PUBLIC UTILITIES DEPARTMENT

990 Palm Street ■ San Luis Obispo, CA 93401

Notice Requesting Proposals for

WATER RESOURCE RECOVERY FACILITY AERATION BLOWER REPLACEMENT PROJECT Specification No. 91280

The City of San Luis Obispo is inviting sealed proposals for the Water Resource Recovery Facility Aeration Blower Replacement Project pursuant to Specification No. 91280. All proposals must be received by the Finance Division by **3:00** P.M. on **July 21, 2016** when they will be opened publicly in the City Hall Council Chambers, 990 Palm Street, San Luis Obispo, CA 93401.

Proposals received after said time will not be considered. To guard against premature opening, each proposal shall be submitted to the Finance Division in a sealed envelope plainly marked with the **proposal title, specification number, proposer name, and time and date** of the proposal opening. Proposals shall be submitted using the forms provided in the specification package.

Specification Package may be obtained by the following:

- Download package from the City's Web site, Bids & Proposals page at: www.slocity.org
- Specification packages and additional information may be obtained by contacting **Howard Brewen** at **(805) 781-7240**.

The City of San Luis Obispo is committed to including disabled persons in all of our services, programs and activities. Telecommunications Device for the Deaf (805) 781-7410.

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BACKGROUND

The City of San Luis Obispo's Water Resource Recovery Facility (WRRF) serves a population of nearly 46,000 people and treats 1.7 billion gallons of wastewater per year. It is one of the largest energy users in the City of San Luis Obispo.

The WRRF's National Pollutant Discharge Elimination Systems (NPDES) permit requires full nitrification. This nitrification process takes place in the Aeration Bays. A critical component of this process is the air that is supplied to the Aeration Bays. This air is supplied by three Aeration Blowers in different configurations (lead, lag & standby) to meet the demands of the system. Two of the Aeration Blowers (Lamson) are 20 years old and well past their expected life cycle and the third Aeration Blower (Turblex) is ten years old and approaching the end of its service life. Currently the air being supplied by our Aeration Blowers makes up 25% of our total annual energy bill. The two (Lamson) Aeration Blowers are very energy inefficient compared with the new Aeration Blowers currently on the market. The cost of maintenance, end of service life, outdated instrumentation and energy efficiency are the reasons for Aeration Blower replacement.

The Work calls for demolition of an existing Lamson multi-stage centrifugal blower and provision and installation of a new turbo blower system in its place.

SCHEDULE

The City's goal is to have the new blower installed, operating, and with all startup and commissioning services complete by December 31st, 2016.

DEFINITIONS

SUPPLIER – The SUPPLIER is the entity responsible for demolishing the existing blower system and providing and installing the new turbo blower system. The Supplier is also the entity providing the proposal in response to this RFP. The SUPPLIER shall be the same entity as the MANUFACTURER or shall have a legal relationship as the sales representative, distributor, or subsidiary of the MANUFACTURER. SUPPLIER and applicable SUPPLIER'S subcontractors shall be in possession of and maintain all required contracting licenses as needed for the duration of the project.

MANUFACTURER – The MANUFACTURER is the entity that manufactures, fabricates, and factory assembles the new blower system. The MANUFACTURER may include equipment components fabricated by others providing they are factory assembled as part of the new blower system by the MANUFACTURER.

OWNER – The City of San Luis Obispo.

ENGINEER – Water Systems Consulting, Inc.

SUMMARY OF WORK

The Supplier shall provide one new turbo blower meeting the specifications given in Attachment B, Technical Specifications, Section 11081, High Speed Turbo Blower complete with acoustic enclosure, motor, variable frequency drive, control panel, programmable logic controller, inlet air filter/silencers, blow-off valve, check valve, discharge valve, flexible connectors and other appurtenances as specified and as required to make a complete and operable system.

The Supplier shall install the turbo blower and specified appurtenances including piping and electrical connections as shown on the Drawings and as needed for a complete and operational system. The Supplier shall provide and install pressure and temperature gauges, other instruments and devices as specified. Drawings and specifications will be finalized and issued for construction by the Owner following selection of Supplier.

The Supplier shall remove and dispose of the existing Lamson blower including the frame, motor, air filters and air filter enclosure, control panel, associated valves, silencers, devices, connecting piping and electrical as shown on the Drawings and as needed to install the new turbo blower.

The Supplier shall provide specified services during startup and commissioning.

The Work includes all labor, materials, and equipment necessary for the demolition, fabrication, production, installation and erection of the items specified herein and as required to make a compete and operable system.

All equipment and services to be provided by a single SUPPLIER.

Section B
GENERAL TERMS AND CONDITIONS

PROPOSAL REQUIREMENTS

1. **Requirement to Meet All Provisions.** Each individual or firm submitting a proposal (SUPPLIER) shall meet all of the terms, and conditions of this Request for Proposals (RFP) specifications package. By virtue of its proposal submittal, the SUPPLIER acknowledges agreement with and acceptance of all provisions of the RFP specifications, except that the SUPPLIER may list exceptions to the technical specification, Section 11801, for the turbo blower on a separate submittal and included with the Proposal. Exceptions taken to Section 11801 will be evaluated along with other aspects of the Proposal.

2. **Proposal Submittal.** Each proposal must be submitted on the form(s) provided in this Request for Proposal (RFP) package and accompanied by any other required submittals or supplemental materials. Proposal documents shall be enclosed in an envelope that shall be sealed and addressed to the Public Works Department, City of San Luis Obispo, 919 Palm Street, San Luis Obispo, CA, 93401. Each proposal submittal shall include one electronic copy of the proposal, submitted in portable document format (PDF) on CD or flash drive. In order to guard against premature opening, the proposal should be clearly labeled with the proposal title, specification number, name of SUPPLIER, and date and time of proposal opening. No FAX submittals will be accepted.

3. **Insurance Certificate.** Each proposal must include a certificate of insurance showing:

    a. The insurance carrier and its A.M. Best rating.
    b. Scope of coverage and limits.

c. Deductibles and self-insured retention.

The purpose of this submittal is to generally assess the adequacy of the SUPPLIER's insurance coverage during proposal evaluation; as discussed under paragraph 12 below, endorsements are not required until contract award. The City's insurance requirements are detailed in Section F.

4. **Submittal of References**. Each proposer shall submit a statement of qualifications and references on the form provided in the RFP package. In addition, each proposer shall provide a list of all operating installations of proposed blower technology which includes location, facility name, blower number and size.

5. **Statement of Contract Disqualifications.** Each proposer shall submit a statement regarding any past government disqualifications on the form provided in the RFP package.

6. **Proposal Withdrawal and Opening.** A SUPPLIER may withdraw its proposal, without prejudice prior to the time specified for the proposal opening, by submitting a written request to the Utilities Director for its withdrawal, in which event the proposal will be returned to the SUPPLIER unopened. No proposal received after the time specified or at any place other than that stated in the "Notice Requesting Proposals" will be considered. All proposals will be opened and declared publicly. SUPPLIERs or their representatives are invited to be present at the opening of the proposals.

7. **Submittal of One Proposal Only.** No individual or business entity of any kind shall be allowed to make or file, or to be interested in more than one proposal, except an alternative proposal when specifically requested; however, an individual or business entity that has submitted a sub-proposal to a SUPPLIER submitting a proposal, or who has quoted prices on materials to such SUPPLIER, is not thereby disqualified from submitting a sub-proposal or from quoting prices to other SUPPLIERs submitting proposals.

8. **Communications.** All timely requests for information submitted in writing will receive a written response from the City. Telephone communications with City staff are not encouraged, but will be permitted. However, any such oral communication shall not be binding on the City.

9. **Alternative Proposals.** When specifically requested, the proposer may submit an alternative proposal (or proposals) that it believes will also meet the City's project objectives but in a different way. In this case, the proposer must provide an analysis of the advantages and disadvantages, including the relative costs, of each of the alternatives, and discuss under what circumstances the City would prefer one alternative to the other(s). If an alternative proposal is submitted, the maximum length of the proposal may be expanded proportionately by the number of alternatives submitted.

CONTRACT AWARD AND EXECUTION

10. **Proposal Retention and Award.** The City reserves the right to retain all proposals for a period of 60 days for examination and comparison. The City also reserves the right to waive non substantial irregularities in any proposal, to reject any or all proposals, to reject or delete one part of a proposal and accept the other, except to the extent that proposals are qualified by specific limitations. See the "Special Terms and Conditions" in Section C of these specifications for proposal evaluation and contract award criteria.

11. **Competency and Responsibility of SUPPLIER.** The City reserves full discretion to determine the competence and responsibility, professionally and/or financially, of SUPPLIERs. SUPPLIERs will provide, in a timely manner, all information that the City deems necessary to make such a decision.

12. **Contract Requirement.** The SUPPLIER to whom award is made shall enter into negotiations with the City within ten (10) calendar days after notice of the award has been sent by mail to it at the

address given in its proposal. The SUPPLIER to whom award is made shall enter into a contract with the City within ten (10) calendar days after negotiations began. The contract shall be made in the form adopted by the City and incorporated in these specifications.

13. **Insurance Requirements.** The SUPPLIER shall provide proof of insurance in the form, coverage's and amounts specified in Section F of these specifications within 10 (ten) calendar days after notice of contract award as a precondition to contract execution.

14. **Business License & Tax.** The SUPPLIER must have a valid City of San Luis Obispo business license and tax certificate before execution of the contract. Additional information regarding the City's business license and tax program may be obtained by calling (805) 781-7134.

15. **Failure to Accept Contract.** The following will occur if the SUPPLIER to whom the award is made fails to enter into the contract: the award will be annulled and an award may be made to the next highest ranked SUPPLIER with whom a responsible compensation is negotiated, who shall fulfill every stipulation as if it were the party to whom the first award was made.

Section C

PROPOSAL CONTENT AND SELECTION PROCESS

PROPOSAL CONTENT

1. Submittal Forms

a. Acknowledgement
b. Certificate of Insurance
c. References for SUPPLIER
d. References for MANUFACTURER'S operating installations
e. Statement of Past Disqualifications
f. Power Guarantee
g. Cost Proposal

2. Qualifications

a. Experience of SUPPLIER in performing similar services.
b. Statement and explanation of any instances where your firm has been removed from a project or disqualified from proposing on a project.
c. Availability and accessibility of SUPPLIER and MANUFACTURER to the City.
d. Location of spare parts and maintenance services and description of response network.
e. List of all operating installations of proposed blower technology which includes location, facility name, blower number and size.
f. Supplier shall list what modifications to the Owner's existing physical facilities (canopy structure) are recommended for weather protection of the proposed blower technology, if any. If no modifications are proposed then the Owner may rely on the Supplier's assertion that the proposed blower technology shall operate continuously and correctly with routine maintenance regardless of inclement weather.

3. Work Program

a. Tentative schedule by phase and task for completing the work.
    i. Include items for shop drawing submittals and review.
    ii. Indicate delivery time for blower equipment after approved shop drawings.
    iii. At a minimum include schedule items for each component of work as listed in the Cost Proposal.
b. Services or information anticipated to be provided by the City.
c. Please indicate how the Work may be expedited to meet the City's goal for completion.

4. Proposal Length and Copies

a. Proposals should be the minimum length to provide the required information.
b. Four (4) printed copies of the proposal must be submitted.
c. One (1) electronic copy in PDF format must be submitted on flash drive, jump drive or CD.

PROPOSAL EVALUATION AND CONTRACTOR SELECTION

Proposals will be evaluated by a review committee and contract award process as follows:

5. Written Proposal Review/Finalist Candidate Selection

Proposals will be reviewed by a selection committee and ranked in accordance with the responsiveness, qualifications and understanding of the SUPPLIER relative to these specification requirements. Where one proposal is rated consistently higher than the others, the contractor may be selected as the top ranked SUPPLIER for purposes of contract negotiation.

EVALUATION

A. The proposals will be evaluated and awarded based on the following criteria.

20 Year Present Worth Costs
Operating Experience and References
Work Program
Service Network and Parts Supply Availability
Owner Preference

Present Worth Costs shall be determined by the City based on the SUPPLIER'S Cost Proposal and Power Guarantee. The same operating hours, electrical rate schedule, and rate of return will be used for all proposals. The number of hours for each operating condition will be calculated by multiplying the operating point's evaluation factor by 8760 (hours in one year). The operating hours will then be multiplied by the guaranteed power draw of the blowers (kW) and the electrical cost per kWh.

Work Programs meeting or beating the City's goal of project completion by the end of November 2016 will be evaluated more favorably.

6. Supplier Selection and Compensation

After evaluating the proposals and discussing them further with the finalists or the tentatively selected SUPPLIER, the City reserves the right to further negotiate the proposed work scope and/or method and amount of compensation. If the City is unable to come to an agreement on the terms of the contract or the amount of compensation, the City reserves the right to negotiate with the next highest ranked SUPPLIER.

Contract award will be based on a combination of factors that represent the best overall value for completing the work scope as determined by the City, including: the written proposal criteria described above; results of background and reference checks; and proposed compensation.

