS

A. Wire and Cable:
   1. Bare conductors: Soft drawn stranded copper meeting ASTM B8.
   2. Insulated conductors: Color coded green, per Section 16125 (Wire and Cable: 600 Volt and Below).

B. Conduit: As specified in Section 16130 (Raceway and Boxes).

C. Grounding Clamps, Connectors and Terminals:
   1. Mechanical type:
      a. Standards: UL 467.
      b. High copper alloy content.
   2. Compression type for interior locations:
      a. Standards: UL 467.
      b. High copper alloy content.
      c. Non-reversible.
      d. Terminals for connection to bus bars shall have two bolt holes.
   3. Compression type suitable for direct burial in earth or concrete:
      a. Standards: UL 467, IEEE 837.
      b. High copper alloy content.
      c. Non-reversible.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
   1. Install products in accordance with manufacturer's instructions.
   2. Size grounding conductors and bonding jumpers in accordance with NFPA 70 Article 250, except where larger sizes are indicated.
   3. Remove paint, rust, or other nonconducting material from contact surfaces before making ground connections.
   4. Do not splice grounding conductors except at ground rods.
   5. Install ground rods and grounding conductors in undisturbed, firm soil.
      a. Provide excavation required for installation of ground rods and ground conductors.
      b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
      c. Unless otherwise specified, connect conductors to ground rods with exothermic weld.
      d. Provide sufficient slack in grounding conductor to prevent conductor breakage during backfill or due to ground movement.

e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.

6. Do not use exothermic welding if it will damage the structure the grounding conductor is being welded to.

B. Raceway Bonding/Grounding:

1. All metallic conduit shall be installed so that it is electrically continuous.
2. All conduits to contain a grounding conductor with insulation identical to the phase conductors, unless otherwise indicated.
3. NFPA 70 required grounding bushings shall be of the insulating type.
4. Provide double locknuts at all panels.
5. Bond all conduit, at entrance and exit of equipment, to the equipment ground bus or lug.
6. Provide bonding jumpers if conduits are installed in concentric knockouts.
7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.

C. Equipment Grounding:

1. All utilization equipment shall be grounded with an equipment ground conductor.

3.2 FIELD QUALITY CONTROL

A. Leave grounding system open until observed by Owner.

B. Provide ground continuity testing for all ground connections and provide reports as detailed in 1.3 SUBMITTALS.

END OF SECTION

SECTION 16125

WIRE AND CABLE: 600 VOLT AND BELOW

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   A. Material and installation requirements for:
      1. Building wire.
      2. Instrumentation cable.
      3. Wire connectors.
      4. Insulating tape.
      5. Pulling lubricant.
B. Related Sections:
   1. Section 16010 (Electrical: Basic Requirements).

1.2 REFERENCES

A. CSA	Test Methods for Electrical Wires and Cables (FT-4 Vertical Cable Tray Test)
B. IEEE 1202	Standard for Flame-Propagation Testing of Wire and Cable
C. NEMA ICS 4	Industrial Control and Systems: Terminal Blocks
D. NFPA 70	National Electrical Code (NEC)
E. UL 44	Standard for Safety Thermoset-Insulated Wires and Cables
F. UL 83	Standard for Safety Thermoplastic-Insulated Wires and Cables
G. UL 467	Standard for Safety Grounding and Bonding Equipment
H. UL 486A	Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors
I. UL 486C	Standard for Safety Splicing Wire Connections
J. UL 510	Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
K. UL 1581	Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords
L. UL 2250	Standard for Safety Instrumentation Tray Cable

1.3 DEFINITIONS

A. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
B. Instrumentation Cable:
   1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
   2. The following are specific types of instrumentation cables:
      a. Analog signal cable:
         1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 Vdc) signals, using No. 16 AWG and smaller conductors.
         2) Commonly used types are defined in the following:
            (a) TSP: Twisted shielded pair.
            (b) TST: Twisted shielded triad.

b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.

C. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

1.4 SUBMITTALS

A. Product Data:
1. Provide submittal data for all products specified in Part 2 of this specification except:
   a. Wire connectors.
   b. Insulating tape.
   c. Cable lubricant.
2. See Section 16010 (Electrical: Basic Requirements) for additional requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 16010 (Electrical: Basic Requirements).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Building wire:
   a. American Insulated Wire Corporation.
   b. General Cable.
   c. Manhattan/CDT.
   d. Southwire Company.
   e. Or Approved Equal.
2. Instrumentation cable:
   a. Analog cable:
      1) Alpha Wire Corporation.
      2) American Insulated Wire Corporation.
      3) Belden CDT Inc.
      4) General Cable.
      5) Manhattan/CDT.
      6) Or Approved Equal.
3. Wire connectors:
   a. Burndy Corporation.
   b. Buchanan.
   c. Ideal.
   d. Ilsco.
   e. 3M Co.
   f. Teledyne Penn Union.
   g. Thomas and Betts.
   h. Phoenix Contact.
   i. Or Approved Equal.
4. Insulating and color coding tape:
   a. 3M Co.
   b. Plymouth Bishop Tapes.

c. Red Seal Electric Co.
d. Or Approved Equal.

2.2 MANUFACTURED UNITS

A. Building Wire:
1. Conductor shall be copper with 600 V rated insulation.
2. Conductors shall be stranded, except for conductors used in lighting and receptacle circuits which may be stranded or solid.
3. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
4. Conform to NEMA/ICEA WC 70/S-95-658 and UL 83 for type THHN/THWN and THHN/THWN-2 insulation or NEMA/ICEA WC 70/S-95-658 and UL 44 for type XHHW-2 insulation.

B. Electrical Equipment Control Wire:
1. Conductor shall be copper with 600 V rated insulation.
2. Conductors shall be stranded.
3. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
4. Conform to UL 44 for Type SIS insulation.
5. Conform to UL 83 for Type MTW insulation.

C. Instrumentation Cable:
1. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
2. Analog cable:
a. Tinned copper conductors, #16 AWG minimum.
b. 600 V PVC insulation with PVC jacket.
c. Twisted with 100 percent foil shield coverage with drain wire.
d. Six (6) twists per foot minimum.
e. Individual conductor color coding: ICEA Method 1, Table K-2.
f. Conform to UL 2250, UL 1581 and NFPA 70 Type ITC.
g. Cables to have individual shielded pairs.

D. Wire Connectors:
1. Twist/screw on type:
a. Insulated pressure or spring type solderless connector.
b. 600 V rated.
c. Ground conductors: Conform to UL 486C and/or UL 467 when required by local codes.
d. Phase and neutral conductors: Conform to UL 486C.
2. Compression and mechanical screw type:
a. 600 V rated.
b. Ground conductors: Conform to UL 467.
c. Phase and neutral conductors: Conform to UL 486A.
3. Terminal block type:
a. High density, screw-post barrier-type with white center marker strip.
b. 600 V and ampere rating as required, for power circuits.
c. 600 V, 20 ampere rated for control circuits.
d. 300 V, 15 ampere rated for instrumentation circuits.
e. Conform to NEMA ICS 4 and UL 486A.

E. Insulating and Color Coding Tape:
   1. Pressure sensitive vinyl.
   2. Premium grade.
   3. Heat, cold, moisture, and sunlight resistant.
   4. Thickness, depending on use conditions: 7, 8.5, or 10 mil.
   5. For cold weather or outdoor location, tape must also be all-weather.
   6. Color:
      a. Insulating tape: Black.
      b. Color coding tape: Fade-resistant color as specified herein.
   7. Comply with UL 510.
F. Pulling Lubricant: Cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Permitted Usage of Insulation Types:
   1. Type XHHW-2 or Type THHN/THWN and THHN/THWN-2.
      a. Building wire.
      b. Building wire in conduit below grade.
   2. Type SIS and MTW:
      a. For the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers.
B. Conductor Size Limitations:
   1. Feeder and branch power conductors shall not be smaller than No. 12 AWG unless otherwise indicated.
   2. Control conductors shall not be smaller than No. 14 AWG unless otherwise indicated.
   3. Instrumentation conductors shall not be smaller than No. 18 AWG unless otherwise indicated.
C. Color Code All Wiring as Follows:
   1. Building wire:

	240 V, 208 V, 240/120 V, 208/120 V	480 V, 480/277 V
Phase 1	Black	Brown
Phase 2	Red	Orange
Phase 3	Blue	Yellow
Neutral	White	White or Gray
Ground	Green	Green

      a. Conductors No. 6 AWG and smaller: Insulated phase, neutral and ground conductors shall be identified by a continuous colored outer finish along its entire length.
      b. Conductors larger than No. 6 AWG:
         1) Insulated phase and neutral conductors shall be identified by one (1) of the following methods:
            (a) Continuous colored outer finish along its entire length.

(b) 3 IN of colored tape applied at the termination.
2) Insulated grounding conductor shall be identified by one (1) of the following methods:
(a) Continuous green outer finish along its entire length.
(b) Stripping the insulation from the entire exposed length.
(c) Using green tape to cover the entire exposed length.
3) The color coding shall be applied at all accessible locations, including but not limited to: Junction and pull boxes, wireways, manholes and handholes.

D. Install all wiring in raceway unless otherwise indicated.

E. Feeder, branch, control and instrumentation circuits shall not be combined in a raceway, cable tray, junction or pull box, except as permitted in the following:
1. Where specifically indicated.
2. Where field conditions dictate and written permission is obtained from Owner.
3. Control circuits shall be isolated from feeder and branch power and instrumentation circuits but combining of control circuits is permitted.
a. The combinations shall comply with the following:
1) 12 Vdc, 24 Vdc and 48 Vdc may be combined.
2) 125 Vdc shall be isolated from all other AC and DC circuits.
3) AC control circuits shall be isolated from all DC circuits.
4. Instrumentation circuits shall be isolated from feeder and branch power and control circuits but combining of instrumentation circuits is permitted.
a. The combinations shall comply with the following:
1) Analog signal circuits may be combined.
2) Digital signal circuits may be combined but isolated from analog signal circuits.
5. Multiple branch circuits for lighting, receptacle and other 120 Vac circuits are allowed to be combined into a common raceway.
a. Contractor is responsible for making the required adjustments in conductor and raceway size, in accordance with all requirements of the NEC, including but not limited to:
1) Up sizing conductor size for required ampacity de-ratings for the number of current carrying conductors in the raceway.
2) Up sizing raceway size for the size and quantity of conductors.

F. Ground the drain wire of shielded instrumentation cables at one (1) end only.
1. The preferred grounding location is at the load (e.g., control panel), not at the source (e.g., field mounted instrument).

G. Splices and terminations for the following circuit types shall be made in the indicated enclosure type using the indicated method.
1. Feeder and branch power circuits:
a. Device outlet boxes:
1) Twist/screw on type connectors.
b. Junction and pull boxes and wireways:
1) Twist/screw on type connectors for use on No. 8 and smaller wire.
2) Compression, mechanical screw or terminal block or terminal strip type connectors for use on No. 6 AWG and larger wire.
c. Motor terminal boxes:
1) Twist/screw on type connectors for use on No. 10 AWG and smaller wire.
2) Insulated mechanical screw type connectors for use on No. 8 AWG and larger wire.

d. Handholes:
   1) Twist/screw on type connectors pre-filled with epoxy for use on No. 8 AWG and smaller wire.
   2) Watertight compression or mechanical screw type connectors for use on No. 6 AWG and larger wire.

2. Control circuits:
   a. Junction and pull boxes: Terminal block type connector.
   b. Manholes or handholes: Twist/screw on type connectors pre-filled with epoxy.
   c. Control panels and motor control centers: Terminal block or strips provided within the equipment or field installed within the equipment by the Contractor.
3. Instrumentation circuits can be spliced where field conditions dictate and written permission is obtained from Owner.
   a. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
   b. Junction and pull boxes: Terminal block type connector.
   c. Control panels and motor control centers: Terminal block or strip provided within the equipment or field installed within the equipment by the Contractor.
   d. Document all splices on as-built drawings.
4. Non-insulated compression and mechanical screw type connectors shall be insulated with tape or hot or cold shrink type insulation to the insulation level of the conductors.

H. Insulating Tape Usage:
   1. For insulating connections of No. 8 AWG wire and smaller: 7 mil vinyl tape.
   2. For insulating splices and taps of No. 6 AWG wire or larger: 10 mil vinyl tape.
   3. For insulating connections made in cold weather or in outdoor locations: 8.5 mil, all weather vinyl tape.

I. Color Coding Tape Usage: For color coding of conductors.

3.2 FIELD QUALITY CONTROL

A. Replace any damaged wire or cable.

END OF SECTION

SECTION 16130

RACEWAY AND BOXES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Material and installation requirements for:
      a. Conduits.
      b. Conduit fittings.
      c. Conduit supports.
      d. Wireways.
      e. Outlet boxes.
      f. Pull and junction boxes.

B. Related Sections:
   1. Section 16010 (Electrical: Basic Requirements).
   2. Section 16135 (Electrical: Exterior Underground).

1.2 REFERENCES

A. ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
B. ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
C. NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
D. NEMA RN1	Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit (IMC)
E. NEMA/ANSI C80.1	Electric Rigid Steel Conduit (ERSC)
F. NEMA TC 14-2002	Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
G. NFPA 70	National Electrical Code (NEC)
H. UL 6	Standard for Electrical Rigid Metal Conduit - Steel
I. UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
J. UL 360	Standard for Liquid-Tight Flexible Steel Conduit
K. UL 467	Grounding and Bonding Equipment
L. UL 514B	Conduit, Tubing, and Cable Fittings
M. UL 870	Standard for Wireways, Auxiliary Gutters, and Associated Fittings
N. UL 886	Standard for Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
O. UL 1684	Standard for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

1.3 SUBMITTALS

A. Product Data:
   1. Provide submittal data for all products specified in PART 2 of this Section 16130 except:
      a. Conduit fittings.
      b. Support systems.

2. See Section 16010 (Electrical: Basic Requirements) for additional requirements.

B. Fabrication and/or layout drawings:
   1. Identify dimensional size of pull and junction boxes to be used.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Rigid metallic conduits:
      a. Allied Tube and Conduit Corporation.
      b. Triangle PWC Inc.
      c. Western Tube and Conduit Corporation.
      d. Wheatland Tube Company.
      e. LTV Steel Company.
      f. Or Approved Equal.
   2. Fiberglass conduit :
      a. Champion Fiberglass, Inc.
      b. United Fiberglass of America.
      c. Or Approved Equal.
   3. Rigid non-metallic conduit:
      a. Carlon.
      b. Cantex.
      c. Osburn Associates.
      d. Or Approved Equal.
   4. Flexible conduit:
      a. Delikon.
      b. Anamet, Inc.
      c. Electri-Flex.
      d. Flexible Metal Hose Company.
      e. International Metal Hose Company.
      f. Triangle PWC Inc.
      g. LTV Steel Company.
      h. Or Approved Equal.
   5. Wireway:
      a. Hoffman Engineering Company.
      b. Wiegmann.
      c. Square D.
      d. Or Approved Equal.
   6. Conduit fittings and accessories:
      a. Appleton.
      b. Carlon.
      c. Cantex.
      d. Crouse-Hinds.
      e. Killark.

f. Osburn Associates.
g. OZ Gedney Company.
h. RACO.
i. Steel City.
j. Thomas and Betts.
k. Or Approved Equal.

7. Support systems:
   a. Unistrut Building Systems.
   b. B-Line Systems Inc.
   c. Kindorf.
   d. Minerallac Fastening Systems.
   e. Caddy.
   f. Or Approved Equal.
8. Outlet, pull and junction boxes:
   a. Appleton Electric Co.
   b. Crouse-Hinds.
   c. Killark.
   d. O-Z/Gedney.
   e. Steel City.
   f. Raco.
   g. Bell.
   h. Hoffman Engineering Co.
   i. Wiegmann.
   j. B-Line Circle AW.
   k. Adalet.
   l. Rittal.
   m. Or Approved Equal.

2.2 RIGID METALLIC CONDUITS

A. Rigid Galvanized Steel Conduit (RGS):
   1. Mild steel with continuous welded seam.
   2. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing.
   3. Threads galvanized after cutting.
   4. Internal coating: Baked lacquer, varnish or enamel for a smooth surface.
   5. Standards: NEMA/ANSI C80.1, UL 6.

2.3 RIGID NON-METALLIC CONDUIT

A. Fiberglass Conduit:
   1. UL approved for above grade installation.
   2. UV inhibited.
   3. Adhesive weld joints.
   4. Standards: UL 1684, NEMA TC 14-2002.
B. Schedules 40 (PVC-40) and 80 (PVC-80):
   1. Polyvinyl-chloride (PVC) plastic compound which includes inert modifiers to improve weatherability and heat distribution.
   2. Rated for direct sunlight exposure.
   3. Fire retardant and low smoke emission.
   4. Shall be suitable for use with 90 DegC wire and shall be marked "maximum 90 DegC".
   5. Standards: NEMA TC 2, UL 651.

2.4 FLEXIBLE CONDUIT

A. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):
   1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
   2. Extruded PVC outer jacket positively locked to the steel core, sunlight (UV) resistant.
   3. Liquid and vaportight.
   4. Corrosion resistant aluminum or 316 stainless fittings.
   5. Standard: UL 360.

2.5 WIREWAY

A. General:
   1. Suitable for lay-in conductors.
   2. Designed for continuous grounding.
   3. Covers:
      a. Hinged or removable in accessible areas.
      b. Non-removable when passing through partitions.
   4. Finish: Rust inhibiting primer and manufacturers standard paint inside and out except for stainless steel type.
   5. Standards: UL 870, NEMA 250.
B. Watertight (NEMA 4X rated) Wireway:
   1. 14 GA Type 304 or 316 stainless steel bodies and covers without knockouts and 10 GA stainless steel flanges.
   2. Cover: Fully gasketed and held in place with captive clamp type latches.
   3. Flanges: Fully gasketed and bolted.
C. Dusttight (NEMA 12 rated) Wireway:
   1. 14 GA steel bodies and covers without knockouts and 10 GA steel flanges.
   2. Cover: Fully gasketed and held in place with captive clamp type latches.
   3. Flanges: Fully gasketed and bolted.

2.6 CONDUIT FITTINGS AND ACCESSORIES

A. Fittings for Use with RGS:
   1. Locknuts:
      a. Threaded steel or malleable iron.
      b. Gasketed or non-gasketed.
      c. Grounding or non-grounding type.
   2. Bushings:
      a. Threaded, insulated metallic.
      b. Grounding or non-grounding type.
   3. Hubs: Threaded, insulated and gasketed metallic for raintight connection.
   4. Couplings:
      a. Threaded straight type: Same material and finish as the conduit with which they are used on.
      b. Threadless type: Gland compression or self-threading type, concrete tight.
   5. Unions: Threaded galvanized steel or zinc plated malleable iron.
   6. Conduit bodies (ells and tees):
      a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
      b. Standard and mogul size.

c. Cover:
1) Clip-on type with stainless steel screws.
2) Gasketed or non-gasketed galvanized steel, zinc plated cast iron or cast copper free aluminum.

7. Conduit bodies (round):
a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
b. Cover: Threaded screw on type, gasketed, galvanized steel, zinc plated cast iron or cast copper free aluminum.

8. Expansion couplings:
a. 2 IN nominal straight-line conduit movement in either direction.
b. Galvanized steel with insulated bushing.
c. Gasketed for wet locations.
d. Internally or externally grounded.

9. Expansion/deflection couplings:
a. 3/4 IN nominal straight-line conduit movement in either direction.
b. 30-degree nominal deflection from the normal in all directions.
c. Metallic hubs, neoprene outer jacket and stainless steel jacket clamps.
d. Internally or externally grounded.
e. Watertight, raintight and concrete tight.

10. Standards: UL 467, UL 514B, UL 886.

B. Fittings for Use with Fiberglass Conduit:
1. Fiberglass by same manufacturer as conduit:
a. Condulets.
b. Ells.
c. Couplings.
d. Strut Support System 316 stainless steel or fiberglass, (if fiberglass must be by manufacturer of conduit).

C. Fittings for Use with FLEX-LT:
1. Connector:
a. Straight or angle type.
b. Metal construction, insulated and gasketed, corrosion resistant aluminum or 316 stainless steel.
c. Composed of locknut, grounding ferrule and gland compression nut.
d. Liquid tight.
2. Standards: UL 467, UL 514B.

2.7 ALL RACEWAY AND FITTINGS

A. Mark Products:
1. Identify the nominal trade size on the product.
2. Stamp with the name or trademark of the manufacturer.

2.8 OUTLET BOXES

A. Cast Outlet Boxes:
1. Zinc plated cast iron or die-cast copper free aluminum with manufacturers standard finish.
2. Threaded hubs and grounding screw.
3. Styles:
a. "FS" or "FD".
b. "Bell".

c. Single or multiple gang and tandem.
4. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.
5. Standards: UL 514A, UL 886.

2.9 PULL AND JUNCTION BOXES

A. NEMA 4X Rated (metallic):
1. Body and cover: 14 GA Type 304 or 316 stainless steel.
2. Seams continuously welded and ground smooth.
3. No knockouts.
4. External mounting flanges.
5. Hinged door and stainless steel screws and clamps.
6. Door with oil-resistant gasket.

B. NEMA 12 Rated:
1. Body and cover:
a. 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
b. Type 5052 H-32 aluminum, unpainted.
2. Seams continuously welded and ground smooth.
3. No knockouts.
4. External mounting flanges.
5. Non-hinged cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
6. Flat door with oil resistant gasket.

C. Miscellaneous Accessories:
1. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
2. Split covers when heavier than 25 LBS.
3. Weldnuts for mounting optional panels and terminal kits.
4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 ampere minimum.

D. Standards: NEMA 250, UL 50.

2.10 SUPPORT SYSTEMS

A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
1. Material requirements.
a. Galvanized steel: ASTM A123 or ASTM A153.
b. Stainless steel: AISI Type 316.
c. PVC coat galvanized steel: ASTM A123 or ASTM A153 and 20 mil PVC coating.