7. Proposal Review and Award Schedule

The following is an outline of the anticipated schedule for proposal review and contract award. Schedule is subject to change:

Issue RFP .....June 29, 2016
Receive proposals..... July 21, 2016
Complete proposal evaluation ..... July 25, 2016
Finalize staff recommendation..... July 26, 2016
Award of contract ..... August 12, 2016
Start work no later than ..... August 12, 2016
Deliver Equipment……..December 30, 2016

AGREEMENT

THIS AGREEMENT is made and entered into in the City of San Luis Obispo on [day, date, year] by and between the CITY OF SAN LUIS OBISPO, a municipal corporation, hereinafter referred to as City, and [CONTRACTOR'S NAME IN CAPITAL LETTERS], hereinafter referred to as Contractor.

W I T N E S S E T H

WHEREAS, on [date], requested proposals for the Water Resource Recovery Facility Aeration Blower Replacement, Specification No. 91280.

WHEREAS, pursuant to said request, Contractor submitted a proposal that was accepted by City for said services.

NOW THEREFORE, in consideration of their mutual promises, obligations and covenants hereinafter contained, the parties hereto agree as follows:

1. **Term**. The term of this Agreement shall be from the date this Agreement is made and entered, as first written above, until acceptance or completion of said services.

2. **Start and Completion of Work**. Work on this project shall begin within 14 calendar days after contract execution and shall be completed _____months after notice to proceed.

3. **Work Delays**. Should the Contractor be obstructed or delayed in the work required to be done hereunder by changes in the work or by any default, act, or omission of the City, or by strikes, fire, earthquake, or any other Act of God, or by the inability to obtain materials, equipment, or labor due to federal government restrictions arising out of defense or war programs, then the time of completion may, at the City's sole option, be extended for such periods as may be agreed upon by the City and the Contractor. In the event that there is insufficient time to grant such extensions prior to the completion date of the contract, the City may, at the time of acceptance of the work, waive liquidated damages that may have accrued for failure to complete on time, due to any of the above, after hearing evidence as to the reasons for such delay, and making a finding as to the causes of same.

4. **Termination**. If, during the term of the contract, the City determines that the Contractor is not faithfully abiding by any term or condition contained herein, the City may notify the Contractor in writing of such defect or failure to perform. This notice must give the Contractor a 10 (ten) calendar day notice of time thereafter in which to perform said work or cure the deficiency.

   If the Contractor has not performed the work or cured the deficiency within the ten days specified in the notice, such shall constitute a breach of the contract and the City may terminate the contract immediately by written notice to the Contractor to said effect. Thereafter, neither party shall have any further duties, obligations, responsibilities, or rights under the contract except, however, any and all obligations of the Contractor's surety shall remain in full force and effect, and shall not be extinguished, reduced, or in any manner waived by the termination thereof.

   In said event, the Contractor shall be entitled to the reasonable value of its services performed from the beginning date in which the breach occurs up to the day it received the City's Notice of Termination, minus any offset from such payment representing the City's damages from such breach. "Reasonable value" includes fees or charges for goods or services as of the last milestone or task satisfactorily delivered or completed by the Contractor as may be set forth in the Agreement payment schedule; compensation for any other work, services or goods performed or provided by the Contractor shall be based solely on the City's assessment of the value of the work-in-progress in completing the overall work scope.

   The City reserves the right to delay any such payment until completion or confirmed abandonment of the project, as may be determined in the City's sole discretion, so as to permit a full and complete accounting of

costs. In no event, however, shall the Contractor be entitled to receive in excess of the compensation quoted in its proposal.

If, at any time during the term of the contract, the City determines that the project is not feasible due to funding shortages or unforeseen circumstances, the City reserves the right to terminate the contract. Contractor will be paid compensation due and payable to the date of termination.

5. **Ability to Perform**. The Contractor warrants that it possesses, or has arranged through subcontracts, all capital and other equipment, labor, materials, and licenses necessary to carry out and complete the work hereunder in compliance with any and all applicable federal, state, county, city, and special district laws, ordinances, and regulations.

6. **Sub-contract Provisions**. No portion of the work pertinent to this contract shall be subcontracted without written authorization by the City, except that which is expressly identified in the Contractor's proposal. Any substitution of sub-contractors must be approved in writing by the City. For any sub-contract for services in excess of $25,000, the subcontract shall contain all provisions of this agreement.

7. **Contract Assignment**. The Contractor shall not assign, transfer, convey or otherwise dispose of the contract, or its right, title or interest, or its power to execute such a contract to any individual or business entity of any kind without the previous written consent of the City.

8. **Inspection**. The Contractor shall furnish City with every reasonable opportunity for City to ascertain that the services of the Contractor are being performed in accordance with the requirements and intentions of this contract. All work done and all materials furnished, if any, shall be subject to the City's inspection and approval. The inspection of such work shall not relieve Contractor of any of its obligations to fulfill its contract requirements.

9. **Record Retention and Audit**. For the purpose of determining compliance with various laws and regulations as well as performance of the contract, the Contractor and sub-contractors shall maintain all books, documents, papers, accounting records and other evidence pertaining to the performance of the contract, including but not limited to the cost of administering the contract. Materials shall be made available at their respective offices at all reasonable times during the contract period and for three years from the date of final payment under the contract. Authorized representatives of the City shall have the option of inspecting and/or auditing all records. For Federally funded projects, access to records shall also include authorized representatives of the State and Federal government. Copies shall be furnished if requested.

10. **Conflict of Interest**. The Contractor shall disclose any financial, business, or other relationship with the City that may have an impact upon the outcome of this contract, or any ensuing City construction project. The Contractor shall also list current clients who may have a financial interest in the outcome of this contract, or any ensuing City construction project which will follow.

    The Contractor covenants that it presently has no interest, and shall not acquire any interest—direct, indirect or otherwise—that would conflict in any manner or degree with the performance of the work hereunder. The Contractor further covenants that, in the performance of this work, no sub-contractor or person having such an interest shall be employed. The Contractor certifies that no one who has or will have any financial interest in performing this work is an officer or employee of the City. It is hereby expressly agreed that, in the performance of the work hereunder, the Contractor shall at all times be deemed an independent Contractor and not an agent or employee of the City.

11. **Rebates, Kickbacks or Other Unlawful Consideration**. The Contractor warrants that this contract was not obtained or secured through rebates, kickbacks or other unlawful consideration, either promised or paid to any City employee. For breach or violation of the warranty, the City shall have the right in its discretion; to terminate the contract without liability; to pay only for the value of the work actually performed; to deduct from the contract price; or otherwise recover the full amount of such rebate, kickback or other unlawful consideration.

12. **Covenant Against Contingent Fees**. The Contractor warrants by execution of this contract that no person or selling agency has been employed, or retained, to solicit or secure this contract upon an agreement or understanding, for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the City has the right to annul this contract without liability;

pay only for the value of the work actually performed, or in its discretion, to deduct from the contract price or consideration, or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

13. **Compliance with Laws and Wage Rates**. The Contractor shall keep itself fully informed of and shall observe and comply with all applicable state and federal laws and county and City of San Luis Obispo ordinances, regulations and adopted codes during its performance of the work. This includes compliance with prevailing wage rates and their payment in accordance with California Labor Code. For purposed of this paragraph, "construction" includes work performed during the design and preconstruction phases of construction, including but not limited to, inspection and land surveying work.

14. **Payment of Taxes**. The contract prices shall include full compensation for all taxes that the Contractor is required to pay.

15. **Permits, Licenses and Filing Fees**. The Contractor shall procure all permits and licenses, pay all charges and fees, and file all notices as they pertain to the completion of the Contractor's work. The City will pay all application fees for permits required for the completion of the project including building and regulatory permit application fees. Contractor will provide a 10 day notice for the City to issue a check.

16. **Safety Provisions**. The Contractor shall conform to the rules and regulations pertaining to safety established by OSHA and the California Division of Industrial Safety.

17. **Public and Employee Safety**. Whenever the Contractor's operations create a condition hazardous to the public or City employees, it shall, at its expense and without cost to the City, furnish, erect and maintain such fences, temporary railings, barricades, lights, signs and other devices and take such other protective measures as are necessary to prevent accidents or damage or injury to the public and employees.

18. **Preservation of City Property**. The Contractor shall provide and install suitable safeguards, approved by the City, to protect City property from injury or damage. If City property is injured or damaged resulting from the Contractor's operations, it shall be replaced or restored at the Contractor's expense. The facilities shall be replaced or restored to a condition as good as when the Contractor began work.

19. **Immigration Act of 1986**. The Contractor warrants on behalf of itself and all sub-contractors engaged for the performance of this work that only persons authorized to work in the United States pursuant to the Immigration Reform and Control Act of 1986 and other applicable laws shall be employed in the performance of the work hereunder.

20. **Contractor Non-Discrimination**. In the award of subcontracts or in performance of this work, the Contractor agrees that it will not engage in, nor permit such sub-contractors as it may employ, to engage in discrimination in employment of persons on any basis prohibited by State or Federal law.

21. **Accuracy of Specifications**. The specifications for this project are believed by the City to be accurate and to contain no affirmative misrepresentation or any concealment of fact. Contractors are cautioned to undertake an independent analysis of any test results in the specifications, as City does not guaranty the accuracy of its interpretation of test results contained in the specifications package. In preparing its proposal, the Contractor and all sub-contractors named in its proposal shall bear sole responsibility for proposal preparation errors resulting from any misstatements or omissions in the specifications that could easily have been ascertained by examining either the project site or accurate test data in the City's possession. Although the effect of ambiguities or defects in the specifications will be as determined by law, any patent ambiguity or defect shall give rise to a duty of Contractor to inquire prior to proposal submittal. Failure to so inquire shall cause any such ambiguity or defect to be construed against the Contractor. An ambiguity or defect shall be considered patent if it is of such a nature that the Contractor, assuming reasonable skill, ability and diligence on its part, knew or should have known of the existence of the ambiguity or defect. Furthermore, failure of the Contractor or sub-contractors to notify City in writing of specification defects or ambiguities prior to proposal submittal shall waive any right to assert said defects or ambiguities subsequent to submittal of the proposal.

    To the extent that these specifications constitute performance specifications, the City shall not be liable for costs incurred by the successful Contractor to achieve the project's objective or standard beyond the amounts provided therefor in the proposal.

In the event that, after awarding the contract, any dispute arises as a result of any actual or alleged ambiguity or defect in the specifications, or any other matter whatsoever, Contractor shall immediately notify the City in writing, and the Contractor and all sub-contractors shall continue to perform, irrespective of whether or not the ambiguity or defect is major, material, minor or trivial, and irrespective of whether or not a change order, time extension, or additional compensation has been granted by City. Failure to provide the hereinbefore described written notice within one (1) working day of Contractor's becoming aware of the facts giving rise to the dispute shall constitute a waiver of the right to assert the causative role of the defect or ambiguity in the plans or specifications concerning the dispute.

22. **Indemnification for Professional Liability**. ***To the fullest extent permitted by law, the Contractor shall indemnify, protect, defend and hold harmless the City and any and all of its officials, employees and agents ("Indemnified Parties") from and against any and all losses, liabilities, damages, costs and expenses, including attorney's fees and cost which arise out of, pertain to, or relate to the negligence, recklessness, or willful misconduct of the Contractor.***

23. **Standards**. Documents shall be prepared in Supplier's standard format.

24. **Contractor Endorsement**. Technical reports, plans and specifications shall be stamped and signed by the Contractor where required.

25. **Ownership of Materials**. Upon completion of all work under this contract, ownership and title to all reports, documents, plans, specifications, and estimates produced as part of this contract will automatically be vested in the City and no further agreement will be necessary to transfer ownership to the City. The Contractor shall furnish the City all necessary copies of data needed to complete the review and approval process.

    It is understood and agreed that all calculations, drawings and specifications, whether in hard copy or machine readable form, are intended for one-time use in the construction of the project for which this contract has been entered into.

    The Contractor is not liable for claims, liabilities, or losses arising out of, or connected with the modification, or misuse by the City of the machine-readable information and data provided by the Contractor under this agreement. Further, the Contractor is not liable for claims, liabilities, or losses arising out of, or connected with any use by City of the project documentation on other projects, except such use as may be authorized in writing by the Contractor.

26. **Release of Reports and Information**. Any reports, information, data, or other material given to, prepared by or assembled by the Contractor as part of the work or services under these specifications shall be the property of City and shall not be made available to any individual or organization by the Contractor without the prior written approval of the City.

    The Contractor shall not issue any news release or public relations item of any nature, whatsoever, regarding work performed or to be performed under this contract without prior review of the contents thereof by the City and receipt of the City's written permission.

27. **Copies of Reports and Information**. If the City requests additional copies of reports, drawings, specifications, or any other material in addition to what the Contractor is required to furnish in limited quantities as part of the work or services under these specifications, the Contractor shall provide such additional copies as are requested, and City shall compensate the Contractor for the costs of duplicating of such copies at the Contractor's direct expense.