B. Single Conduit and Outlet Box Support Fasteners:
1. Material requirements:
a. Zinc plated steel.
b. Stainless steel.
c. Malleable iron.
d. PVC coat malleable iron or steel: 20 mil PVC coating.
e. Steel protected with zinc phosphate and oil finish.

2.11 OPENINGS AND PENETRATIONS IN WALLS AND FLOORS

A. Cut neatly. See Section 02072 (Demolition, Cutting and Patching).

PART 3 EXECUTION

3.1 RACEWAY INSTALLATION - GENERAL

A. Shall be in accordance with the requirements of:
   1. NFPA 70.
   2. Manufacturer instructions.
B. Size of Raceways:
   1. Raceway sizes are indicated, if not indicated, then size in accordance with NFPA 70.
   2. Unless specifically indicated otherwise, the minimum raceway size shall be:
      a. Conduit: 3/4 IN.
      b. Wireway: 2-1/2 IN x 2-1/2 IN.
C. Field Bending and Cutting of Conduits:
   1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
   2. Do not reduce the internal diameter of the conduit when making conduit bends.
   3. Prepare tools and equipment to prevent damage to the PVC coating.
   4. Degrease threads after threading and apply a zinc rich paint.
   5. Debur interior and exterior after cutting.
D. Male threads of conduit systems shall be coated with an electrically conductive anti-seize compound.
E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
   1. Repair galvanized components utilizing a zinc rich paint.
   2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
   3. Repair surfaces which will be inaccessible after installation prior to installation.
F. Remove moisture and debris from conduit before wire is pulled into place.
   1. Pull mandrel with diameter nominally 1/4 IN smaller than the interior of the conduit, to remove obstructions.
   2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
   3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.
G. Only nylon or polyethylene rope shall be used to pull wire and cable in conduit systems.
H. Where portions of a raceway are subject to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway shall be sealed to prevent circulation of warm air to colder section of the raceway.
I. Fill openings in walls, floors, and ceilings and finish flush with surface.

3.2 RACEWAY ROUTING

A. Raceways shall be routed in the field unless otherwise indicated.
   1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
   2. Run in straight lines parallel to or at right angles to building lines.
   3. Do not route conduits:
      a. Through areas of high ambient temperature or radiant heat.
      b. In suspended concrete slabs.
   4. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.

5. Provide pull boxes or conduit bodies as needed so that there is a maximum of 360 degrees of bends in the conduit run or in long straight runs to limit pulling tensions.

B. All rigid conduits within a structure shall be installed exposed.

C. Conduits shall be installed to eliminate moisture pockets.
   1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.

D. Conduit shall not be routed on the exterior of structures except as specifically indicated.

E. Provide all required openings in walls, floors, and ceilings for conduit penetration.

3.3 RACEWAY APPLICATIONS

A. Permitted Raceway Types Per Wire or Cable Types:
   1. Power wire or cables: All raceway types.
   2. Control wire or cables: All raceway types.
   3. Instrumentation cables: Metallic raceway except non-metallic may be used underground.

B. Permitted Raceway Types Per Area Designations:
   1. Dry areas:
      a. RGS.
   2. Wet areas and outdoors exposed to weather:
      a. Fiberglass.

C. FLEX-LT conduits shall be install as the final conduit connections to equipment.

D. NEMA 4X Rated Wireway:
   1. Surface mounted in areas designated as wet and outdoors exposed to weather.

E. NEMA 12 Rated Wireway:
   1. Surface mounted in areas designated as dry.

3.4 CONDUIT FITTINGS AND ACCESSORIES

A. Rigid non-metallic conduit and fittings shall be joined utilizing solvent cement.
   1. Immediately after installation of conduit and fitting, the fitting or conduit shall be rotated 1/4 turn to provide uniform contact.

B. Install Expansion Fittings:
   1. Where conduits are exposed to the sun and conduit run is greater than 200 FT.
   2. Elsewhere as indicated.

C. Install Expansion/Deflection Fittings:
   1. Where conduits enter a structure.
      a. Except electrical manholes and handholes.
      b. Except where the ductbank is tied to the structure with rebar.
   2. Where conduits span structural expansions joints.
   3. Elsewhere as indicated.

D. Threaded connections shall be made wrench-tight.

E. Conduit joints shall be watertight:
   1. Where subjected to possible submersion.
   2. In areas classified as wet.
   3. Underground.

F. Terminate Conduits:
   1. In metallic outlet boxes:
      a. RGS:
         1) Conduit hub and locknut.
         2) Insulated bushing and two (2) locknuts.

3) Use grounding type locknut or bushing when required by NFPA 70.
2. In NEMA 1 rated enclosures:
   a. RGS:
      1) Conduit hub and locknut.
      2) Insulated bushing and two (2) locknuts.
      3) Use grounding type locknut or bushing when required by NFPA 70.
3. In NEMA 12 rated enclosures:
   a. Watertight, insulated and gasketed hub and locknut.
   b. Use grounding type locknut or bushing when required by NFPA 70.
4. In NEMA 4X rated enclosures:
   a. Watertight, insulated and gasketed hub and locknut.
5. When stubbed up through the floor into floor mount equipment:
   a. With an insulated grounding bushing on metallic conduits.
   b. With end bells on non-metallic conduits.

G. Threadless couplings shall only be used to join new conduit to existing conduit when the existing conduit end is not threaded and it is not practical or possible to cut threads on the existing conduit with a pipe threader.

3.5 CONDUIT SUPPORT

A. Permitted multi-conduit surface or trapeze type support system per area designations and conduit types:
   1. Dry areas:
      a. Galvanized system consisting of: Galvanized steel channels and fittings, nuts and hardware and conduit clamps.
   2. Wet areas:
      a. Stainless steel or fiberglass system.
   3. Conduit type shall be compatible with the support system material.
      a. Galvanized steel system may be used with RGS.
      b. Stainless steel or fiberglass system may be used with fiberglass conduit.

B. Permitted single conduit support fasteners per area designations and conduit types:
   1. Dry areas:
      a. Material: Zinc plated steel, stainless steel and malleable iron.
      b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
   2. Wet areas and outdoors exposed to weather:
      a. Material: Stainless steel or fiberglass.
      b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
   3. Conduit type shall be compatible with the support fastener material.
      a. Zinc plated steel, steel protected with zinc phosphate and oil finish and malleable iron fasteners may be used with RGS.
      b. Stainless steel or fiberglass system may be used with fiberglass conduit.

C. Conduit Support General Requirements:
   1. Maximum spacing between conduit supports per NFPA 70.
   2. Support conduit from the building structure.
   3. Do not support conduit from process, gas, air or water piping; or from other conduits.

4. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 LBS.
   a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
   b. Conduit hangers:
      1) Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.
5. Conduit support system fasteners:
   a. Use sleeve-type expansion anchors as fasteners in masonry wall construction.
   b. Do not use concrete nails and powder-driven fasteners.

3.6 OUTLET, PULL AND JUNCTION BOX INSTALLATION

A. General:
   1. Install products in accordance with manufacturer's instructions.
   2. Fill unused punched-out, tapped, or threaded hub openings with insert plugs.
   3. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.
B. Outlet Boxes: Cast type only.
   1. Mount device outlet boxes where indicated.
   2. Set device outlet boxes plumb and vertical to the floor.
C. Pull and Junction Boxes:
   1. Install pull or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections.
      a. Make covers of boxes accessible.
   2. Permitted uses of NEMA 4X metallic enclosure:
      a. Pull or junction box surface mounted in areas designated as wet and outdoors exposed to weather.
   3. Permitted uses of NEMA 12 enclosure:
      a. Pull or junction box surface mounted in areas designated as dry.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Material and installation requirements for:
      a. Light switches.
      b. Receptacles.
      c. Device wallplates and coverplates.

1.2 REFERENCES

A.	NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
B.	NEMA WD-1	Wiring Devices
C.	NEMA WD-6	Wiring Devices - Dimensional Requirements
D.	NEMA 5-20R	Receptacle Configuration
E.	UL 20	General Use Snap Switches
F.	UL 498	Attachment Plugs and Receptacles
G.	UL 514A	Metallic Outlet Boxes
H.	UL 894	Safety Switches for Use in Hazardous (Classified) Locations
I.	UL 943	Ground-Fault Circuit-Interrupters
J.	UL 1010	Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations

1.3 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Light switches and receptacles:
      a. Hubbell.
      b. Bryant.
      c. Pass & Seymour.
      d. Arrow Hart.
      e. General Electric.
      f. Leviton.
      g. Crouse-Hinds.
      h. Appleton Electric Co.
      i. Killark.
      j. Or Approved Equal.

2.2 LIGHT SWITCHES

A. General requirements unless modified in specific requirements paragraph of switches per designated areas or types:
   1. Toggle type, quiet action, heavy duty grade.
   2. Self grounding with grounding terminal.
   3. Back and side wired.
   4. Solid silver cadmium oxide contacts.
   5. Rugged urea housing and one-piece switch arm.
   6. Rated 20 A, 120/277 V AC.
   7. Switch handle color: Ivory.
   8. Types as indicated:
      a. Single pole.
      b. Double pole.
      c. 3-way.
      d. 4-way.
   9. Standards: UL 20, 514A; NEMA WD-6.
B. Wallplate: Type 302 stainless steel. Single or multiple gang as required.
C. Wet and Corrosive Areas:
   1. Corrosion resistant nickel plated metal parts.
   2. Coverplate: Gasketed zinc plated malleable iron or copper free aluminum with stainless steel screws utilizing rocker, front mounted toggle or pull type switch. Single or multiple gang as required.

2.3 RECEPTACLES

A. General requirements unless modified in specific requirements paragraph of receptacles per designated areas:
   1. Straight blade, all GFCI type, extra heavy duty grade.
   2. Brass triple wipe line contacts.
   3. One piece grounding system with double wipe brass grounding contacts and self grounding strap.
   4. Back and side wired.
   5. Rated 20 A, 125 V AC.
   6. High impact nylon body.
   7. Receptacle body color:
      a. Normal power: Ivory.
      b. Generator or UPS power: Red.
   8. All outlets to be ground fault circuit interrupter: Feed-through type with test and reset buttons.
   9. Duplex or simplex as indicated.
   10. Configuration: NEMA 5-20R.
   11. Standards: UL 498, 514A, 943; NEMA WD-1, WD-6.
B. Wallplate: Type 302 stainless steel.
C. Wet and Corrosive Areas:
   1. Corrosion resistant nickel plated metal parts.
   2. Receptacle body color: Yellow.
D. Special Purpose Receptacles:
   1. NEMA configuration as indicated.
   2. Coverplate: See requirements per area designations herein.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Mount devices where indicated and as scheduled in Section 16010 (Electrical: Basic Requirements).
C. See Section 16130 (Raceway and Boxes) for device outlet box requirements.
D. Where more than one receptacle is installed in an area, the receptacles shall be symmetrically arranged.
E. Provide blank plates for empty outlets.

END OF SECTION

SECTION 16265

VARIABLE FREQUENCY DRIVES - LOW VOLTAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Variable frequency drives (VFDs) for operation of 460 V AC, 3 PH, 60 HZ induction motors.

1.2 REFERENCES

A.	ANSI C62.41	Guide for Surge Voltages in Low Voltage AC Power Circuits
B.	ANSI C62.45	Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits
C.	IEEE 519	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
D.	NEMA ICS 6	Enclosures for Industrial Controls and Systems
E.	NEMA MG-1	Motors and Generators
F.	NFPA 70	National Electrical Code
G.	UL 508	Electrical Industrial Control Equipment

1.3 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements)
B. Product Data:
   1. Rated VFD input kVA and current.
   2. Rated output kVA and current.
   3. Overload current.
   4. Percent efficiency and power factor at 50, 75, and 100 percent speed.
   5. Maximum BTU heat release data and verification of the drive cooling requirements.
   6. Panel interior, and front and side exterior views, with details showing maximum overall dimensions of VFD and isolation transformer (if provided).
   7. Locations and sizes of electrical connections, ground terminations, and shielded wire usage.
   8. Identification and location of closest authorized service organization.
C. Quality Assurance/Control Submittals:
   1. Certificates:
      a. Submit after installation:
         1) That the critical frequency of the drive system has been identified and the VFD has been set to lockout these frequencies.
         2) Installation test reports that show:
            (a) Each VFD is operational.
            (b) Each VFD and its driven equipment motor is compatible.
            (c) Each VFD responds correctly to the input control signals.
         3) Schedule of actual settings of parameters in VFD. (Place in Installation, Operation, and Maintenance Manual.)
   2. Manufacturer's Instructions:
      a. Troubleshooting procedures with a cross-reference between symptoms and corrective recommendations.

b. Connection data to permit removal and installation of recommended smallest field-replaceable parts.

D. Installation, Operations and Maintenance Manuals:
1. Each type and size of VFD.
2. Listing of all parameter settings. (Default and site specific.)
3. Wiring diagrams.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Provide drives that have the standard factory configuration of the variable speed drive listed and labeled by Underwriter's Laboratories, Inc. (UL), Canadian Standards Association (CSA), ETL Testing Laboratories (ETL), or that shall be capable of field inspection and subsequent field labeling by a UL-recognized field inspector. Where drives and controlling equipment are mounted in a custom enclosure, UL listed components shall be furnished.
2. VFD Supplier shall maintain an authorized service organization within 300 miles of the Site.

B. Coordination:
1. VFD manufacturer shall verify with the driven equipment manufacturer that the VFD and the drive motor are compatible and that the VFD will operate the driven equipment motor over its required operating range and will do so without exceeding the motor or VFD safety factors.
2. VFD shall be supplied complete with all required control components.
   a. VFD manufacturer shall review the application and provide, at no additional cost to the Owner, the hardware and software necessary to allow the VFD to control the driven equipment motor over its required operating range. These may include, but are not limited to, analog and digital interface modules, communication interface modules, feeder circuit power output filters or chokes which may be required due to VFD to motor feeder length, switches, lights and other devices.
3. Verify plan dimensions with equipment space requirements as indicated.
   a. Equipment which exceed the allotted maximum dimensions may not be acceptable.
   b. Equipment which reduces clear space below the minimums established by the NEC will not be acceptable.
4. Contractor shall coordinate submittal with submittals from the motor manufacturer and the equipment manufacturer to provide concurrent submittals.

C. VFD manufacturer shall clearly identify conditions that will limit the operation of, or cause damage to, the VFD. These shall include, but are not limited to:
1. Line side overvoltage.
2. Line side voltage imbalance.
3. Line side surge magnitude and duration.
4. Location of VFD enclosure with respect to external cooling air flow.

1.5 MAINTENANCE

A. Provide list of manufacturer's recommended spare parts.

B. When not included in the recommended spare parts provide for each type and rating of drive:
1. One set of 3 of each type power fuse.
2. One set of 12 of each type control fuse.

C. Spare parts shall be labeled and packed in containers suitable for storage.

D. Spare parts utilized during pre-startup or startup and demonstration testing shall be immediately restocked, at no cost to the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Allen Bradley Power Flex 70. No substitutions.

2.2 TYPE OF DRIVE

A. Pulse-Width Modulated (PWM) type with IGBT transistors.

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

A. Application:
   1. VFD(s) shall be of sufficient capacity and shall provide a quality output waveform for stepless motor control from 10 to 100 percent of base speed for (NEMA Design B squirrel cage induction motors or special purpose submersible pump squirrel cage induction motor.
   2. The drives shall be suitable for Constant Torque (CT) or Variable Torque (VT) applications.
   3. VFDs shall be designed to operate successfully under the following conditions:
      a. Ambient:
         1) Temperature: 0-40 DegC.
         2) 95 percent non-condensing relative humidity.
      b. Elevation: 200 FT above MSL.
      c. Input power to VFD:
         1) 480 V AC (±10 percent).
         2) 3 PH, 60 HZ (±3 percent).
      d. Line voltage imbalance ±5 percent of rated voltage.

B. Performance:
   1. The VFD shall have the following capabilities:
      a. Voltage rating:
         1) 480 V AC, 3 PH, 60 HZ.
      b. Continuous current rating:
         1) 100 percent of rated VFD current shall be equal to or greater than the motor full load nameplate rating including motor service factor.
      c. Current overload capacity:
         1) VT: 110 percent for 1 min..
         2) CT: 150 percent for 1 min..
      d. Efficiency:
         1) 97 percent at full speed and full load.
         2) 93 percent at 1/2 speed and full load.
         3) Efficiency shall be determined excluding isolation transformer and input and output reactor losses.
      e. Power Factor:
         1) 94 percent at full speed and load.

f. Frequency drift:
   1) ± 0.5 percent of set frequency.
g. Speed regulation (motor dependent):
   1) 3 percent.
h. Speed range:
   1) 10:1.
i. Critical frequency lockout:
   1) Minimum of three.
j. Continued operation with momentary voltage dips of 25 percent of rated voltage for a 4 second duration.
k. Volts/Hertz ratio; constant over the entire operating range of the VFD except:
   1) When operating under voltage boost.
   2) At frequencies over 60 HZ.
l. Automatic restart following a power outage.
m. Spinning load restart: Synchronization of VFD starting frequency with spinning or coasting load.
n. Load side contactor that opens when VFD is off.

C. The VFD shall be provided with the following adjustments:
   1. Independent maximum and minimum speed.
   2. Independent linear acceleration and deceleration time.
   3. Volts/Hertz ratio.
   4. Voltage boost.
   5. Process follower gain, offset and bias.
   6. Torque limit.
   7. Overcurrent trip point.

D. The VFD shall have the power circuit designed such that the power circuit components are protected:
   1. Input protection:
      a. Undervoltage trip:
         1) Auto restart.
         2) Ride through a momentary power dip, magnitude and duration as previously specified.
         3) Ride through a one cycle loss of power.
      b. Incoming line transient suppression.
      c. Loss of phase trip:
         1) Manual restart.
      d. Reverse phase trip:
         1) Manual restart.
      e. Overvoltage trip:
         1) Manual restart.
   2. Internal protection:
      a. Surge suppression and power device snubbers.
      b. Power devices rated at 2.5 times line voltage.
      c. Instantaneous overcurrent trip with manual reset.
      d. DC bus overvoltage trip with manual reset.
      e. Power device overtemperature trip with manual reset.
      f. Control logic circuit malfunction trip with manual reset.

3. Output protection:
   a. Inverse-time overload trip:
      1) Manual restart.
   b. Overvoltage trip:
      1) Manual restart.
   c. Overfrequency trip:
      1) Manual restart.
   d. Short circuit trip:
      1) Line to line and line to ground.
      2) Manual restart.
   e. Ground fault trip:
      1) Manual restart.

2.4 OPERATOR AND REMOTE CONTROL INTERFACE

A. Control circuits shall be 115 V AC.
B. Operator interface:
   1. Sealed keypad, membrane type with LED or LCD display.
      a. Messages shall be in English and engineering units.
      b. Drive operating parameters shall be programmable.
      c. Menu driven.
      d. Password security.
      e. Display fault and diagnostic data.
      f. Operating parameters, fault and diagnostic data maintained in non-volatile memory with historic log of fault and diagnostic data.
      g. Gold plated plug-in contacts.
      h. Mounted on door of panel.
   2. Diagnostic indicators located externally on the face of the drive shall show the type of fault responsible for drive warning, shutdown or failure. On occurrence of more than one condition each shall be recorded or indicated by the diagnostics.
C. Remote Control Interface:
   1. Analog and discrete inputs:
      a. Isolated process follower with offset, gain and span adjustment for accepting a remote 4-20 mA DC speed reference signal.
      b. Drive disable permissive:
         1) Per Section 13441 (Control Loop Descriptions).
   2. Analog and discrete outputs:
      a. 4-20 mA DC output for remote speed indication, as a function of frequency, calibrated 0 to 100 percent.
      b. Drive FAULT contacts.
      c. Drive RUNNING contacts.
      d. Drive in REMOTE status contacts.
   3. Contacts:
      a. Contacts shall be rated 2 A inductive at 120 V AC.
      b. All contacts shall be wired to terminal boards.

2.5 EQUIPMENT CONSTRUCTION

A. Fabrication and Assembly:
   1. Each VFD system shall be open type for installation in an existing enclosure and shall utilize interchangeable plug-in printed circuit boards and power conversion components

wherever possible. Systems fabricated or assembled in whole or in part by parties other than the VFD manufacturer or his authorized agent will not be acceptable.

2. Cooling fans shall be provided to run when drive is running where required.

B. Wiring:

1. The wiring in the VFD shall be neatly installed in wire ways or with wire ties where wire ways are not practical. Where wire ties are used, the wire bundles are to be held at the back panel with a screw-mounted wire tie mounting base. Bases with a self-sticking back will not be allowed.
2. All plug-in contacts shall be gold-plated.
3. Terminal blocks shall be complete with marking strip, covers and pressure connectors. They shall be nonbrittle, interlocking, track-mounted type. Screw terminals will not be allowed. A terminal shall be provided for each conductor of external circuits plus one ground for each shielded cable. For free-standing panels, 8 IN of clearance shall be provided between terminals and the panel base for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Terminals shall be labeled to agree with identification indicated on the suppliers submittal drawings. Each control loop or system shall be individually fused, and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.
4. All grounding wires shall be attached to the enclosure sheet metal with a ring tongue terminal. The surface of the sheet metal shall be prepared to assure good conductivity and corrosion protection.
5. Wiring shall not be kinked or spliced and shall have markings on both ends or be color coordinated. Markings or color coordination shall comply with the manufacturer's drawings.
6. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 V, with a moisture-resistant and flame-retardant covering rated for not less than 90 DegC.

C. Nameplates:

1. All devices mounted on the face of the drive shall be provided with a suitable nameplate as specified in Section 10405 (Identification, Stenciling, and Tagging Systems). Push buttons, selector switches, and pilot lights shall have the device manufacturer's standard legend plate. All other devices shall have an engraved, laminated plate. All lettering shall be a minimum of 3/16 IN high and shall be white or silver on a black background.
2. Relays, terminals and special devices inside the control enclosure shall have permanent markings to match identification used on manufacturer's wiring diagrams.
3. Use stainless steel screws to attach nameplates.