28. **Contractor Invoices**. The Contractor shall deliver a monthly invoice to the City, itemized by project title. Invoice must include a breakdown of hours billed and miscellaneous charges and any sub-contractor invoices, similarly broken down, as supporting detail.

29. **Payment**. The Contractor shall be reimbursed according to the payment schedule attached to this Agreement.

30. **Payment Terms**. The City's payment terms are 30 days from the receipt of an original invoice and acceptance by the City of the materials, supplies, equipment or services provided by the Contractor (Net 30).

31. **Resolution of Disputes**. Any dispute, other than audit, concerning a question of fact arising under this contract that is not disposed of by agreement shall be decided by a committee consisting of the City Utilities Deputy Director and the City Utilities Director, who may consider written or verbal information submitted by the Contractor. Not later than thirty days after completion of all deliverables necessary to complete the plans, specifications and estimate, the Contractor may request review by the City Council of unresolved claims or disputes, other than audit, in accordance with Chapter 1.20 Appeals Procedure of the Municipal Code.

    Any dispute concerning a question of fact arising under an audit of this contract that is not disposed of by agreement, shall be reviewed by the City's Chief Fiscal Officer. Not later than 30 days after issuance of the final audit report, the Contractor may request a review by the City's Chief Fiscal Officer of unresolved audit issues. The request for review must be submitted in writing.

    Neither the pendency of a dispute, nor its consideration by the City will excuse the contractor from full and timely performance in accordance with the terms of this contract.

32. **Agreement Parties**.

    City: Carrie Mattingly, Utilities Director
    City of San Luis Obispo
    879 Morro Street
    San Luis Obispo, CA 93401

    Contractor: X

    All written notices to the parties hereto shall be sent by United States mail, postage prepaid by registered or certified mail addressed as shown above.

33. **Incorporation by Reference**. City Request for Proposal Specification No. 91280 and Contractor's proposal dated X, are hereby incorporated in and made a part of this Agreement.

34. **Amendments**. Any amendment, modification or variation from the terms of this Agreement shall be in writing and shall be effective only upon approval by the City Engineer.

35. **Working Out of Scope**. If, at any time during the project, the contractor is directed to do work by persons other than the Utilities Deputy Director and the Contractor believes that the work is outside of the scope of the original contract, the Contractor shall inform the Utilities Deputy Director immediately. If the Utilities Deputy Director and Contractor both agree that the work is outside of the project scope and is necessary to the successful completion of the project, then a fee will be established for such work based on Contractor's hourly billing rates or a lump sum price agreed upon between the City and the Contractor. Any extra work performed by Contractor without prior written approval from the Utilities Deputy Director shall be at Contractor's own expense.

36. **Liquidated Damages.** City and Contractor recognize that time is of the essence of this Agreement and that City will suffer financial loss if the Work is not completed within the time specified in Article 2, herein. Further, they recognize the delays, expense and difficulties involved in proving the actual loss suffered by City if the project is not completed on time. Accordingly, instead of requiring such proof, City and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay City $500.00 for each calendar day that expires after the time allowed for completion of the project. The maximum total amount for liquidated damages shall be limited to 15 percent of the Total Contract Price.

37. **Complete Agreement**. This written agreement, including all writings specifically incorporated herein by reference, shall constitute the complete agreement between the parties hereto. No oral agreement, understanding or representation not reduced to writing and specifically incorporated herein shall be of any force or effect, nor shall any such oral agreement, understanding or representation be binding upon the parties hereto. For and in consideration of the payments and agreements hereinbefore mentioned to be made and performed by City, Contractor agrees with City to do everything required by this Agreement, the said specification and incorporated documents.

Authority to Execute Agreement. Both City and Contractor do covenant that each individual executing this agreement on behalf of each party is a person duly authorized and empowered to execute Agreements for such party.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed the day and year first above written.

CITY OF SAN LUIS OBISPO:	CONTRACTOR:
Katie Lichtig, City Manager	By:

APPROVED AS TO FORM:

Christine Dietrick, City Attorney

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, hereinafter called Principal, and _____, hereinafter called Surety, are jointly and severally held and firmly bound into the CITY OF SAN LUIS OBISPO, hereinafter called Owner, in the penal sum of _____ _____Dollars ($ _____) lawful money of the United States, for the payment whereof unto, the Principal and Surety jointly and severally bind themselves forever firmly by these presents.

WHEREAS, Owner has awarded to Principal the Blower Replacement Project.

WHEREAS, Principal is required under the terms of the Contract to furnish a bond for the faithful performance of the Contract,

NOW, THEREFORE, the condition of the obligation is such that if Principal shall faithfully perform the covenants, conditions and agreements in the Contract and any changes made as therein provided and shall indemnify and save harmless Owner, its officers and agents as therein stipulated, then this obligation shall become null and void; otherwise, it shall remain in full force and virtue, and Principal and Surety, in the event suit is brought on this bond, will pay to Owner such reasonable attorney's fees as shall be fixed by the Court.

As a condition precedent to the satisfactory completion of the Contract, the above obligation shall hold good for a period of one (1) year after the completion of the Work and its acceptance by Owner, during which time if Principal shall fail to make full, complete, and satisfactory repair and replacements and totally protect the Owner from loss or damage made evident during the period of one (1) year from the date of acceptance of the Work, and resulting from or caused by defective materials or faulty workmanship, the above obligation in penal sum thereof shall remain in full force and effect. However, nothing in this paragraph to the contrary notwithstanding, the obligation of Surety hereunder shall continue so long as any obligation of Principal remains.

AND, Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration of addition to the terms of the Contract or to the work to be performed thereunder or the Technical Specifications and Drawings accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Technical Specifications and Drawings.

AND IT IS HEREBY DECLARED AND AGREED, that this obligation shall be binding upon and inure to the benefit of Principal, Surety and Owner and their respective heirs, executors, administrators, successors and assigns.

SIGNED AND SEALED THIS _____ day of _____, 2016

_____Principal

By: _____
Signature

_____ Surety

By: _____
Signature

_____
(Surety's Mailing Address)

_____
_____
_____
_____
_____
(Telephone Number)

(Attach Notarial Acknowledgement of Surety)

Approved as to form this _____day of_____,2016___

_____
Attorney for Owner

NOTE: The principal amount of this bond shall not be less than 100 percent of the total Contract price.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, hereinafter called Principal, and, hereinafter called Surety, are jointly and severally held and firmly bound unto the CITY OF SAN LUIS OBISPO, hereinafter called Owner, in the penal sum of _____ Dollars ($ _____), lawful money of the United States, for the payment whereof unto Owner, the Principal and Surety jointly and severally bind themselves forever firmly by these presents.

WHEREAS, Owner has awarded to Principal the construction of the Blower Replacement Project.

WHEREAS, said Principal is required to furnish a Payment Bond in connection with said Contract.

NOW, THEREFORE, the conditions of this obligation are such that if said Principal or any of his Subcontractor, heirs, executors, administrators, successors, or assigns shall fail to pay any of the persons named in Civil Code Section 3181, or amounts due under the Unemployment Insurance Code with respect to work or labor performed by any such claimant, or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the Contractor and his Subcontractors pursuant to Section 18806 of the Revenue and Taxation Code, with respect to such work and labor, Surety will pay the same in or to an amount not exceeding the amount hereinabove set forth, and also will pay in case suite is brought upon this bond, such reasonable attorney's fee as shall be fixed by the Court.

This bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under Section 3181 of the California Civil Code, so as to give a right or action to them or their assigns in any suit brought upon this bond.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract, or to the work to be performed thereunder, or the Drawings and Technical Specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Drawings and Technical Specifications.

AND IT IS HEREBY DECLARED AND AGREED, that this obligation shall be binding upon and insure to the benefit of Principal, Surety and Owner and their respective heirs, executors, administrators, successors and assigns.

SIGNED AND SEALED THIS ___day of _____,20_____

_____
Principal

By:_____
Signature

_____
Surety

By:_____
Signature

_____
(Surety's Mailing Address)

_____
(Telephone Number)

(Attach Notarial Acknowledgement of Surety)

Approved as to form this __ day of _____, 20____

_____
Attorney for Owner

NOTE: The principal amount of this bond shall not be less than 100 percent of the total Contract price.

ACKNOWLEDGEMENT

The undersigned declares that she or he:

- Has carefully examined the RFP pursuant to Specification No. 91280
- Is thoroughly familiar with its content
- Is authorized to represent the proposing firm; and
- Agrees to perform the work as set forth in the specification and this proposal.

Firm Name and Address:		
Contact Name:		
Email:	Fax:	Phone:

Signature of Authorized Representative:	Date:

INSURANCE CERTIFICATE

_____ Insurance Company's A.M. Best Rating

☐ Certificate of insurance attached

STATEMENT OF PAST CONTRACT DISQUALIFICATIONS

The Supplier shall state whether it or any of its officers or employees who have a proprietary interest in it, has ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal, state, or local government project because of the violation of law, a safety regulation, or for any other reason, including but not limited to financial difficulties, project delays, or disputes regarding work or product quality, and if so to explain the circumstances.

Do you have any disqualifications as described in the above paragraph to declare? ☐ Yes ☐ No

If yes, explain the circumstances.

Executed on _____ at _____
under penalty of perjury of the laws of the State of California, that the foregoing is true and correct.

_____
Signature of Authorized Supplier Representative

SUPPLIER REFERENCES

Number of years engaged in providing the services included within the scope of the specifications under the present business name: _____

Describe fully the last three contracts performed by your firm that demonstrate your ability to provide the services included with the scope of the specifications. Attach additional pages if required. The City reserves the right to contact each of the references listed for additional information regarding your firm's qualifications.

Supplier Reference No. 1

Customer Name	
Contact Individual	
Telephone & Email	
Street Address	
City, State, Zip Code	
Date of Services	
Contract Amount	
Description of Services	
Project Outcome	

Supplier Reference No. 2

Customer Name	
Contact Individual	
Telephone & Email	
Street Address	
City, State, Zip Code	
Date of Services	
Contract Amount	
Description of Services	
Project Outcome	

Supplier Reference No. 3

Customer Name	
Contact Individual	
Telephone & Email	
Street Address	
City, State, Zip Code	
Date of Services	
Contract Amount	
Description of Services	
Project Outcome	

MANUFACTURER REFERENCES (If other than SUPPLIER)

Provide references for installations where the turbo blower equipment proposed herein has been installed and has been operating for at least 2 years. The City reserves the right to contact each of the references listed for additional information regarding performance of the installed equipment.

Manufacturer Reference No. 1

Customer Name	
Contact Individual	
Telephone & Email	
Street Address	
City, State, Zip Code	
Date of Installation	
Blower Model and Number Installed	
Description of Installation	

Manufacturer Reference No. 2

Customer Name	
Contact Individual	
Telephone & Email	
Street Address	
City, State, Zip Code	
Date of Installation	
Blower Model and Number Installed	
Description of Installation	

Manufacturer Reference No. 3

Customer Name	
Contact Individual	
Telephone & Email	
Street Address	
City, State, Zip Code	
Date of Installation	
Blower Model and Number Installed	
Description of Installation	

POWER GUARANTEE

The SUPPLIER shall submit MANUFACTURER'S guaranteed wire-to-air ("wire") KW values on the following form for the Blower system specified in Section 11081, High Speed Turbo Blower, of the Technical Specifications. The wire KW shall include all losses associated with the blower system at all specified operating points including those due to the blower, motor, intake filter/silencer, and VFD or inverter.

Operating Point	Capacity %	Evaluation Factor	Flow scfm	Pressure (psia)		Inlet Temp °F(1)	RH %	Guaranteed Wire KW
				Barometric	Outlet			
1	100	.1	4100	14.56	22.56	95	72	
2	80	.4	3280	14.56	22.56	95	72	
3	75	.2	3075	14.56	22.56	95	72	
4	60	.2	2460	14.56	22.56	95	72	
5	50	.1	2050	14.56	22.56	95	72	

Notes:

1. Inlet air temperature to the blower core as defined by ASME PTC-10.

COST PROPOSAL

This form includes the SUPPLIER'S total cost proposal for demolition, equipment, equipment installation, startup, commissioning, training, and all other items included in the Work. Proposed Costs include all SUPPLIER's overhead and profit.

The Proposed Cost for the Project is _____ Dollars ($_____).

SUPPLIER accepts the terms included in the Form of Agreement.

_____ Date_____
By (Authorized Signatory)

_____
Title of Authorized Signatory

Item	Cost
Mobilization and Demobilization	
Demolition	
Equipment Complete Including Factory Testing and all Taxes and Delivery Costs	
Equipment Installation Including Blowers, Appurtenances, Valves, Piping, Electrical, and Instrumentation	
Modifications to Existing Canopy Structure	
Field Testing, Start-up and Commissioning, and Training	
Insurance (during construction)	
Payment and Performance Bonds	
Other (not included in items above)	
TOTAL PROPOSED COST	

Section F

INSURANCE REQUIREMENTS

INSURANCE REQUIREMENTS: CONTRACTORS

The Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, employees, or subcontractor.

Minimum Scope of Insurance.