D. Painting: Equipment, after being phosphate washed, shall be thoroughly cleaned and given at least one coat of rust-inhibiting primer on all inner surfaces prior to fabrication.

2.6 SOURCE QUALITY CONTROL

A. Factory Tests:

1. Conduct all standard tests in accordance with NEMA and ANSI standards to ensure conformance to Specification requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions and as indicated.
B. Verify the installed motor nameplate electrical requirements do not exceed the VFD capacity.
C. Provide services of manufacturer's representative to perform start-up services.

3.2 START UP

A. Pre-startup services:
   1. Shall be completed a minimum of 30 Days prior to the startup and demonstration period.
   2. Shall consist of:
      a. Physical and electrical installation check.
      b. Final adjustments and calibration of drive parameters.
      c. VFD operation from simulated input signals.
   3. Shall be complete when VFD(s) are fully operational.
B. Startup and demonstration services:
   1. Supervise startup of all units including recheck of settings made during the pre-startup tests.
      a. Perform all Work in the presence of the Owner's designated representatives.
   2. Simulate operation of the VFD and its associated control and instrumentation system in both the manual and automatic modes.
      a. Ensure compatibility of VFD with associated control and instrumentation signals.
   3. Simulate VFD failures and demonstrate troubleshooting aids.
   4. Instruct Owner's designated personnel:
      a. Minimum of 1 hour at the Site.
      b. Instructions shall include proper operation and maintenance procedures including, but not limited to:
         1) Troubleshooting.
         2) Repair and replacement.

3.3 SCHEDULE

A. Recycle Pump:

MOTOR HP	VFD RATING	REACTOR		MOUNTING	TYPE
		INPUT	OUTPUT		
10	10 HP, Heavy Duty	No	No	Existing Panel	6 Pulse

3.4 INSTALLATION IN EXISTING PANEL

A. Install in existing air conditioned panel with the existing 3 VFD's.
B. Install proper nameplates on each VFD; PMP-1, 2, 3 and 4.
C. Install wiring in neat bundles with tie-wraps and in existing plastic wireway.
D. Install ground lug in existing panel with space for 1#8 and 10#12 wires.
E. See Section 13448 (Control Panels and Enclosures).

END OF SECTION

SECTION 16410

SAFETY SWITCHES

PART 1 GENERAL

1.1 REFERENCES

A.	NEMA 250	Enclosures for Electrical Equipment (1000 Volt Maximum)
B.	NEMA KS-1	Enclosed and Miscellaneous Distribution Equipment Switches
C.	NFPA 70	National Electrical Code (NEC)
D.	UL 98	Enclosed and Dead-Front Switches.

1.2 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements).
B. Product Data:
   1. Associate safety switch type and rating with connect equipment tag number.
C. Installation, Operation and Maintenance Manuals:
   1. Safety switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following safety switch manufacturers are acceptable:
   1. Cutler-Hammer.
   2. General Electric Company.
   3. Square D Company.
   4. Siemens.
   5. Or Approved Equal.

2.2 SAFETY SWITCHES

A. General:
   1. Non-fusible or fusible as indicated.
   2. Suitable for service entrance when required.
   3. NEMA Type HD heavy-duty construction.
   4. Switch blades will be fully visible in the OFF position with the enclosure door open.
   5. Quick-make/quick-break operating mechanism.
   6. Deionizating arc chutes.
   7. Double-break rotary action shaft and switchblade shall be manufactured as one common component.
   8. Clear line shields to prevent accidental contact with line terminals.
   9. Operating handle:
      a. Red and easily recognizable.
      b. Padlockable in the OFF position
      c. Interlocked to prevent door from opening when the switch is in the ON position with a defeater mechanism.

B. Ratings:
   1. Horsepower rated of connected motor.
   2. Voltage and amperage: As indicated on Drawings.
   3. Short circuit withstand: Equal to or greater than the upstream equipment.
C. Enclosures:
   1. NEMA 4X rated (metallic):
      a. Body and cover: Type 304 or 316 stainless steel.
      b. No knockouts, external mounting flanges, hinged and gasketed door.
   2. NEMA 12 rated:
      a. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
      b. No knockouts, external mounting flanges, hinged and gasketed door.
D. Overcurrent and short circuit protective devices:
   1. Fuses.
   2. See Section 16490 (Overcurrent and Short Circuit Protective Devices) for overcurrent and short circuit protective device requirements.
E. Standards: NEMA KS-1, UL 98.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's instructions and recommendations.
B. Switches shall be installed adjacent to the equipment they are intended to serve unless otherwise indicated on the Drawings.
C. Permitted uses of NEMA 4X metallic enclosure:
   1. Surface mounted in areas designated as wet or outdoors exposed to weather.
D. Permitted uses of NEMA 12 enclosure:
   1. Surface mounted in areas designated as dry in non-architecturally finished areas.

END OF SECTION

SECTION 16412

SEPARATELY MOUNTED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Separately mounted circuit breakers.

1.2 REFERENCES

A. UL 489 — Standard for Safety Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures

1.3 SUBMITTALS

A. Shop Drawings:
   1. Circuit breakers.
B. Installation, Operation, and Maintenance Manual:
   1. Circuit breakers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Cutler Hammer.
   2. General Electric Company.
   3. Square D Company.
   4. Siemens.
   5. Or Approved Equal.

2.2 COMPONENTS

A. NEMA 4X rated:
   1. Body and cover: Type 304 or 316 stainless steel.
   2. No knockouts, external mounting flanges, hinged and gasketed door.
   3. Front operating handle padlockable in the OFF position and interlocked to prevent door from opening when the breaker is ON.
   4. Suitable for service entrance.
B. NEMA 12 rated:
   1. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
   2. No knockouts, external mounting flanges, hinged and gasketed door.
   3. Front operating handle padlockable in the OFF position and interlocked to prevent door from opening when the breaker is ON.
   4. Suitable for service entrance.
C. Standards: UL 489.
D. Overcurrent and short circuit protective devices:
   1. Molded case circuit breaker.
   2. See Section 16490 for overcurrent and short circuit protective device requirements.

3. Factory installed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations and instructions.
B. Permitted uses of NEMA 4X enclosure:
   1. Surface mounted in areas designated as wet or outdoors exposed to weather.
C. Permitted uses of NEMA 12 enclosure:
   1. Surface mounted in areas designated as dry.

END OF SECTION

SECTION 16442

MOTOR CONTROL EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Motor control centers.
   2. Separately mounted motor starters (including those supplied with equipment).
   3. Manual motor starters.
   4. Arc flash calculations, labels and any recommendations to minimize PPE.
   5. Power meter.

1.2 REFERENCES

A.	NEMA/ANSI C12.26	For Electricity Meter - 0.2 and 0.5 Accuracy Class
B.	NEMA 250	Enclosures for Electrical Equipment (1000 Volt Maximum)
C.	NEMA ICS 1	Industrial Control Devices, Controllers, and Assemblies
D.	UL 508	Industrial Control Equipment
E.	UL 845	Electric Motor Control Centers

1.3 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements).
B. Shop Drawings:
   1. Front elevation and plan drawing of the assembly.
   2. Conduit space locations within the assembly.
   3. Single line drawing.
   4. Unit wiring diagrams for motor starter controls.
   5. Starter and component schedule.
   6. Typical control power transformer size calculation for each starter size.
   7. Discrepancies between equipment sizes on drawing and actual installed equipment.
C. Quality Assurance/Control Submittals:
   1. Test Reports:
      a. Ground fault protection system test report signed by the supervising electrical foreman.
D. Installation, Operation, and Maintenance Manual:
   1. Motor control center.
   2. Starters.
   3. Relays.
   4. Circuit breakers.
   5. Control devices.
   6. Power monitor.
   7. Copy of Arc Flash Report.

1.4 QUALITY ASSURANCE

A. Verify motor horsepower loads, other equipment loads, and controls from approved Shop Drawings and notify Owner of any discrepancies.
B. Verify the required instrumentation and control wiring for a complete system and notify Owner of any discrepancies.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Allen-Bradley
   2. Cutler Hammer.
   3. General Electric Company.
   4. Square D Company.
   5. Siemens.
   6. Or Approved Equal.

2.2 MOTOR CONTROL CENTERS

A. Ratings:
   1. 600 Volt class, 3 phase, 60 hertz with operating voltage and number of wires as indicated.
   2. Short circuit withstand rating: 65 KAIC symmetrical unless otherwise indicated.
B. Construction:
   1. Standards: UL 845.
   2. Totally enclosed, dead front, free standing assemblies. Bolted together to form a single assembly.
   3. Fabricate of not less than 14 GA steel with 16 GA steel doors in standardized units.
   4. Nominal size per section: 20 IN wide, 20 IN deep, and 90 IN high.
   5. Enclosure:
      a. NEMA 12:
         1) Dust-tight and drip-proof.
         2) Gasketed material round all doors, door cutouts, cover plates, side, top and back sheets.
         3) Gasketed bottom plate.
      b. NEMA 3R non-walk-in:
         1) Rainproof and sleet resistant.
         2) NEMA 1 gasketed enclosure with an outdoor house erected around it.
   6. Horizontal wireways:
      a. At the top, isolated from the main bus
      b. At the bottom.
      c. Easily accessible.
      d. Full length of the MCC.
   7. Vertical wireway:
      a. Located in each MCC section that accepts plug-in units.
      b. Connect to top and bottom wireways.
      c. Isolated from the unit interiors.
      d. Accessible through a separate hinged door.
      e. Cable tie supports to hold wiring in place.
   8. Unit doors:
      a. Formed round corners and rolled edges.
      b. Continuous piano hinge.
      c. Held closed by means of captive fasteners.
      d. Fabricate to be a part of the structure and not part of the starter.

9. Unit cubicles:
    a. Draw-out type for motor starters through NEMA Size 5.
    b. Guide rails for supporting and aligning starters.
    c. Operating handle:
        1) With the unit stabs engaged and door closed the handle mechanism allows complete ON/OFF control of the unit disconnect and clear indication of the disconnect status.
        2) Circuit breaker and MCP operators includes a separate TRIPPED position.
        3) Mechanical interlock to prevent the opening of the door when the disconnect is in the ON position with a defeater mechanism.
        4) Mechanical interlock to prevent the placement of the disconnect in the ON position with the door open with a defeater mechanism.
        5) Non-defeatable interlock to prevent the installation or removal of a unit unless the disconnect is in the OFF position.
        6) Padlockable in the OFF position.
    d. Control panel:
        1) Provide control devices as indicated per Section 16493 (Control Equipment Accessories), the following devices are the minimum required.
            (a) Three position switch (hand-off-auto).
            (b) Red ON indicator light.
            (c) Green OFF indicator light.
    e. Control Power:
        1) Control power transformer:
            (a) 120 Volt secondary.
            (b) Fused on primary and secondary side.
            (c) Sized for 140 percent of required load.
    f. Minimum of one full size space unit (12 IN) for any combination magnetic motor starter or starter without overload relay.
    g. One-half full size space unit (6 IN) for circuit breakers 100 A and less.
    h. Effectively baffled to isolate any ionized gases which may occur within unit starter.
    i. Each unit shall have a HawkEye IR window installed in the door for IR scanning.
10. Externally mounted overload relay pushbutton.
11. Assemblies effectively ventilated to allow relocation of starters and other components:
    a. Within the assembly and with the same load.
    b. Without having to compensate for changes in location.
12. Finish: Rust inhibited primer and manufacturers standard paint inside and out.
13. Provide ample unrestricted space for conduit entry from the bottom.
14. Wiring: NEMA Class I, Type B.
15. Seismic label.

C. Buses:
1. Material: Silver-plated copper.
2. Main horizontal bus:
    a. 600 A unless otherwise indicated.
    b. Extend the full-length of the MCC with provisions for splicing additional sections to either end.
3. Vertical buses
    a. 300 A minimum.

b. Securely bolted to the horizontal main bus with joint easily accessible for maintenance.
c. Completely isolated and insulated by means of a barrier.
d. Extended full length of vertical section to distribute incoming power to each circuit breaker and starter in structure. Starters NEMA size 5 and larger and certain other components may be cable connected to the main bus with the approval of the Owner.
e. Extend Vertical bus to spaces provided for future equipment.

4. Ground bus:
   a. Extend the full-length of the MCC with provisions for splicing additional sections to either end.
   b. 1/4 x 2 IN, 300 A tin-plated copper.
   c. Solidly grounded to each structure.
   d. Locate near bottom of structure.
   e. Provide for lug connection of equipment ground wires.

D. Overcurrent and Short Circuit Protective Devices:
   1. Main device:
      a. Molded case circuit breaker.
   2. Feeder devices:
      a. Molded case circuit breaker.
   3. Motor protection with full voltage starters:
      a. Motor circuit protector.
   4. Motor protection with VFD:
      a. Molded case circuit breaker.
   5. See Section 16490 (Overcurrent and Short Circuit Protective Devices) for overcurrent and short circuit protective device requirements.
   6. Factory installed.

E. Motor Starters: See requirements within this section.

F. Surge protective device: Integrally mounted, see Section 16491 (Low Voltage Surge Protection Devices (SPD)).

2.3 SEPARATELY MOUNTED COMBINATION STARTERS

A. Standards:
   1. NEMA 250, ICS 2.
   2. UL 508.

B. Enclosure:
   1. NEMA 4X rated:
      a. Body and cover: Type 304 or 316 stainless steel.
      b. No knockouts, external mounting flanges, hinged and gasketed door.
   2. NEMA 12 rated:
      a. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
      b. No knockouts, external mounting flanges, hinged and gasketed door.

C. Operating Handle:
   1. With the door closed the handle mechanism allows complete ON/OFF control of the unit disconnect and clear indication of the disconnect status.
   2. Circuit breaker and MCP operators includes a separate TRIPPED position.

3. Mechanical interlock to prevent to prevent the opening of the door when the disconnect is in the ON position with a defeater mechanism for use by authorized personnel.
4. Mechanical interlock to prevent the placement of the disconnect in the ON position with the door open with a defeater mechanism for use by authorized personnel.
5. Padlockable in the OFF position.
6. Exceptions: NEMA 7 and 9 enclosures.

D. External mounted overload relay pushbutton.

E. Control Devices:
1. Provide control devices as indicated on the Drawings.
2. Devices will be accessible with the door closed.

F. Control Power Transformer:
1. 120V secondary.
2. Fused on primary and secondary side.
3. Sized for 140 percent of required load.

G. Fault current withstand rating: Equal to the rating of the electrical gear from which it is fed.

H. Motor Starters: See requirements within this section.

I. Overcurrent and Short Circuit Protective Devices:
1. Motor protection with full voltage starters:
   a. Motor circuit protector.
2. Motor protection with reduced voltage starters:
   a. Molded case circuit breaker.
3. See Section 16490 (Overcurrent and Short Circuit Protective Devices) for overcurrent and short circuit protective device requirements.
4. Factory installed.

2.4 MOTOR STARTERS, IF SHOWN

A. Standards:
1. NEMA ICS 2.
2. UL 508.

B. Full Voltage Non-Reversing (FVNR) Magnetic Starters:
1. NEMA full size rated contactor.
   a. NEMA half sizes and IEC contactors are not permitted.
2. Double-break silver alloy contacts.
3. Overload relays:
   a. Ambient compensated, bimetallic type with interchangeable heaters, +/-24 percent adjustability, single phase sensitivity, an isolated arm contact and manual reset.
   b. Ambient insensitive, adjustable solid state type with phase loss protection, phase imbalance protection and manual reset.
4. Interlock and auxiliary contacts, wired to terminal blocks:
   a. Holding circuit contact, normally open.
   b. Overload alarm contact, normally open.
   c. Normally open auxiliary contact, for remote run status.
   d. Additional field replaceable auxiliary contacts as required per the Sequence of Operation.
   e. Two additional normally open spare field replaceable auxiliary contacts.

2.5 MANUAL MOTOR STARTERS, IF SHOWN

A. Standards:
1. NEMA 250, ICS 2.

2. UL 508.

B. Quick-make, quick-break toggle mechanism that is lockable in the OFF position.

C. Types:
1. Horsepower rated, for ON/OFF control.
2. Horsepower rated, for ON/OFF control and thermal overload protection. Switch to clearly indicate ON, OFF, and TRIPPED position.

D. Voltage and current ratings and number of poles as required for the connected motor.

E. Enclosures:
1. NEMA 4X rated:
   a. Type 304 or 316 stainless steel.
   b. No knockouts, external mounting flanges.
2. NEMA 12 rated:
   a. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
   b. No knockouts, external mounting flanges.

2.6 SYSTEM ARC FLASH

A. Arc flash labels shall be provided for and affixed to motor control center showing hazard category and PPE requirements.

2.7 DIGITAL METERING DEVICES

A. General:
1. Direct reading metered or calculated values.
2. Microprocessor based.
3. Integral LED or LCD display, mount on door.
4. Current and potential transformers as required.
5. Integral fusing.
6. Operating temperature: 0 DegF to 150 DegF.
7. Standards:
   a. NEMA/ANSI C12.20.
   b. UL 508.

B. Type 'B' Midrange Meter:
1. Display the following minimum electrical parameters:
   a. RMS current per phase.
   b. RMS voltage line-to-line and line-to-neutral.
   c. Real power (W): 3 PH total.
   d. Apparent power (VA): 3 PH total.
   e. Reactive power (VAR): 3 PH total.
   f. Power factor.
   g. Frequency.
   h. Percent current total harmonic distortion (31 st).
   i. Percent voltage total harmonic distortion (31 st).
2. Communication ports and protocols: As specified herein and/or as required for a functioning system.
3. Supply voltage: 120 Vac.

C. Retrofit Application Enclosure:
1. NEMA 12 rated for indoor locations.
2. Hinged front opening door with padlockable latch.
3. Input/output terminal blocks and wiring.

4. Separate control voltage source disconnect switch and wiring.
5. 600 Volt rated power voltage terminal blocks and wiring.
6. Current transformer shorting terminal blocks and wiring.

D. Current Transformer:
1. Window type.
2. Suitable to mount over MCC feed conductors.
3. 400: 5 amp ratio.
4. Accuracy to match power monitor.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations and instructions.
B. Mounting height for surface mounted equipment: See Section 16010 (Electrical: Basic Requirements).
C. Mount MCC on 4 IN high concrete pad:
1. Install two 4 IN wide channel sills flush in pads to support and maintain alignment of the MCC.
2. Align front of MCC with top edge of pad chamfer.

D. Overload Heaters:
1. Size for actual motor full load current of the connected motor.
2. For motors with power factor correction capacitors, size to compensate for the capacitors effect on load current.

E. Combination and Manual Starter Enclosures:
1. Permitted uses of NEMA 4X enclosure:
   a. Surface mounted in areas designated as wet or outdoors exposed to weather.
2. Permitted uses of NEMA 12 enclosure:
   a. Surface mounted in areas designated as dry.

F. Power Meter:
1. Install current transformer over conductors feeding MCC-5-100.
2. Install fuse block in main breaker compartment for voltage sensing.
3. Meter maybe installed on cover of spare section or in separate enclosure.

3.2 FIELD QUALITY CONTROL

A. Test all breakers and control circuits/starters for proper operation.
B. Configure all points on power meter and include in MCC installation, Operations and Maintenance Manual.

END OF SECTION

SECTION 16490

OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Low voltage circuit breakers.
   2. Low voltage fuses.

1.2 REFERENCES

A. IEEE 242	Protection and Coordination of Industrial and Commercial Power Systems (Buff Book)
B. IEEE 399	Power System Analysis (Brown Book)
C. NEMA AB1	Molded Case Circuit Breakers
D. UL 489	Molded Case Circuit Breakers and Circuit Breaker Enclosures
E. UL 943	Ground Fault Circuit Interrupters

1.3 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements).
B. Product Data:
   1. Descriptive literature on all equipment proposed.
C. Installation, Operation, and Maintenance Manual:
   1. Circuit breakers.
   2. Fuses.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Circuit breakers:
      a. Cutler-Hammer.
      b. General Electric Company.
      c. Square D Company.
      d. Siemens.
      e. Or Approved Equal.
   2. Fuses:
      a. Bussmann, Inc.
      b. Littlefuse, Inc.
      c. Gould Shawmut.
      d. Or Approved Equal.

2.2 CIRCUIT BREAKERS

A. Molded case type:
   1. General:
      a. Standards: NEMA AB 1, UL 489.

b. Unit construction.
c. Over-center, toggle handle operated.
d. Quick-make, quick-break, independent of toggle handle operation.
e. Manual and automatic operation.
f. All poles open and close simultaneously.
g. Three position handle: on, off and tripped.
h. Molded-in ON and OFF markings on breaker cover.
i. One-, two- or three-pole as indicated.
j. Current and interrupting ratings as indicated.
k. Bolt on type.

2. Thermal magnetic type:
   a. Inverse time overload and instantaneous short circuit protection by means of a thermal magnetic element.
   b. Frame size 150 amp and below:
      1) Non-interchangeable, non-adjustable thermal magnetic trip units.
   c. Frame sizes 225 to 250 amp:
      1) Interchangeable and adjustable instantaneous thermal magnetic trip units.
   d. Ground Fault Circuit Interrupter (GFCI) Listed:
      1) Standard: UL 943.
      2) One- or two-pole as indicated.
      3) Class A ground fault circuit.
      4) Trip on 5 mA ground fault (4-6 mA range).
   e. HACR listed:
      1) Heating, air conditioning and refrigeration applications.
3. Solid state trip type:
   a. Inverse time overload, instantaneous short circuit and ground fault protection by means of a solid state trip element, associated current monitors and flux shunt trip mechanism.
   b. Frame size 400 amp and above:
      1) Interchangeable current sensor or rating plug:
      2) Adjustable long time pickup setting. Adjustable from 50 to 100 percent of the current sensor or rating plug.
      3) Adjustable short time pickup setting.
      4) Adjustable instantaneous pick-up.
      5) Fixed ground fault pickup.
4. Motor circuit protector:
   a. Adjustable instantaneous short circuit protection by means of a magnetic or solid state trip element.
   b. Sized for the connected motor.