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage (occurrence form CG 20 10 Prior to 1993 or CG 20 10 07 04 with CG 20 37 10 01 or the exact equivalent as determined by the City).
2. Insurance Services Office form number CA 0001 (Ed. 1/87) covering Automobile Liability, code 1 (any auto).
3. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance.

Minimum Limits of Insurance.

Contractor shall maintain limits no less than:

1. General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
2. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.
3. Employer's Liability: $1,000,000 per accident for bodily injury or disease.

Deductibles and Self-Insured Retentions.

Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

Other Insurance Provisions.

The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

1. The City, its officers, officials, employees, agents and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the City, its officers, officials, employees, agents or volunteers.
2. For any claims related to this project, the Contractor’s insurance coverage shall be primary insurance as respects the City, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees, agents or volunteers shall be excess of the Contractor’s insurance and shall not contribute with it.
3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the City, its officers, officials, employees, agents or volunteers.
4. The Contractor’s insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the City.
6. Coverage shall not extend to any indemnity coverage for the active negligence of the additional insured in any case where an agreement to indemnify the additional insured would be invalid under Subdivision (b) of section 2782 of the Civil Code.

Acceptability of Insurers.

Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII.

Verification of Coverage.

Contractor shall furnish the City with a certificate of insurance showing required insurance coverage. Original endorsements effecting general liability and automobile liability coverage required by this clause must also be provided. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All endorsements are to be received and approved by the City before work commences.

Subcontractors.

Contractor shall include all subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

Attachment A

General Requirements

SECTION 01100

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work under other contracts.
3. Use of premises.
4. Owner's occupancy requirements.
5. Work restrictions.

B. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Blower Replacement Project

1. Project Location: Water Resource Recovery Facility (WRRF)

B. Owner: City of San Luis Obispo
1. Address:
35 Prado Road
San Luis Obispo, CA 93401

C. Engineer: Water Systems Consulting
1. Address:
3765 S. Higuera Street, Suite102
San Luis Obispo, CA 93401

D. Construction Manager: To be determined

E. The Work consists of the following:

1. The Work includes provision and installation of equipment and interconnecting piping, electrical, and controls for Blower Replacement Project.

F. Supplier:
1. The respondent to the Request for Proposals that has been selected by the Owner to provide the Work.
2. Wherever “Supplier” or “Contractor” is designated in the Contract documents.

1.3 WORK UNDER OTHER CONTRACTS

A. General: Coordinate the Work of this Contract with work being performed by others on site.

1.4 USE OF PREMISES

A. General: Supplier shall have limited use of premises for installation operations as required for execution of the Work.

B. Use of Site: Limit use of premises to work in areas at the installation site. Do not disturb portions of Owner property beyond areas in which the Work is indicated. Project location is on an operating wastewater treatment facility. Supplier must not disturb Owner's operations.

1. Limits: Confine constructions operations to within lines of demarcation indicated on drawings. Do not disturb Owner's operations or site beyond lines of demarcation and setbacks.
2. Owner Occupancy: Allow for Owner occupancy of Project site.
3. Roads and Entrances: Keep roads and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    a. Schedule deliveries to minimize use of roads and entrances.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed on site during normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.

B. The Contractor shall schedule all the required work with the Owner, including each utility or equipment shutdown period. Each shutdown shall be implemented to minimize disruption of the existing operations. The work to be provided under this Contract shall not disrupt any of the existing operations without prior approval.

1. The Contractor shall limit all unscheduled shutdown periods to less than 2 hours and only with written prior approval of the Construction Manager and Owner.
2. Carry out scheduled shut downs only after the time, date, and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Construction Manager and Owner. Submit shutdown plans at least 72 hours in advance of when the scheduled shutdown is to occur. Utility outages to be limited to maximum of 2 hours. Equipment outages that affect existing operations shall not exceed 2 hours or as otherwise approved by Construction Manager and Owner.
3. The Owner reserves the right to delay, change, or modify any shutdown at any time, at no additional cost to the Owner, when the risk of such a shutdown would jeopardize the operation of system.

END OF SECTION 01100

SECTION 01150
MEASUREMENT AND PAYMENT

PART 1 - APPLICATIONS FOR PAYMENT

1.1 SUMMARY

A. General work included in this Section:
   1. Measurement and Payment.

1.2 GENERAL

A. Submit Applications for Payment to Construction Manager in accordance with the schedule established by conditions of the Contract and Agreement between Owner and Supplier.

B. Additional requirements specified elsewhere.
   1. Lump sum price: Agreement.
   2. Progress payments, retainages, and final payment: Conditions of the Contract and Agreement.

1.3 PAYMENT SCHEDULE

A. Owner shall make progress payments on account of the Contract Price on the basis of Supplier's Applications for Payment as follows:
   1. Upon receipt of application for Payment Submitted and accompanied by Construction Manager's recommendation of payment, an amount equal to the amounts listed below less such amounts as Construction Manager may determine shall be withheld pending satisfactory completion of the item.
      a. Bonds and Insurance Furnished: 10 percent of the Contract Price.
      b. Submission of Certified Shop Drawings: 15 percent of the Contract Price.
      c. Delivery of Goods to the Project Site, including submission of draft Operation and Maintenance Manuals: 25 percent of Contract Price.
      d. Installation of equipment including piping and electrical connections: 40 percent of the Contract Price
      e. Completion of performance testing, startup, manufacturer's training, project acceptance and final Operations and Maintenance Manual: 10 percent of the Contract Price.

1.4 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application:
   1. Fill in required information, including that for Change Orders executed prior to the date of submittal application.
   2. Execute certification with the signature of a responsible officer of the Supplier's firm.

1.5 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When Owner or Construction Manager requires substantiating data, Supplier shall submit suitable information, with a cover letter identifying:
   1. Project.
   2. Application number and date.
   3. Detailed list of enclosures.
   4. For stored products:

a. Item number and identification as shown on application.
b. Description of specific material.

1.6 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in application form as specified for progress payments.

1.7 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to Construction Manager.

B. Number: One original plus four copies of each application.

C. When Construction Manager finds the application properly completed and correct, he will transmit a Certificate for Payment to Owner, with a copy to Supplier.

END OF SECTION

SECTION 01300

CONSTRUCTION SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements and procedures for submitting Shop Drawings, Product Data, Samples, during construction.

1.2 DEFINITIONS

A. Manufacturer's Instructions: Instructions, stipulations, directions, and recommendations issued in printed form by the manufacturer of a product addressing handling, installation, erection, and application of the product; Manufacturer's Instructions are not prepared especially for the Work.

B. Shop Drawings: Drawings, diagrams, schedules, and other data specially prepared for the Work to illustrate some portion of the Work.

C. Product Data: Illustrations, standard schedules, performance charts, brochures, diagrams and other information to illustrate materials or equipment for some portion of the Work.

D. Mix Design: Proportioning of materials to be used for the Work.

E. Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

F. Special Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged, and will be incorporated in the Work.

1.3 PROCEDURES

A. Deliver submittals to Construction Manager.

B. Submit submittals in ample time for each to serve submittals' intended purpose.

C. Submit submittals which are specified or reasonably required for construction, operation, and maintenance of the Work.

D. Deliver submittals under acceptable transmittal form which identifies:
   1. Submittal Date
   2. Project and Supplier.
   3. Subcontractor and major supplier, when appropriate.
   4. Reference submittal to Contract Documents by Drawing, detail, and/or Specification section numbers, as appropriate.

5. Variations from Contract Documents when variations are included in submittal.

E. Submit specified number of copies of submittal.

F. Provide or furnish products and execute the Work in accordance with accepted submittals, unless in conflict with Contract Documents.

G. When minor deviations from Contract Documents are accepted, modify Contract Documents in accordance with Conditions of the Contract.

1.4 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. Submit Shop Drawings, Product Data, Mix Designs, Samples, and other pertinent information in sufficient detail to show compliance with specified requirements.

B. Check, verify, and revise submittals as necessary to bring them into conformance with Contract Documents and actual field conditions.
1. Determine and verify quantities, dimensions, specified design and performance criteria, materials, catalog numbers, and similar data.
2. Coordinate submittal with other submittals and with the requirements of the Contract Documents.

C. After completion of checking, verifications, and revising; stamp, sign and date submittals indicating review and approval; and submit to Construction Manager.
1. Stamp and signature indicates Supplier has satisfied shop drawing review responsibilities and constitutes Supplier's written approval of shop drawing.
2. Shop drawings without Supplier's written approval will be returned for resubmission.

D. Shop Drawings: Submit 4 copies. Two will be returned with reviewer's comments and stamp.

E. Product Data and Manufacturer's Instructions: Submit 3 copies. Excise or cross out non-applicable information and clearly mark applicable information with citations to and terminology consistent with Contract Documents.
1. 1 copy will be returned with reviewer's comments and stamp.

F. Mix Design: Submit 3 copies. One copy will be returned with reviewer's comments and stamp.

G. Assume risk of expense and delays when proceeding with work related to required submittals without review and acceptance.

1.5 MANUFACTURER'S INSTRUCTIONS

A. Submit manufacturer's instructions whenever made available by manufacturers and when installation, erection, or application in accordance with manufacturer's instructions are required by the Specifications.

B. Submit manufacturer's instructions prior to installation, erection, or application of equipment and other project components. Submit manufacturer's instructions in accordance with requirements for Product Data.

1.6 CONSTRUCTION MANAGER'S REVIEW

A. Construction Manager's review of submittals shall not release Supplier's responsibility for performance of requirements of Contract Documents. Neither shall Construction Manager's review release Supplier from fulfilling purpose of installation nor from Supplier's liability to replace defective work.

B. Do not consider submittals as Contract Documents. Purpose of submittals is to demonstrate how Supplier intends to conform to the design concepts.

C. Construction Manager's review of shop drawings, samples, or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents.
   1. Construction Manager's review does not extend to:
      a. Accuracy of dimensions, quantities, or performance of equipment and systems designed by Supplier.
      b. Supplier's means, methods, techniques, sequences, or procedures except when specified, indicated on the Drawings, or required by Contract Documents.
      c. Safety precautions or programs related to safety which shall remain the sole responsibility of the Supplier.
      d. Structural calculations provided by Supplier or Equipment Manufacturers related to seismic, foundation, or anchorage of structures or equipment provided by Supplier or Equipment Manufacturer. Such items will be marked "Not Reviewed – Filed for Record".

D. Except as may be provided in subsequent specifications, a submittal will be returned within 30 days. When a submittal cannot be returned within that period, Construction Manager will, within a reasonable time after receipt of the submittal, give notice of the date by which that submittal will be returned.

E. For submittals returned Resubmittal Not Required – No Exceptions Taken/ No further action is required by Supplier.

E. For submittals returned Resubmittal Not Required – Make Corrections Noted / See all Comments, Supplier shall incorporate all review comments into the work, but resubmittal of an amended submittal package is not required.

F. For submittals returned Correct and Resubmit – Make Corrections Noted / See All Comments, Supplier shall incorporate all review comments into a complete revised package, and resubmit for review.

G. For submittals returned Rejected – See All Comments, shall develop a new submittal package with materials, equipment, methods, etc. that meet the requirements of the Contract Documents.

H. For submittals returned Submittal Not Reviewed, Filed for Record, no further action is required by the Supplier for this submittal.

I. Construction Manager will be entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed professionals accompanying a particular submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.

J. Costs incurred by Owner as a result of additional reviews of a particular submittal after the second time it has been reviewed shall be borne by Contractor. Reimbursement to Owner will be made by deducting such costs from Contractor's subsequent partial payments.

1.7 MINOR OR INCIDENTAL PRODUCTS AND EQUIPMENT SCHEDULES

A. Shop Drawings of minor or incidental fabricated products will not be required, unless requested.

1.8 SUBMITTALS FOR INFORMATION OR RECORD ONLY

A. Submit 2 copies of each. None will be returned.

END OF SECTION

SECTION 01310
PROCUREMENT, DELIVERY, & INSTALLATION SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

A. General work included in this Section:
   1. Schedules.

1.2 SCHEDULES: GENERAL

A. Prepare and submit to the Construction Manager estimated progress schedules for the Work, with subschedules of related activities that are essential to its progress.

B. Submit revised progress schedules with progress payments.

1.3 FORM OF SCHEDULES

A. Prepare schedules in the form of a horizontal bar chart:
   1. Provide separate horizontal bar for each trade or operation.
   2. Horizontal time scale: Identify the first work day of each week.
   3. Scale and spacing: To allow space for notations and future revisions.
   4. Minimum sheet size: 11 IN x 17 IN.

B. Format of Listings: Breakdown of tasks associated with procurement, delivery, installation, and startup.

C. Format of Listing: The chronological order of the start of each item of work.

1.4 CONTENT OF SCHEDULES

A. Show on construction progress schedule:
   1. The complete sequence of construction by activity.
   2. The dates for the beginning and completion of each major element of construction.
      a. Specifically list:
         1) Mobilization.
         2) Demolition.
         3) Piping Installation.
         4) Electrical Installation.
         5) Equipment Installation.
         6) Any process or utility outages
         7) Connections.
         8) Subcontractor work.
         9) Startup and Training.
         10) Punchlist.
   3. Show for submittal schedules for shop drawings and product data.
   4. The dates for Supplier's submittals.
   5. The dates approved submittals will be required from Construction Manager.
      a. Extensions of time for delays in submittal approval shall only be allowed as provided in Section 01340.

1.5 PROGRESS REVISIONS

A. Indicate progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule:
   1. Major changes in scope.
   2. Activities modified since previous submission.
   3. Revised projections of progress and completion.
   4. Other identifiable changes.

C. Provide a narrative report as needed to define:
   1. Problem areas, anticipated delays, and the impact on the schedule.
   2. Corrective action recommended, and its effect.
   3. The effect of changes on schedules of other prime contractors.

1.6 SUBMISSIONS

A. Submit initial schedules within 14 days after the award of Contract:
   1. Construction Manager will review schedules and return review copy within 10 days after receipt.
   2. If required, resubmit within 7 days after return of review copy.

B. Submit revised progress schedules with each Application for Payment.

C. For each submission, submit the number of opaque reproductions that the Supplier requires, plus three copies that will be distributed by the Construction Manager.
   a. Do not submit less than five copies.

D. Submit one reproducible transparency and one opaque reproduction for each initial resubmission.

1.7 DISTRIBUTION

A. Construction Manager will distribute copies of the accepted schedules to:
   1. One copy to Owner.
   2. Two copies to Resident Project Representative.
   3. One copy to be retained in Construction Manager's file.
   4. One copy to Supplier to be kept on file at job site.
   5. Remainder to Supplier for his distribution.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. General:
1. The section applies to all equipment provided under this Contract.
3. Provide all new materials and equipment, except as specified or required by testing.
4. Supplier to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components.
5. Supplier is responsible for all alterations in the Work to accommodate equipment differing in sizes and configurations.
6. Do not use any material or equipment for any purpose other than that for which is designed or specified.

C. Definitions:
1. Special tools, instruments, devices or accessories - Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question or which are not normally kept in stock by local tool suppliers.

1.02 QUALITY ASSURANCE

A. Installer's Qualifications:
1. Equipment and material shall be installed and placed in service by, or under the guidance of, qualified personnel having the knowledge and experience necessary for proper results. Where Supplier's or subcontractor's employees are not properly qualified, such personnel shall be field representative of the equipment supplier.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with Work and conditions at the site:
1. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible.
2. Immediately on delivery, inspect shipments to assure that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

C. Deliver anchor bolts together with templates sufficiently early to permit setting when structural concrete is placed.

D. Preparation for Shipment:
1. Package materials and equipment to facilitate handling and protect against damage during transit handling or storage.

2. Box, crate, or otherwise completely enclose and protect all equipment.
3. Protect equipment from exposure to the elements and keep thoroughly dry and dust free at all times.
4. Protect painted surfaces against impact, abrasion, discoloration or other damage.
5. Grease or oil all bearings and similar items.
6. Tag or mark each item per the delivery schedule or the Shop Drawings.
7. Include complete packing lists and bills of material with each shipment.

E. Storage and Protection:
1. Store immediately upon delivery.
2. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
3. Store electrical equipment and equipment with bearings in weather-tight structures maintained above 60 Degrees F.
4. Protect electrical equipment, controls and insulation against moisture, water, and dust damage.
5. Connect and operate continuously all space heaters furnished in electrical equipment.
6. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining.
7. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
8. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
9. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.
10. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.
11. Provide permanent, labeled, packings for spare parts.

1.04 JOB CONDITIONS

A. The project is a wastewater treatment facility where dilute concentrations of such corrosive materials as Hydrogen Sulfide, Ferric Chloride, and low pH materials are expected to be present. Select and design materials and equipment to resist the corrosive attack of these and similar liquids and gases.

1.05 GUARANTEE

A. Guarantee all materials and equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage, or other failure through the final acceptance and guarantee period.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:
1. Suitable for the service conditions.
2. Structural and miscellaneous fabricated steel in equipment shall conform to AISC standards, except as otherwise specified.

B. Safety Guards:
   1. Guards: 16 ga or heavier galvanized or aluminum coated steel or 1/2-inch mesh expanded metal.
   2. Accessories and supports, including bolts: Galvanized steel.

C. Baseplates:
   1. Cast iron or welded steel.

D. Shop Painting:
   1. Shop primer for steel and iron surfaces: Cook "391-R-259 Clorocon Barrier Coat", Mobil "13-R-50 Chromox QD Primer", Tnemec "77 Chem-Prime", or equal.
   2. Rust preventative coating for machined, polished and nonferrous surfaces not to be painted: Houghton "Rust-Veto 344", Rust-Oleum "R-9", or equal.
   3. Paint for self-contained or enclosed components such as motors, speed reducers and starters: High grade, oil-resistant enamel.

2.02 FABRICATION AND MANUFACTURE

A. General:
   1. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices.
   2. Manufacture parts to standard sizes and gages.
   3. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
   4. Design structural members for shock and vibratory loads.
   5. Use 1/4-inch minimum thickness for all steel, which will be submerged, wholly or partially, during normal operation.

B. Lubrication System:
   1. Require no more than weekly attention during continuous operation.
   2. Require no attention during equipment startup and shutdown.
   3. No lubricant wasting.
   4. Convenient and accessible:
      a. Oil drains and fill plugs easily accessible from the normal operating area or platform.
      b. Drains located to allow convenient collection of oil during oil changes without removing the equipment from its normal installed position.
      c. Drains with isolation valves and plugs to be plumbed out beyond base for draining.
   5. Provide constant level oilers or oil level indicators for oil lubrication systems.

C. Electric Motors:
   1. General:
      a. Designed and applied in accordance with NEMA, ANSI, IEEE, AFBMA, and NEC standards for the duty imposed by the driven equipment.
      b. All motors to be severe duty rated.
      c. Nameplate horsepower based on continuous duty at 40 C ambient, unless recognized and defined by the standards and codes for intermittent duty as a standard industry practice. Temperature rise about 40 Degrees C ambient on continuous operation not to exceed the NEMA limit for 1.15 service factor and Class F or better insulation.
      d. Designed for satisfactory operation at any voltage within plus or minus 10 percent of rated

voltage.

e. Designed for full voltage starting.

f. Non-contacting bearing isolators, conforming to IP55, for all motor ball bearings. Bearing life based on the actual operating load conditions imposed by driven equipment.

g. Sized for the altitude at which the equipment is installed.

h. Maximum continuous load shall not exceed motor rating. Service factor shall not be used to determine non-overloading condition.

i. If driven equipment Specification calls for encapsulated winding, provide a sealed insulation system designed for a more severe environment than usual varnish treatments can withstand, General Electric "Polyseal", Allis-Chalmers "Poxeal", U.S. Motors "Ever-seal" or equal. Motors with encapsulated windings may be single voltage rated.

j. Clamp-type grounding terminal inside the motor conduit box.

k. Oversized motor conduit boxes, twice NEMA standard.

l. Totally enclosed where outdoors.

m. Totally enclosed where indoors.

n. Explosion proof motors where required adjacent to digesters and biogas equipment per NFPA 820.

n. On integrally constructed motor driven equipment such as appliances and hand tools, and similar equipment, specified by model number, the manufacturer's standard motor may be provided if a complete redesign of the unit would be required to meet the requirements of this article.

o. Premium energy-efficient motors:

1) Supply premium energy-efficient motor:

a) Supply premium energy efficient motor even if specified equipment overall efficiency can be met with normal efficiency motor.

2) Test method: IEEE 112 Method B.

3) Motor warranty: 5 years minimum.

4) Minimum efficiencies for energy-efficient motors (nominal):

hp	Efficiency		
	1200 rpm and slower	1800 rpm	3600 rpm
1	78.5	84.0	78.5
2	84.0	84.0	81.5
3	86.0	86.0	82.0
5	88.0	88.0	88.0
7-1/2	88.0	88.0	88.0

hp	Efficiency		
	1200 rpm and slower	1800 rpm	3600 rpm
10	88.6	88.6	88.6
15	90.0	90.0	90.0
20	90.7	90.7	90.7
25	91.2	91.2	91.2
30	91.7	91.7	91.7
40	92.2	92.2	92.2
50	92.6	92.6	92.6
60	93.0	93.0	93.0

75	93.4	93.4	93.4
100	93.7	93.7	93.7
125	94.0	94.0	94.0
150	95.0	95.0	95.0
200 and over	95.4	95.4	95.4

p. All vertical oriented motors to include rain cover, whether installed indoors or outdoors.
q. Service factor for all motors to be 1.15 unless otherwise indicated.
r. Motor frames shall be cast iron. Motor frame feet to be machined for flatness to 0.005".

2. Below 1/2 hp:
   a. 115 V, 60 Hz, single phase.
   b. Permanently lubricated ball bearings.
   c. Built-in manual-reset thermal protector or provided with an integrally mounted manual motor starter, NEMA 4 or 4Y only. No automatic reset overload devices.
3. 1/2 to 1 hp:
   a. 230/460 V, 60 Hz, 3 phase.
   b. Specially insulated for damp locations below 20 Degrees C.
   c. Oil or grease-lubricated anti-friction or oil lubricated ball bearings.
   d. 15-year average-life thrust bearings in vertical motors.
4. 1-1/2 hp and above:
   a. 230/460 V, 60 Hz, 3 phase.
   b. Specially insulated for damp locations below 20 Degrees C.
   c. Oil or grease-lubricated anti-friction or oil lubricated ball bearings.
   d. 15-year average-life thrust bearings in vertical motors.

D. Drive Units:
1. General:
   a. Input horsepower rating not less than nameplate horsepower of the driving motor.
   b. Designed for 24-hour continuous duty.

E. Safety Guards:
1. Provide for all belt or chain drives, fan blades, couplings or other moving or rotary parts.
2. Cover rotating part on all sides.
3. Designed for easy installation and removal.
4. Provided with all necessary supports and accessories.
5. If outdoors, designed to prevent the entrance of rain and dripping water.

F. Equipment Anchor Bolts:
1. Furnished with equipment.
2. Provided with at least 2 nuts per bolt.
3. 3/4-inch minimum diameter.
4. Long enough to permit 1-1/2 inches of grout below baseplate, if equipment is baseplate mounted, and to provide adequate anchorage into structural concrete.
5. Stainless Steel.

G. Baseplates:
1. Provide for pumps, compressors and similar equipment.
2. Neat design.
3. Pads for anchoring.

4. Adequate grout holes.
5. Provide pump bases with a means for collecting leakage and a threaded drain connection.

H. Special Tools and Accessories:
1. Provide all special tools, instruments and accessories required for proper maintenance.
2. Provide all special lifting and handling devices required.

I. Shop Painting:
1. Coat all steel and iron surfaces.
2. Protect surfaces which will be inaccessible after assembly for the life of the equipment.
3. Provide a smooth uniform base for painting of exposed surfaces by finishing smooth, cleaning thoroughly and filling as necessary.
4. Apply shop primer to protect equipment to be field painted.
5. Shop finish, self-contained or enclosed components.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any equipment showing such effects. Replace damaged equipment with identical new equipment.

3.02 PREPARATION

A. Install Equipment Anchor Bolts During Placement of Structural Concrete.

3.03 INSTALLATION

A. Install All Equipment on Bases 4 Inches Minimum High.

B. Anchor Baseplates to the Concrete Base and Fill Space Beneath with Grout.

C. Repaint All Painted Surfaces Which Are Damaged Prior to Equipment Acceptance to Construction Manager's Satisfaction.

D. Provide lubricants as recommended by the equipment manufacturer in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup and operation prior to acceptance of equipment by Owner.

E. For Material and Equipment Specifically Indicated or Specified to Be Reused in the Work:
1. Use special care in removal, handling, storage and reinstallation, to assure proper function in the completed Work.
2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such Work.

F. Handle, install, connect, clean, condition and adjust products in strict accord with manufacturer's instructions and in conformity with specified requirements:
1. Obtain and distribute copies of such instructions to parties involved in the installation in the

manner detailed in the submittal section.

2. Maintain one set of complete instructions at the job site during installation and until completion.
3. Perform Work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.
4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Construction Manager for further instructions.
5. Do not proceed with Work without clear instructions.

G. No Shimming Between Machined Surfaces is Allowed.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Representative:
   1. Provide a qualified manufacturer's field representative when specified in the detailed Specifications, to provide the services specified.
   2. Where installation assistance is specified, manufacturer's representative is to observe, guide, instruct and direct Supplier's erection or installation procedure.
   3. Where an installation check is specified, manufacturer's representative is to verify equipment is properly installed.
   4. Field representatives are to revisit the site as often as necessary to attain installation satisfactory to Construction Manager.
   5. Acceptance of Work in connection with the installation of equipment furnished by others is subject to acceptance by the field representative. Such acceptance by the field representative or Construction Manager does not relieve Supplier of responsibility for planning, supervising, and executing the installation of Work or of responsibility for defective Work.