PART 3 EXECUTION

3.1 INSTALLATION

A. Current and interrupting ratings as indicated.
B. Series rated systems not acceptable.
C. Devices shall be ambient temperature compensated.
D. Molded case circuit breakers shall incorporate the following, unless otherwise indicated:
   1. Frame sizes 250 amp and less shall be thermal magnetic type.

2. Frame sizes 400 amp and larger shall be solid state trip type.
   a. Current sensor or rating plugs long time pickup setting shall be set so that the indicated trip level is near the 75 percent trip point.
3. Motor circuit protectors sized for the connected motor.

3.2 FIELD QUALITY CONTROL

A. Adjustable Circuit Breakers:
   1. Set all circuit breaker adjustable taps as defined on the Drawings.
   2. Test all circuit breakers for proper operation.

END OF SECTION

SECTION 16493

CONTROL EQUIPMENT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Operator control devices (selector switches, pushbuttons, indicator lights, etc.).
   2. Control devices (timers, relays, contactors, etc.).
   3. Control panels and operator stations.

1.2 REFERENCES

A. NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
B. NEMA 250	Enclosures for Electrical Equipment (1000 Volt Maximum)
C. UL 508	Industrial Control Equipment

1.3 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements).
B. Installation, Operation, and Maintenance Manual:
   1. Control Devices.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Pilot Devices:
      a. Cutler Hammer.
      b. Allen Bradley.
      c. Or Approved Equal.
   2. Relays:
      a. Idec.
      b. Potter & Brumfield.
      c. Allen-Bradley.
      d. Or Approved Equal.
   3. Terminal Blocks:
      a. Phoenix Contact.
      b. Allen-Bradley.
      c. Or Approved Equal.
   4. Enclosures:
      a. Hoffman Engineering Co.
      b. Wiegmann.
      c. B-Line Circle AW.Adalet.
      d. Or Approved Equal.

2.2 PILOT DEVICES

A. General Requirements:
   1. Standards: NEMA ICS 2, UL 508.

2. Heavy-duty NEMA 4/13 watertight/oiltight.
3. Heavy-duty NEMA 4/4X corrosion resistant.
4. Heavy-duty factory sealed, explosion-proof and dust ignition-proof (Class I and II).
5. Mounting hole: 30.5 mm.
6. Contact blocks: 10 amp, NEMA A600 rated, number as required to fulfill functions shown or specified.
7. Legend plate marked as indicated or specified.

B. Selector Switches:
1. Two, three- or four-position rotary switch as required to fulfill functions shown or specified.
2. Maintained contact type.
3. Knob or lever type operators.

C. Pushbuttons:
1. Non-illuminated type:
   a. Protective boot.
   b. Momentary contact.
   c. Standard flush and mushroom operators.
   d. Red colored buttons for START or ON and green color for STOP or OFF.
   e. Emergency stop pushbuttons: Mushroom head operator and maintained contact.
2. Illuminating type:
   a. Protective boot.
   b. Momentary contact.
   c. Standard flush operator.
   d. Serves as both pushbutton control and indicating light.
   e. Red colored lenses for START or ON and green color for STOP or OFF.
   f. LED light unit with lens and panel gasket.

D. Indicating Lights:
1. Allowing replacement of bulb without removal from control panel.
2. Lamp: LED, 120 V or 24 V as required.
3. Full voltage type.
4. Push-to-test indicating lights.
5. Glass lens.
6. Color code lights as follows:
   a. Red: ON or running; valve open.
   b. Amber: Standby; auto mode; ready.
   c. Green: OFF or stopped; valve closed.
   d. Dark grey: Fail or off-line.
   e. Yellow: Alarm or error.
   f. Orange: Manual mode.
   g. Purple: Transition.
   h. White: Power available.

E. Lockout Stop Switches:
1. Pushbutton.
2. Install lockout device so when engaged the pushbutton is maintained in the contact open position.

2.3 RELAYS

A. General Requirements:
   1. Standards: NEMA ICS 2, UL 508.
B. Control Relays:
   1. General purpose (ice cube) type:
      a. Plug-in housing.
      b. Clear polycarbonate dust cover with clip fastener.
      c. Coil voltage: 120 V AC or as required.
      d. Contacts:
         1) 10 amp continuous.
         2) Silver cadmium oxide.
         3) Minimum of 3 SPDT contacts.
      e. Sockets: DIN rail mounted.
      f. Internal neon or LED indicator is lit when coil is energized.
      g. Manual operator switch.
   2. Industrial type:
      a. Coil voltage: 120 V AC or as required.
      b. Contacts:
         1) 10 amp, NEMA A600 rated.
         2) Double break, silver alloy.
         3) Convertible from normally open to normally closed or vice versa, without removing any wiring.
         4) Expandable from 2 poles to 12 poles.
      c. Provide contacts for all required control plus two spares.
C. Time Delay Relays:
   1. General purpose type:
      a. Timing modes: On and Off delay, interval, one shot and repeat cycle.
      b. Plug-in housing.
      c. Polycarbonate dust cover with clip fastener.
      d. Coil voltage: 120 V AC or as required.
      e. Contacts:
         1) 10 amp continuous.
         2) Silver cadmium oxide.
         3) Two normally open and two normally closed DPDT contacts.
      f. Sockets: DIN rail mounted.
      g. External timing adjustment knob.
      h. Timing ranges: 0.05 seconds to 16.65 HRS.
      i. Repeat accuracy: $\pm$1 percent.
   2. Solid State industrial type:
      a. Timing modes: On and Off delay and repeat cycle.
      b. Industrial housing.
      c. Coil voltage: 120 V AC or as required.
      d. Contacts:
         1) 5 amp, NEMA B150 rated.
         2) Silver alloy.
         3) Convertible On Delay and Off Delay contacts.
         4) One normally open and one normally closed timed contacts.
         5) One normally open and one normally closed instantaneous contacts.

e. Furnish with "on" and "timing out" indicators.
f. External timing adjustment knob.
g. Timing ranges: 0.05 seconds to 10 HRS.
h. Repeat accuracy: ±1 percent.

3. Mechanical industrial type:
   a. Timing modes: On and Off delay.
   b. Coil voltage: 120 V AC or as required.
   c. Contacts:
      1) 10 amp, NEMA A600 rated.
      2) Double break, silver alloy.
      3) Convertible On Delay and Off Delay contacts.
      4) Convertible normally open and normally closed timed contacts.
      5) Convertible normally open instantaneous contacts.
   d. External timing adjustment knob.
   e. Timing ranges: 0.2 – 60 sec or 5 – 180 sec.
   f. Repeat accuracy: greater than ±10 percent.

2.4 MISCELLANEOUS DEVICES

A. Run Time Meters:
   1. Six-digit wheels including a 1/10 digit.
   2. Non-reset type.
   3. Time range in hours.
   4. Automatic recycle at zero.
   5. Accuracy: 1 percent.
   6. Sealed against dirt and moisture.
   7. Tamperproof.

2.5 TERMINATION EQUIPMENT

A. General Requirements:
   1. Modular type with screw compression clamp.
   2. Screws: Stainless steel.
   3. Current bar: Nickel-plated copper allow.
   4. Thermoplastic insulation rated for -40 to +90 DegC.
   5. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
   6. End sections and end stops at each end of terminal strip.
   7. Machine-printed terminal markers on both sides of block.
   8. Spacing: 6 mm.
   9. Wire size: 22-12 AWG.
   10. Rated voltage: 600 V.
   11. Din rail mounting.
B. Standard-type block:
   1. Rated current: 30 A.
   2. Color: Gray body.
C. Bladed-type disconnect block:
   1. Terminal block with knife blade disconnect which connects or isolated the two sides of the block.
   2. Rated current: 10 A.
   3. Color:
      a. Panel control voltage leaves enclosure - normal: Gray body, orange switch.

b. Foreign voltage entering enclosure: Orange body, orange switch.

D. Grounded-type block:
1. Electrically grounded to mounting rail.
2. Terminal ground wires and analog cable shields.
3. Color: Green and yellow body.

E. Fuse Holders:
1. Blocks can be ganged for multi-pole operation.
2. Spacing: 9.1 mm.
3. Wire size: 30-12 AWG.
4. Rated voltage: 300 V.
5. Rated current: 12 A.
6. Fuse size: 1/4 x 1-1/4.
7. Blown fuse indication.
8. DIN rail mounting.

2.6 ENCLOSURES

A. Control Panels:
1. NEMA 4X rated:
   a. Body and cover: 14 GA Type 304 or 316 stainless steel.
   b. Seams continuously welded and ground smooth.
   c. No knockouts.
   d. External mounting flanges.
   e. Hinged door and stainless steel screws and clamps.
   f. Door with oil-resistant gasket.
2. NEMA 12 enclosure:
   a. Body and cover: 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
   b. No knockouts.
   c. External mounting flanges.
   d. Non-hinged stainless steel cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
   e. Flat door with oil resistant gasket.
3. Control Panel Miscellaneous Accessories:
   a. Back plane mounting panels: Steel with white enamel finish or Type 304 stainless steel.
   b. Interiors shall be white or light gray in color.
   c. Wire management duct:
      1) Bodies: PVC with side holes.
      2) Cover: PVC snap-on.
      3) Size as required.
   d. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
   e. Split covers when heavier than 25 LBS.
   f. Floor stand kits made of same material as the enclosure.
   g. Weldnuts for mounting optional panels and terminal kits.
4. Standards: NEMA 250, UL 50.

B. Operator Control Stations:
1. NEMA 4X rated:
   a. Type 304 or 316 stainless steel body.

b. Gasketed Type 304 or 316 stainless steel cover.
c. Number of device mounting holes as required.

2.7 MAINTENANCE MATERIALS

A. Provide 10 percent replacement lamps for indicating lights.
B. Provide 5 percent replacement caps for indicating lights.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations and instructions.
B. Control Panels:
   1. Size as required to mount the equipment.
   2. Permitted uses of NEMA 4X enclosure:
      a. Surface mounted in areas designated as wet or outdoors exposed to weather.
   3. Permitted uses of NEMA 12 enclosure:
      a. Surface mounted in areas designated as dry architecturally or non-architecturally finished areas.
C. Operator Control Stations:
   1. Permitted uses of NEMA 4X enclosure:
      a. Surface mounted in areas designated as wet or outdoors exposed to weather.

3.2 FIELD QUALITY CONTROL

A. See Section 16010 (Electrical: Basic Requirements).

END OF SECTION

SECTION 16500

INTERIOR AND EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   A. Material and installation requirements for:
      1. Interior building lighting fixtures.
      2. Exterior building and Site lighting fixtures.
      3. Lamps.
      4. Ballasts.
      5. Lighting poles.
      6. Lighting control.

1.2 REFERENCES

A. ANSI C82	Standards for Electric Lamp Ballasts
B. CFR 47 CFR 18	Industrial, Scientific and Medical Equipment
C. IEEE C62.41	Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
D. NEMA 250	Enclosures for Electrical Equipment (1000Volts Maximum)
E. NFPA 101	Life Safety Code
F. UL 198C	High-Interrupting-Capacity Fuses, Current Limiting Type
G. UL 924	Emergency Lighting and Power Equipment
H. UL 935	Fluorescent Lamp Ballasts
I. UL 1029	High Intensity Discharge Lamp Ballasts
J. UL 1570	Fluorescent Lighting Fixtures
K. UL 1572	High Intensity Discharge Lighting Fixtures

1.3 SUBMITTALS

A. See Section 16010 (Electrical: Basic Requirements).
B. Product Data:
   1. Identify fixtures by Fixture Schedule number.
   2. Fixture data sheet including:
      a. Photometric performance data including candlepower distribution and coefficient of utilization (CU) table.
      b. Fixture EPA's for pole mounted fixtures.
   3. Pole data shall include:
      a. Pole wind loading.
      b. Anchor bolt template.
C. Installation, Operation, and Maintenance Manual:
   1. Lighting Fixtures.
   2. Ballasts.
   3. Lamps.

1.4 MAINTENANCE

A. Furnish a minimum of 2 or 10 percent of total of each type and wattage of lamps, whichever is greater.

B. Furnish a minimum of 10 percent of total of each type and amperage of fuses for fixtures indicated to be fused.
C. Spare parts are to be stored in a box clearly labeled as to its contents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Lighting fixtures: See Fixture Schedule.
   2. Lamps:
      a. Osram/Sylvania.
      b. General Electric.
      c. Philips.
      d. Or Approved Equal.
   3. Ballasts: Fixture manufacturer's standard.
   4. Poles: Fixture manufacturer's standard.

2.2 GENERAL REQUIREMENTS

A. All lighting fixtures and electrical components:
   1. UL labeled.
   2. Fixtures complete with lamps and ballasts.
   3. Rated for area classification as indicated.
B. Provide all recessed fixtures with gaskets of rubber, fiberglass, or equivalent material to prevent light leaks around flush trim. Provide recessed fixtures with trim gaskets cemented in proper position.
C. Reflector coating having a minimum 89 percent reflectance factor.
D. No live parts normally exposed to contact.
E. When intended for use in wet areas: Mark fixtures "Suitable for wet locations."
F. When intended for use in damp areas: Mark fixtures "Suitable for damp locations" or "Suitable for wet locations."

2.3 LIGHT FIXTURES

A. Fluorescent:
   1. UL 1570.
   2. NEMA LE 4 for recessed locations.
   3. Lenses: As indicated in Fixture Schedule, with the following minimums:
      a. Troffer: 100 percent virgin acrylic, conical shaped, female 0.1875 IN, square based prisms, aligned 45 degrees to the length and width, 0.125 IN nominal thickness.
   4. Finish: Manufacturer's standard polyester, acrylic enamel or epoxy powder coating applied after fabrication. Manufacturer's standard color or special color specified in Fixture Schedule.
   5. Prewired and provided with lamps that are properly mated to the ballast operating characteristics.
B. High Intensity Discharge:
   1. UL 1572.

2. Finish: Manufacturer's standard polyester, acrylic enamel or epoxy powder coating applied after fabrication. Manufacturer's standard color or special color specified in Fixture Schedule.
3. Prewired and provided with lamps that are properly mated to the ballast operating characteristics.
4. Provided with safety chain.

2.4 LAMPS

A. Fluorescent:
1. T8 (265 mA) rapid-start medium bipin lamps.
   a. Correlated color temperature of 3500 degrees Kelvin.
   b. Minimum color rendering index (CRI) of 70.
   c. Minimum initial lumen ratings for each lamp type shall be:
      1) 1300 lumens for 24 IN, 17 watt F17T8 lamp.
      2) 2025 lumens for 36 IN, 25 watt F25T8 lamp.
      3) 2800 lumens for 48 IN, 32 watt F32T8 lamp.
      4) 5700 lumens for 96 IN, 59 watt F96T8 lamp.
      5) 2725 lumens for 22.5 IN, 32 watt F32T8/U/6 lamp (U-shaped 6 inch leg spacing).

B. High Intensity Discharge (HID) Lamps:
1. Metal halide lamps.
   a. Correlated color temperature of 4000 degrees Kelvin.
   b. Minimum color rendering index (CRI) of 65.
2. High pressure sodium lamps.
   a. Correlated color temperature of 2100 degrees Kelvin.
   b. Minimum color rendering index (CRI) of 21.
   c. High pressure sodium lamps are designated on the lighting Fixture Schedule by the prefix HPS.
3. Uncoated (clear) unless identified as coated in the fixture schedule.
4. The specified fixture in the fixture schedule shall dictate the required lamp operating position and base type.
5. Provide lamps that have the correct bulb shape for the fixture specified.

2.5 BALLASTS

A. Fluorescent High Frequency Electronic Ballasts:
1. UL 935.
2. "High Frequency" electronic operating lamps at a frequency of 20 KHz or higher without visible flicker.
3. Power Factor: Greater than 90 percent.
4. Input current Total Harmonic Distortion (THD) of less than 20 percent.
5. Lamp Current Crest Factor: Less than 1.7, in accordance with lamp manufacturer's recommendations and ANSI C82.11.
6. Instant start with lamps wired in parallel.
7. Support a sustained short to ground or open circuit of any output leads without damage to the ballast.
8. Ballast Factor: Greater than 0.85 per ANSI C82.11.
9. Audible noise rating: Class A or better.
10. Operation in ambient temperatures up to (105 DegF) without damage.
11. Light output to remain constant for a line voltage fluctuation of $\pm$5 percent.

12. Meet the requirements of the Federal Communications Commission Rules and Regulations, Part 18 (47 CFR 18), for non-consumer equipment for EMI and RFI.
13. Meet ANSI C82.11 standards regarding harmonic distortion.
14. Meet ANSI C62.41 Cat. A for transient protection.
15. Comply with all applicable state and federal efficiency standards.
16. Underwriters' Laboratories (UL) listed (Class P).
17. Contain no Polychlorinated Biphenyls (PCB's).

B. High Intensity Discharge Ballasts:
1. ANSI C82.4, UL 1029.
2. Metal halide:
   a. Input voltage variation: ±10 percent.
   b. Maximum lamp regulation spread: 20 percent.
   c. Minimum power factor: 90 percent.
   d. Starting current: not greater than operating current.
   e. Maximum input voltage dip: 40 percent.
   f. Crest factor: 1.5 to 1.8.
   g. Types:
      1) Lead-Type Regulators: constant wattage autotransformer (CWA) and pulse start.
      2) Lag-Type Regulators: magnetic regulator and pulse start.
   h. Contain no Polychlorinated Biphenyls (PCB's).
3. High pressure sodium:
   a. Input voltage variation: ±10 percent.
   b. Maximum lamp regulation spread: 30 percent.
   c. Minimum power factor: 90 percent.
   d. Starting current: not greater than operating current.
   e. Maximum input voltage dip: 20 percent.
   f. Crest factor: 1.6 to 1.8.
   g. The Volts-Watts trace shall be within the lamp manufacturer’s trapezoid.
   h. Types:
      1) Lead-Type Regulators: constant wattage autotransformer (CWA).
      2) Lag-Type Regulators: magnetic regulator and regulated lag.
   i. Ballast shall not contain Polychlorinated Biphenyls (PCB's).
4. Ballasts for interior use:
   a. Encased and potted type.
   b. Audible noise rating of B or better.
   c. Built-in automatic resetting thermal protection switch.
5. Ballasts for exterior use:
   a. Starting temperature: -20 DegF.

2.6 POLES

A. As scheduled or noted on the Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate fixtures as indicated.
B. Mount lighting fixtures at heights indicated in Section 16010 (Electrical: Basic Requirements) or per fixture schedule or as indicated.

C. Install exterior fixtures so that water can not enter or accumulate in the wiring compartment.
D. Ground fixtures and ballasts.

3.2 POLE INSTALLATION

A. Mount as shown on drawings.
B. Protect pole finish during installation. Repair damage to pole finish with manufacturer approved repair kit.
C. Ground poles as indicated.
D. Conductors:
   1. See Section 16125 (Wire and Cable - 600 Volt and Below) for required underground conductors.
   2. Use interior building wire, as specified in Section 16125 (Wire and Cable - 600 Volt and Below), from pole base to fixture, #12 AWG minimum.
E. Overcurrent and Short Circuit Protection:
   1. Protect each phase with a UL Class CC fuse:
      a. Size: 3 times load current.
      b. Standard: UL 198C.
   2. Fuseholder:
      a. Watertight, in-line and break-a-way style.
      b. Accept up to a 30 Amp, 600 Volt fuse.
      c. Neutral conductor shall utilize a fuseholder with a solid copper rod.
      d. Conductor terminal: Adequate size for the installed conductors.

3.3 LIGHTING CONTROL

A. Fixtures controlled as detailed on Drawings.

3.4 ADJUST AND CLEAN

A. Replace all inoperable lamps with new lamps prior to final acceptance.

END OF SECTION

SECTION 16973

ACCEPTANCE TESTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for acceptance testing.

1.2 REFERENCES

A. NETA	Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
B. NFPA 70	National Electrical Code (NEC)
C. NFPA 70E	Electrical Safety Requirements for Employee workplaces
D. OSHA	Occupational Safety and Health Standards (U.S. Department of Labor)

1.3 SUBMITTALS

A. Quality Assurance/Control Submittals:
   1. Test Reports:
      a. Test reports signed by the technician including the following information:
         1) Summary of Project.
         2) Description of equipment/components tested.
         3) Visual inspection report.
         4) Description of tests.
         5) Test results including appropriate test forms.
         6) Conclusions and recommendations.
         7) Identification of test equipment used.
   2. Conductor megger testing results.

1.4 SYSTEM DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment, and services for all electrical testing work as indicated, in accord with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
B. All equipment included in Division 16 shall be provided with manufacturer's test certification. Additional equipment and system testing requirements are specified in this Section.
C. Tests and inspections not specifically itemized herein but required to insure that the equipment is ready for commercial operation shall be performed by this Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. General:
   1. The acceptance tests shall be performed per NETA's Acceptance Testing Specifications For Electrical Power Distribution Equipment and Systems.
   2. The following paragraphs identify items to be tested and a brief list of the required tests per NETA. Additional tests not listed in the NETA document are also listed when required.
   3. Repairs shall be made when test values do not meet known acceptable values.

B. 600 V Cables:
   1. Perform visual and mechanical inspections:
      a. See the NETA document for requirements.
   2. Perform electrical tests:
      a. Insulation resistance test.
      b. Connection resistance measurements.
      c. Continuity test.
   3. Compare test values with known acceptable values.
   4. Contractor may perform testing using megger with records of all testing.
   5. Maintain record of all testing and submit as a submittal in accordance with Article 1.3 SUBMITTALS.
   6. Megger each conductor after pulling and prior to connection.

C. System Functional Test:
   1. Perform test upon completion of equipment acceptance tests.
   2. The test is to prove the correct interaction of all sensing, processing and action devices.
   3. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
   4. Perform the following tests:
      a. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
      b. Verify the correct operation of all sensing devices, alarms and indicating devices.
   5. Systems to be set:
      a. Set adjustments in adjustable circuit breakers.

END OF SECTION