3.05 ADJUSTMENT AND CLEANING

A. Perform all required adjustments, tests, operation check and other startup activities required.

END OF SECTION

SECTION 01650

FACILITY STARTUP AND COMMISIONING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:
   1. Project performance demonstration.

1.02 DEFINITIONS

A. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction and installation activities during which Supplier, with assistance from manufacturer's representatives, performs in the following sequence:
   1. Finishing type construction work to ensure the Project or components of the project are suitable for startup and continuous operation.
   2. Equipment start-up.

B. Demonstration Period: A period of time, of specified duration, following the Pre- Demonstration Period, during which the Owner operates the facility, and during which the installed aeration systems shall operate continuously and without malfunction.

C. Guarantee Period: One year following the completion and acceptance of the Demonstration Period, during which the Supplier’s guarantee is in effect.

D. Facility- Equipment, processes, systems, and constructed physical portions of the Project.

E. Functional Integrity – Ability of facility, provided technology, and installed equipment including instrumentation and controls to operate as intended, within accepted performance parameters, in a continuous manner in an environment that represents actual operating conditions.

1.04 COST OF STARTUP AND COMMISIONING

A. Supplier to pay all costs associated with Supplier’s personnel and equipment repairs.

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

PART 3 - EXECUTION

3.01 GENERAL

A. Facility Start-up Divided into Three Periods:
   1. Pre-Demonstration Period including:
      a. Completion of installation work.
      b. Start-up of Equipment.
      c. Completion of the filing of all required submittals.

2. Demonstration Period including:
    a. Demonstration of operating performance of aeration system.
3. Guarantee Period.

3.02 PRE-DEMONSTRATION PERIOD

A. Completion of Installation:
    1. Complete the work to bring the Project to a state ready and suitable for startup and continuous operation.

B. Equipment Startup:
    1. Equipment installation per equipment manufacturer's recommendations.
    2. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
    3. Procedures include but are not necessarily 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) Instrumentation and control signal generation, transmission, reception and response.
            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 Demonstration Period.
    4. Obtain certifications, without restrictions or qualifications, and deliver to Construction Manager:
        a. Manufacturer's equipment installation check letters.

C. Complete the filing of all required submittals:
    1. Shop drawing.
    2. Operation and Maintenance Manuals.

3.03 DEMONSTRATION PERIOD

A. General:
    1. Demonstrate the functional integrity of the mechanical, electrical and control interfaces of the respective equipment and components.
    2. Duration of Demonstration Period: 336 consecutive hours.
    3. If, during the Demonstration 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 Demonstration Period, the demonstration of functional integrity will be deemed to have failed. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure. The new Demonstration Period

shall have the same requirements and duration as the Demonstration Period previously conducted.

4. Conduct the demonstration of functional integrity under full operational conditions.
5. Owner will provide operational personnel during Demonstration Period. Supplier will perform all other functions including but not limited to equipment tuning, repairs, and trouble-shooting until successful completion of the Demonstration Period. Supplier to remain on standby during the demonstration period and be able to respond as needed within a period of 48 hours.
6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic systems.
7. Owner reserves the right to track and record alarms, operating parameters, and performance results on Owner's SCADA system for use in evaluating the functional integrity of the provided technology.
7. Time of beginning and ending any Demonstration Period shall be agreed upon by Supplier, Owner, and Construction Manager in advance of initiating Demonstration Period.

B. Upon successful completion of Demonstration Period, Construction Manager will endorse certificate attesting to the successful demonstration, and citing the hour and date of beginning and ending the successful Demonstration Period and the beginning of the Guarantee Period.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Compile Product Data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.

B. Prepare operating and maintenance data as specified in this section and as referenced elsewhere.

1.02 QUALITY ASSURANCE

A. Preparation of Data Shall be Done by Personnel:
   1. Trained and experienced in maintenance and operation of the described products.
   2. Completely familiar with requirements of this section.
   3. Skilled as a technical writer to the extent required to communicate essential data.
   4. Skilled as a draftsman competent to prepare required Drawings.

B. Manuals for equipment and systems shall be prepared by the equipment manufacturer or system supplier.

1.03 SUBMITTALS

A. For each O&M Manual submittal, include Transmittal Form.

B. Prepare data in the form of an instructional manual for use by Owner's personnel.

C. Format:
   1. Size: 8-1/2 inches by 11 inches.
   2. Paper: 20 lb. minimum, white, for typed pages.
   3. Text: Manufacturer's printed data, or neatly typewritten.
   4. Tab each section with plastic coated dividers.
   5. Provide index for each manual.
   6. Provide plastic sheet lifters prior to the first page and following the last page.
   7. Drawings:
      a. Provide reinforced punched binder tab, bind in with text.
      b. Reduced to 8-1/2 inches by 11 inches or 11 inches by 17 inches and folded to 8-1/2 inches by 11 inches.
      c. Where reduction is impractical, folded and placed in 8 1/2-inch by 11-inch envelopes bound in text.
      d. Suitably identified on Drawings and envelopes.
   8. Provide fly-leaf for each separate product, or each piece of operating equipment:
      a. Provide typed description of product, and major component parts of equipment.
      b. Provide indexed tabs.
   9. Cover: Identify each volume with typed or printed title on front and spine of each binder, "OPERATING AND MAINTENANCE INSTRUCTIONS” List:

a. Title of Project.
b. Identity of separate structure as applicable.
c. Identity of general subject matter covered in manual.

7. As much as possible, assemble and bind material in the same order as specified.

D. Binders:
1. Preliminary manuals: Heavy paper covers.
2. Final manuals: Commercial quality substantial, stiff metal hinged 3-ring or 3-post binders with durable, cleanable plastic covers.

E. Electronic Copies:
1. Provide on DVD or flash drive.
2. All information provided in paper manuals in pdf, Word, Excel, and/or ppt format.
3. Provide three copies.

F. Equipment Record:
1. Submittals for mechanical equipment shall include completed copies of exhibits O&M-2 and O&M-3, as included at end of this section.

1.04 CONTENT OF MANUALS

A. Neatly typewritten table of contents for each volume, arranged in a systematic order:
1. Supplier, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to the content of the volume.
3. List, with each product, the name, address and telephone number of:
a. Subcontractor or installer.
b. Maintenance contractor, as appropriate.
c. Identify the area of responsibility of each.
d. Local source of supply for parts and replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:
1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:
a. Clearly identify the specific product or part installed.
b. Clearly identify the data applicable to the installation.
c. Delete references to inapplicable information.

C. Drawings:
1. Supplement Product Data with Drawings as necessary to clearly illustrate:
a. Relations of component parts of equipment and systems.
b. Control and flow diagrams.
2. Coordinate Drawings with information in Project Record Documents to assure correct illustration of completed installation.
3. Do not use Project Record Documents as maintenance Drawings.

D. Written text, as required to supplement product data for the particular installation:
1. Organize in a consistent format under separate headings for different procedures.
2. Provide a logical sequence of instructions for each procedure.

E. Copy of each Equipment Warranty, Bond and Service Contract Issued:
   1. Provide information sheet for Owner's personnel, give:
      a. Proper procedures in the event of failure.
      b. Instances which might affect the validity of warranties or bonds.

1.05 MANUALS FOR EQUIPMENT AND SYSTEMS

A. Provide an operation and maintenance manual for each item of equipment or system listed in the schedule of manuals in the quantity listed in the submittal schedule, paragraph 1.09 of this section.

B. Content, for each unit of equipment and system, as appropriate:
   1. Description of unit and component parts:
      a. Function, normal operating characteristics, and limiting conditions.
      b. Performance curves, Engineering data and tests.
      c. Complete nomenclature and commercial number of all replaceable parts.
   2. Operating procedures:
      a. Startup, break-in, routine and normal operating instructions.
      b. Regulation, control, stopping, shutdown and emergency instructions.
      c. Summer and winter operating instructions, as applicable:
      d. Special operating instructions.
   3. Maintenance procedures:
      a. Routine operations.
      b. Guide to "troubleshooting".
      c. Disassembly, repair and reassembly.
      d. Alignment, adjusting and checking
   4. Servicing and lubrication schedule:
      a. List of lubricants required.
      b. Lubrication schedule.
   5. Manufacturer's printed operating and maintenance instructions.
   6. Description of sequence of operation by control manufacturer.
   7. Original manufacturer's parts list, illustrations, assembly Drawings and diagrams required for maintenance:
      a. Predicted life of parts subject to wear.
      b. Items recommended to be stocked as spare parts.
   8. As-installed control diagrams by controls manufacturer.
   9. Each Supplier's coordination Drawings.
      a. As-installed color coded piping diagrams.
   10. Charts of valve tag numbers, with the location and function of each valve.
   11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
   12. Other data as required under pertinent sections of Specifications.

C. Content, for each electric and electronic item or system, as appropriate:
   1. Description of system and component parts:
      a. Function, normal operating characteristics, and limiting conditions.
      b. Performance curves, Construction Manager data and tests.
      c. Complete nomenclature and commercial number of replaceable parts.
   2. Circuit directories of panelboards:

a. Cal service.
b. Controls.
c. Communications.

3. As-installed color-coded wiring diagrams.
4. Operating procedures:
   a. Routine and normal operating instructions.
   b. Sequences required.
   c. Special operating instructions.
5. Maintenance procedures:
   a. Routine operations.
   b. Guide to "troubleshooting".
   c. Adjustment and checking.
6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of Specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

1.06 SUBMITTAL SCHEDULE

A. Manuals for Equipment and Systems:
   1. Submit 3 preliminary copies prior to the date of shipment of the equipment or system:
      a. Construction Manager will review.
      b. If acceptable one copy will be returned to Supplier, one copy sent to Owner and one copy retained in Construction Manager's file.
      c. If unacceptable, 2 copies will be returned to Supplier with Construction Manager's comments for revision and one copy retained in Construction Manager's file. Resubmit 3 revised preliminary copies for Construction Manager's review.
      d. No partial payments will be made for equipment and systems on hand or installed until preliminary manuals are submitted.
   2. Submit 4 final copies no less than 30 days prior to putting the equipment or system in service. If final manuals differ from accepted preliminary manuals, submit 2 copies of any necessary supplemental material, with instructions for insertion, for conforming Construction Manager's and Owner’s copies of preliminary manuals to final manuals:
      a. Construction Manager will compare with accepted preliminary manual.
      b. If identical, or otherwise acceptable, Supplier will be so notified. One copy will be transmitted to Owner, 5 copies will be held for later transmittal to Owner.
      c. If not acceptable, all 6 copies will be returned to Supplier for revision or retained by Construction Manager and the necessary revision data requested from Supplier, at Construction Manager's option.
      d. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Construction Manager.
      e. Submit 6 copies of any revisions found desirable during instruction of Owner's personnel, with instructions for insertion, for revising Owner's, Construction Manager's and Resident Project Representatives copies of manual.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and system per Section 01650, Startup and Commissioning.

B. Operating and Maintenance Manual Shall Constitute the Basis of Instruction:
   1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

1.09 SCHEDULES

A. Equipment and Systems Operation and Maintenance Manuals shall be prepared for each of the following (as applicable) as a minimum:

Equipment and Systems

High Speed Turbo Blower and appurtenances.

END OF SECTION

SECTION 01740

GUARANTEES AND WARRANTIES

1.0 Supplier's Guarantee. The Supplier shall warrant and guarantee the Work and all parts thereof, including that performed and constructed by Subcontractors, Sub-subcontractors, and others employed directly or indirectly by Supplier, against faulty or defective materials, equipment, or workmanship for a period of one (1) year from the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any special guarantee or warranty required by the Contract Documents. In addition, the equipment furnished by the Supplier shall be guaranteed to be free from defects in design. Within the guarantee period and upon notification of the Supplier by the Owner, the Supplier shall promptly make all needed adjustments, repairs or replacements arising out of defects which, in the judgment of the Owner, become necessary during such period. The cost of all materials, parts, labor, transportation, supervision, special tools and supplies required for correction of abnormalities shall be paid by the Supplier. The Supplier also extends the terms of this guarantee to cover repaired parts and all replacement parts furnished under this guarantee provisions for a period of one (1) year from the date of Substantial Completion. If, within fifteen (15) days, unless specified otherwise, after the Owner gives the Supplier notice of a defect, failure, or abnormality in the Work, the Supplier neglects to make or undertake with due diligence the necessary repair or adjustments of the Work, the Owner will direct the work to be completed by others with the cost of the repair or adjustment to be paid by the Supplier. In the event of an emergency where, in the judgment of the Owner, delay would cause a spill, an odor complaint, serious loss or damage, repairs or adjustments may be made by the Owner, or a third party chosen by the Owner, without giving notice to the Supplier, and the cost of the work shall be paid by the Supplier.

2.0 Manufacturers' Warranties. As a precedent to final inspection, the Supplier shall deliver to the Contract Manager all the manufacturers' warranties required by the Contract Documents, with the Owner named as beneficiary. In addition, for all equipment bearing a manufacturer's warranty that extends for a longer period of time than the Supplier's guarantee, the Supplier shall secure and deliver the warranties to the Construction Manager in the same manner.

END OF SECTION

Attachment B

Technical Specifications

SECTION 05501

ANCHOR BOLTS AND EXPANSION ANCHORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Equipment anchor bolts
   2. Structural anchor bolts
   3. Expansion anchors
   4. Epoxy set anchor bolts

B. Additional Requirements Specified Elsewhere:
   1. Shop Drawings, Product Data and Samples: Section 01300
   2. Product Requirements: Section 01600

1.02 SUBMITTALS

A. Product Data: Sufficient to verify compliance with Specifications

B. Provide structural calculations for equipment anchor bolts as required in individual equipment specifications including Section 11081, High Speed Turbo Blower.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver anchor bolts and templates in time to permit setting when structural concrete is placed

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bolts:
   1. Stainless steel: IFI-104, Grade 316

B. Nuts:
   1. Same material as bolts
   2. Self-locking: Prevailing torque, IFI-100, grade A

C. Washers:
   1. Same material as bolts
   2. Flat: ANSI B27.2
   3. Locking: Spring type ANSI B27.1

D. Sleeves:
   1. Pipe: ASTM A120
   2. Bearing plates: ASTM A36

3. Hot dip galvanize after fabrication

E. Expansion Anchors:
   1. In hardened concrete and grouted masonry
      a. Type "A": Wedge type, FS FF-S-325, Group II, Type 4, Class 1
      b. Type "B": Self-drilling, FS FF-S-325, Group III, Type 1, flush type
      c. Type "C": Non-drilling, internally threaded, FS FF-S-325, Group VIII, Type 1 Drop in
      d. Type "D": Non-drilling, externally threaded, FS FF-S-325, Group VIII, Type 2
   2. In hollow and solid masonry
      a. Type "E": Lag shield, FS FF-S-325, Group II, Type 1, Class 1
      b. Type "F": Split sleeve, FS FF-S-325, Group II, Type 3, Class 3

2.02 FABRICATION AND MANUFACTURE

A. Anchor Bolts:
   1. 3/4 inch minimum, except as indicated on the Drawings
   2. Type:
      a. General use: L-shaped hook type
      b. Where indicated on Drawings or specified:
         1) Straight bolt with square head
         2) Straight bolt with square plate welded to bolt and nut welded to plate and bolt
         3) Through-bolt with sleeve and square plate assembly
         4) Coupled bolt with sleeve welded to square plate and bolt
   3. Material:
      a. General use: Stainless steel
      b. Submerged service: Stainless steel
      c. Where indicated on Drawings: Stainless steel

B. Expansion Anchors:
   1. 3/4-inch maximum unless otherwise indicated on Drawings
   2. Do not use cinch anchors
   3. Length: As required for proper embedment
   4. Material:
      a. General use: Stainless steel
      b. Submerged service: Stainless steel
      c. Where indicated on Drawings: Stainless steel

C. Epoxy Set Anchors:
   1. FS FF-S-325
   2. In hardened concrete and where specifically noted on plans:
      a. Parabond capsule anchors
      b. Stainless steel studs, nuts and washers
      c. Approved manufacturers:
         1) Molly Fastener Group by Emhart
         2) Hilti, Inc.
         3) Or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that holes for anchor bolts in forms and templates match applicable equipment Shop Drawings

3.02 INSTALLATION

A. Anchor Bolts:
   1. Where installed in cast-in-place concrete, install a nut on the concrete side of the form or supporting template
   2. Provide 3 nuts for each anchor bolt for which a lock nut is indicated, 2 for others
   3. Sleeved anchor bolts:
      a. Centered in pipe sleeve
      b. Sleeve ID: Approximately 2 1/2 times bolt OD
      c. Sleeve length: Approximately 8 times bolt OD
      d. Bearing plate minimum thickness: 1/2 times bolt OD
   4. Through bolts:
      a. Sleeved with bearing plates
      b. Bearing plates welded to bolt and plate welded to sleeve
      c. Dimensions: As specified for sleeved anchor bolts

B. Expansion Anchors:
   1. Install in conformity with the manufacturer's instructions
   2. Minimum embedment: 4 bolt diameter or manufacturer's instructions, whichever is greater
   3. Minimum distance between expansion anchor centerline and any edge or exterior corner of concrete: 4 l/2 bolt hole diameter

C. Epoxy Set Anchors:
   1. Install as per manufacturer's recommendation
   2. Minimum hole depth: As per manufacturer's recommendation but not less than 6-5/8 inches
   3. Diameter of drilled holes: As per ANSI B94.12

3.03 SCHEDULE

A. Expansion Anchors:
   1. In hardened concrete and grouted masonry: Type "A," "B," "C," or "D," Contractor's option, unless type is indicated on Drawings
   2. In hollow and solid masonry: Type "E," or "F," Contractor's option, unless type is indicated on Drawings
   3. Epoxy set anchors were adhesion or epoxy anchor bolts specifically noted on Drawings

END OF SECTION

SECTION 11081

HIGH SPEED TURBO BLOWER

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Furnish, and test One (1), factory assembled high speed direct drive turbo blower system. The packaged blower systems shall be complete, including acoustic enclosure, motors, variable frequency drives, control panels, programmable logic controllers, inlet air filter/silencers, blow-off valves, check valves, discharge valves, flexible connectors and other appurtenances as shown on the Drawings, as specified herein, and as needed for a complete and operational blower system.

B. Blowers shall be complete pre-packaged units consisting of Permanent Magnet Synchronous Motors, integrated air filters, variable speed drive, and PLC (programmable logic controller) based Local Control Panel.

C. The equipment shall be furnished by a single MANUFACTURER.

1.2 SYSTEM DESCRIPTION

A. The system shall include factory assembled high speed turbo blowers with UL listed integral variable frequency drives and programmable logic controllers in a complete package that does not require lubrication of the bearings for operation.

B. All equipment including controls and drives specified herein shall be specifically designed for this service and the environment encountered in this installation.

C. Equipment shall be designed and capable of either continuous or intermittent operation.

D. All equipment, supports, anchors and fasteners shall be of adequate strength to withstand loads associated with starting, turbulence, thrusts, thermal expansion and contraction and other loads encountered under normal operating conditions.

1. Equipment anchors shall be designed for seismic and wind forces according to the State of California Building Code.

E. The equipment, sizes, materials and arrangements described in this specification shall be considered minimum limits of acceptability. The equipment manufacturer shall be responsible for design, arrangement and performance of all equipment supplied under this section. Arrangements other than those shown on Drawings shall be subject to the ENGINEER'S approval.

1.3 JOB CONDITIONS

A. Equipment will be installed out of doors at a wastewater treatment plant under a metal canopy. All equipment shall be designed to function in this environment, regardless of inclement weather, including instrumentation and electronics. All sensitive equipment shall be protected as required to provide a continuous, enduring, and fully functional installation.

1.4 SUBMITTALS

A. Product Data: Provide construction details, material descriptions, dimensions of individual components and profiles and finishes for each component.

B. Shop Drawings: Provide plans, elevations, sections, details and attachments to other work.
    1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connection.
    2. Complete bill of materials for all equipment, components, piping, accessories, including materials of construction and coatings applied.
        a. Show thicknesses of each plate, channel, and panel.
    3. Manufacturer and model number of all equipment within this specification and an itemized list of components being furnished.
    4. Layout drawings and equipment cut sheets showing dimensions, clearances, sizes, arrangement and size of connections, supports, anchors and total weights of the product.
    5. Wiring Diagrams: For power, signal and control wiring diagrams, including terminals and numbers.
    6. Drawings of control panels, including instruments, and panel wiring.
        a. Show interconnects to all components outside panels
        b. Provide sample Operator Interface screens for local control panel.
        c. Provide local control panel interconnect wiring diagrams.
        d. Show CPU address points for remote monitoring and control.
    7. Preliminary input/output (I/O) Listing.
    8. Motor requirements in accordance with applicable motor specification section.
    9. Equipment weights and lifting points.
    10. Setting drawings, templates and directions for the installation and location of anchor bolts and lateral load restraints.
        a. Include anchor calculations signed and stamped by Professional Engineer registered in State of California.

C. Information Submittals:
    1. Descriptive literature, bulletins, catalog cut sheets of each item of equipment.
    2. Motor type, input voltage rating, service factor, cooling system, insulation class, temperature protection, environmental temperature range.
    3. Detailed test plan delineating quality control procedures and test procedures.
    4. Special shipping, storage and protection and handling instructions.
    5. Manufacturer’s instructions for installation.
    6. Location of nearest stocking distributor for spare parts.
    7. Recommended spare parts list to maintain the equipment in service for a period of three years. Include a list of special tools required for checking, testing, parts replacement and maintenance with current pricing information.
    8. List special tools, materials and supplies furnished with equipment for use prior to and during start-up and for future maintenance.
    9. Lateral load calculations stamped by a licensed professional civil or structural engineer in the State of California.
    10. List of installations and references.
    11. Warranty certificate.

D. Performance Data: Blower certified past performance test reports for each blower (as outlined later in this specification) and including, but not limited to, certified blower curves showing pressure, capacity, horsepower demand and blower efficiency over the entire operating range of the blower. The equipment manufacturer shall also indicate separately the pressure, capacity, horsepower demand and efficiency required at the design point(s).

E. Submit complete instruction manual for operation and maintenance of the equipment in accordance with this section. Include the following data:

1. Alignment, adjustment, and repair instructions.
2. MANUFACTURER'S installation and operation instructions.
3. Assembly diagrams.
4. Troubleshooting guide.
5. Recommended spare parts lists and predicted life of parts subject to wear.
6. Scheduled maintenance intervals.
7. Manufacturer's service plans.

F. Factory Testing Results
1. Submit after testing at the factory but prior to shipment to project site.
2. Submit all factory functional and motor performance test reports.
3. Submit the results of all control panel shop tests.
4. Submit results of acoustic testing.

G. Following installation submit MANUFACTURER'S field certification report stating that equipment is properly installed and ready for operation.

1.5 QUALITY ASSURANCE

A. The packaged blower systems, including blower, motors, controls and all appurtenances to form an integrated system, shall be factory assembled by a single manufacturer.

B. Manufacturer Qualifications:
1. MANUFACTURER shall be experienced in manufacturing high speed turbo blowers similar to those indicated for this Project and have a record of over five (5) years successful in-service performance in Canada and/or USA for similar municipal wastewater treatment applications.
2. MANUFACTURER must have high speed oil free turbo blowers permanently installed and operational in at least fifty (50) wastewater treatment facilities in North America.
3. MANUFACTURER shall have a history of manufacturing, providing and servicing this equipment for at least five (5) years in North America.
4. A list of similar installations shall be furnished, to show conformance with article 1.4 B.1 to B.3, with the SUPPLIER'S proposal as well as with the shop drawing submittal, including names and telephone numbers of contacts.
5. MANUFACTURER shall have a domestic service facility and factory personnel located within 24 hours travel time.

C. Installer Qualifications: A MANUFACTURER authorized representative who is trained and approved for installation of units is required for this Project.

D. Acceptable manufacturers:
1. APG-Neuros
2. Aerzen USA
3. ABS Sulzer
4. Listing of an acceptable manufacturer does not release Manufacturer and Supplier from complying with any requirements of this specification.
5. Listing of an acceptable manufacturer is not a guarantee that listed manufacturer is qualified or pre-selected for this project.
6. It is the Owner's intention to select one of the acceptable manufacturers to provide one or more blower systems. It is the Owner's intention to make the selection on an evaluated basis considering multiple factors of which cost is only one factor.

E. The installation drawings provided as part of this RFP are based on a generic turbo blower design. It shall be the responsibility of the SUPPLIER to provide information and equipment data to assist Owner with any required redesign and coordination associated with, but not limited to, mechanical equipment layout, equipment foundations, seismic restraints, electrical wiring, conduit and controls as required adapting the blower system design to the proposed Manufacture's equipment. The proposed redesign shall be subject to review and approval of the Engineer.

1.6 DELIVERY, STORAGE AND HANDLING

A. The equipment, material and spare parts shall be shipped complete except where partial disassembly is required by transportation regulations or for the protection of components.

B. Mechanical and electrical components shall be protected from the weather for shipping.

C. Spare parts shall be packed in containers bearing labels clearly designating contents and pieces of equipment for which they are intended.

D. The SUPPLIER shall unload, store and safeguard equipment, materials and spare parts in accordance with the MANUFACTURER's instructions.

1.7 WARRANTY

A. Provide an equipment warranty in the Owner's name for a One (1) year period from initial operation and acceptance by Owner of installation of the blower equipment, or twenty four (24) months from delivery, whichever occurs first.
   1. See Section 01740, Guarantees and Warranties for further requirements

B. Provide an equipment warranty in the Suppliers' name to cover the period during construction, through Owner's acceptance. The duration of this warranty period will be determined based on the construction schedule and confirmed with the SUPPLIER.
   1. Provide a parts warranty that guarantees availability of replacement parts for 5 years after purchase.

1.8 SPARE PARTS

A. Furnish the following recommended spare parts with the blowers:
   1. One (1) complete set of spare inlet air filters, per blower.

B. Furnish one set of special tools required for complete assembly or disassembly of blower system components for each type or size of blower specified, together with a storage box (or boxes) for the same. This tool kit shall be sufficiently complete to permit normal repair and maintenance of all equipment furnished under this project.

PART 2 - EQUIPMENT

2.1 EQUIPMENT PERFORMANCE

A. Aeration Blowers shall meet the following design conditions. Blowers will be evaluated based on the data in the table below.

Total Number of Blowers	One (1)
Method of Operation	Continuous
Drive Type	Direct
Design Ambient Barometric Pressure (PSIA)	14.56
Design Site Elevation (FASL)	130
Design Relative Humidity (%)	72%
Design Inlet Air Temperature (deg F)	95
Design Blower Capacity (SCFM)	4100
Design Discharge Pressure (PSIG)	8.0
Discharge Flange size (ANSI 150 lb.) (in)	12
VFD-Rated Maximum Motor Horsepower (bhp)	200
Available Power Voltage	480
Available Power Phase	3 phase
Maximum Noise at 5 Feet	85
Allowable vibration level	< 4 mm/sec

2.2 POWER GUARANTEE

A. The blower manufacturer shall submit guaranteed wire-to-air (“wire”) KW values during the Shop Drawing submittal. The wire KW shall include all losses associated with the blower system at all specified operating points including those due to the blower, motor, intake filter/silencer, and VFD or inverter.

B. The guaranteed wire-to-air KW values of each blower unit shall honor or better the values provided during the Proposal process and shall be submitted in the form given in Table 1. Failure to meet the “as proposed” Power Guarantee values may result in immediate rejection.

Table 1							
Operating Point	**Capacity %**	**Flow scfm**	**Pressure (psia)**		**Inlet Temp °F(1)**	**RH %**	**"As Proposed" Guaranteed Wire KW**
			Barometric	**Outlet**			
1	100	4100	14.56	22.56	95	72	
2	80	3280	14.56	22.56	95	72	
3	75	3075	14.56	22.56	95	72	
4	60	2460	14.56	22.56	95	72	
5	50	2050	14.56	22.56	95	72	
Notes: 1. Inlet air temperature to the blower core as defined by ASME PTC-10.							

2.3 CONTRACT PRICE ADJUSTMENT

A. The guaranteed wire KW of the blower unit (including the cooling system, motor, intake filter, VFD and cooling system, if used) shall be proven by measuring each guarantee point during the ASME PTC-10 factory tests. Should the factory tests show that the actual wire KW is more than the guaranteed wire KW, the OWNER will adjust the contract price as follows:

Adjusted contract price = A minus B.

A = Contract price
B = $10,000 times C, if C is greater than zero
C = Sum of evaluated wire KW

"C" shall be calculated as follows:

Operating Point	**Evaluation Factor**	**Actual Wire KW Minus Guaranteed Wire KW**	**Evaluated KW**
1	.1	**[_____}**	**[_____}**
2	.4	**[_____}**	**[_____}**
3	.2	**[_____}**	**[_____}**
4	.2	**[_____}**	**[_____}**
5	.1	**[_____}**	**[_____}**
			"C" = (sum of above)

B. Adjustment will be made to the payment at time payment for blower unit is approved. No credit shall be allowed in the case where total actual wire KW is less than the total guaranteed wire KW.

C. If blower fails to perform as guaranteed, Manufacturer shall complete corrective action and re-test within a reasonable time frame as to not delay overall project. All costs for the second

testing including travel and accommodations for any required witness shall be responsibility of the manufacturer.

D. If the blower cannot be corrected to meet guaranteed wire KW as determined by the factory testing, OWNER may reject product in its entirety or accept the contract price adjustment. There shall be no cancellation penalties for terminating the order due to non-conforming goods per the guarantee.

2.4 GENERAL

A. Blowers shall have a magnetic or bump air foil bearing and shall not require oils or lubricants for adequate operation.

B. Blowers shall be capable of variable speed operation with a minimum turndown of fifty percent (50%) from its maximum flow capacity and shall use integral variable frequency drives. Each blower shall be capable of operating continuously and satisfactorily at any point between the minimum and maximum flows without any surge, vibration, hunting, or excessive heating of bearings or motor.

C. Complete blower packages shall be UL-Listed, with no exception. UL Listing nameplate to be on package exterior. UL-listing must be for the complete package.

D. Blowers shall be factory tested per ASME PTC-10 Type 2 Performance test to verify flow and wire power at design conditions as well as blower maximum conditions. The acceptance criteria are 4% tolerances on flow.

E. Neither special foundations nor anchoring shall be required for installation.

F. All elastomeric materials for couplings, valves, etc., shall be rated for a minimum 250° F temperature.

2.5 HIGH SPEED BLOWERS

A. Each blower shall be designed to maintain a minimum rise-to-surge of 3.0 psig at the maximum flow point and design pressure.

B. Blower impellers shall be a high efficiency configuration milled from forged aluminum alloy, with first critical speed at least 110 percent of the maximum allowable operating speed. The impeller shall be mounted directly to the motor shaft and shall be dynamically balanced. The use of dual impellers is not permitted

C. Bearings shall be sized for a minimum of expected ten (10) years between scheduled overhauls or inspections.

D. Each blower shall be supplied with a sound enclosure covering the entire blower package. The sound enclosure shall be designed for easy inspection and maintenance of all blower package components. Quick release panels shall provide easy and quick access for routine maintenance of the blower and the package components.

E. The currently designed blower system layout is based on blowers that do not require separate exhaust connections for ventilation of cooling air. Blowers shall not allow heat caused by motor or electrical cooling to be exhausted into the blower room. Blower and integral VFD shall not require any external cooling devices such as cooling fans, ducting, or external glycol cooling.

F. Integrated blower instrumentation and PLC programming shall enable measurement and display of shaft vibration, and temperatures in the motor windings and bearings.

G. Each blower shall be supplied with blower core built in vibration isolating mounts. The blower manufacturer shall be responsible for demonstrating the vibration of the blower core below the 4 mm/s design limit.

H. Each blower shall be supplied with a discharge cone that will be designed to reduce discharge flow speeds to minimize discharge piping noise and losses, and increase overall efficiency.

2.6 APPURTENANCES

A. Each blower shall be supplied with one (1) 12" EPDM or stainless steel bellows type expansion joint to be installed on the discharge piping prior to the main air header to mitigate the transmission of vibration to the discharge piping and allow for thermal expansion of the discharge components. The flexible connector shall be suitable for the maximum operating discharge flow temperature and pressure.

B. Each blower shall be supplied with one (1) 12" wafer style, dual plate check valves that shall be installed on the discharge cones. Check valves shall be of iron body with aluminum or stainless steel internals and silicon or EPDM seat.

C. Each blower shall be supplied with one (1) 12" manually operated discharge isolation valves. Valve shall be lug type with iron body, 316 stainless steel disc, 416 stainless steel stem, and Viton or EPDM seat.

D. Each blower shall be equipped with Manufacturers' standard blow-off valve, and a signal of open/closed status available through the blower PLC.

E. The blow-off valve discharge shall be supplied with a properly sized blow-off for discharge noise levels not to exceed 90 dBa at 5 feet from blower at HMI height.

F. Each blower shall be provided with an intake filter and silencer system. Intake, filter and silencer performance losses shall be included by the blower vendor in the blower performance calculation. The intake/inlet filter/silencer system shall be integrated into the overall blower and enclosure design and shall fit within the enclosure.

G. Integrated blower dual filtration shall be comprised of a core pre-filter and a fine filter media with 90% by weight per ASHRAE 52-76 with 98% efficiency @ 10 microns (nom). Filter element shall be removable without disconnecting the inlet duct and shall be cleanable by maintenance personnel as a preventative maintenance procedure.

H. Each blower shall be provided with an intake flange and a flange mounted upturned elbow and mushroom cap to reduce entrance of rain water, moisture, and dust into the blower inlet. The mushroom cap shall be fitted with a replaceable dust filter.

I. Internal passive type Harmonic Filter to meet IEEE519.

2.7 VIBRATION SENSOR WITH TRANSMITTER.MOTORS

A. Each blower shall be supplied with a high speed Permanent Magnet Synchronous Motor (PMSM) operating on 460/480 Volts, 3 Phase, 60 Hertz input power to the VFD. Induction or Permanent Magnet Brushless DC Motors shall not be acceptable.

B. The maximum allowable motor horsepower shall be as specified in paragraph 2.1 Equipment Performance.

C. The motor shall have a 1.15 service factor.

2.8 INVERTER/VFD

A. Each blower shall be equipped with a high efficiency UL listed VFD (Variable Frequency Drive) with 97% efficiency at full rated motor speed and power. Non UL listed VFDs shall not be accepted.

B. Each VFD shall have an operation in the USA for manufacturing, support and provision of replacement parts.

C. Each VFD shall be supplied with a passive harmonic filter that reduces the THD (Total Harmonic Distortion) in compliance with IEEE 519 rating. The harmonic filters shall have built-in line input reactors. Harmonic filter shall be mounted inside the blower enclosure.

2.9 CONTROLS AND INSTRUMENTATION

A. General
   1. All components in the control panel shall be completely factory wired and shall include all necessary controls for both the manual/local and automatic/remote operation as indicated on the Drawings and Specifications.
   2. The incoming power provided to the panel shall be 480 volt, 3 phases. A suitable thermal-magnetic main circuit breaker sized no less than 125% greater than the connected load shall be provided along with all transformers, relays, etc. necessary to make the panel fully functional. Surge protective devices (SPD) shall be provided to protect the electrical and control components from excessive voltage and current: Type 1 SPD to protect the 480V loads (VFD) and Type 2 SPD to protect the 120V loads (PLC controller box). The SPD locations shall be strategically selected to have surge immunity and the MCOV shall be not less than 115% of nominal voltage.
   3. Wiring shall comply with UL and the National Electrical Code.
   4. All electrical connections to external devices and equipment shall be provided by the SUPPLIER.
   5. Equipment and controls furnished by other manufacturers shall be provided in accordance with their instructions, where applicable.
   6. The blower shall have an Allen Bradley CompactLogix L24 PLC for operation, adjustment and monitoring.
   7. The system shall have an Allen-Bradley Panelview 600 HMI touchscreen.

B. Miscellaneous electrical devices
   1. A 120 VAC to 24 VDC power supply shall be provided to power the programmable controller inputs and other 24 VDC powered devices. The power supply shall be properly sized for the LCP (local control panel) total load.
   2. Provide noise filter to provide clean, noise-free power to programmable controllers.

C. Operator Interface: Provide the following minimum indicators on the operator interface:
   1. Blower Status (RUN/STOPPED)
   2. Operator Mode Selection
   3. System pressure display
   4. Blower Local / Remote Control
   5. Blower Speed Indication Status
   6. Blower Run Times (hours)
   7. Blower Amp Draw (amps)
   8. System Pressure
   9. System Flow

D. Operator interface device

1. The device shall include the following displays:
    a. History: displays history of sequential alarms with date and time of occurrence.
    b. Status: One-touch access to display current system operating status. When the system is running, the display shall show the set point pressure, actual pressure, flow and speed (0-100%).
    c. Alarm Information: Last alarms recorded in memory are displayed with related detailed information on the alarm including time of occurrence, date, and blower's main operating parameters at the time of alarm and how to correct the alarm condition. Each log shall include individual blower run status, VFD mode, flow and alarm type.
    d. Alarm List: One-touch access to an Alarm List of all possible alarms and their current status.
    e. Daily Log/Total: Displays the individual equipment run times and run times since last reset.
    f. Scroll Key: Used to scroll up and down through data.
2. Provide Setup Menu system for adjusting all alarm set points, dead band, delays, etc. Display and adjust flow and pressure set points and time delays. Set equipment alternation to manual or automatic. Set the hour of the day for automatic alternation. Restore all factory defaults. Protect adjustable settings with a password.

E. Each blower shall be equipped with the following manufacturer's integrated instrumentation and display on blower HMI.
1. Inlet differential pressure sensors for filter monitoring
2. Discharge differential pressure sensor
3. Inlet and discharge temperature sensors
4. Bearing temperature sensor
5. Motor temperature sensor
6. Ambient temperature sensor
7. Ambient pressure transducer
8. Vibration sensor

F. Alarm systems
1. Local indication of alarm conditions shall be provided on the face of the control panel via a general amber alarm light. Specific alarm messages shall be provided on the operator interface screen.
2. All alarm conditions shall be displayed at the operator Panel View 600 HMI terminal and shall provide output capability to display all alarm conditions at future SCADA system.

G. SCADA System
1. The following outputs shall be provided to the plant PLC and SCADA system via Ethernet/IP communication.
    a. All alarms
    b. All equipment status (On/Off, In Remote/Not in Remote, Off)
    c. All parameters displayed at the operator interface (blower PLC)
    d. Motor speed
    e. Airflow
    f. Discharge pressure
    g. Blower run: output
    h. Blower stop: output
    i. Blower fault: output
    j. Remote on: output, enabled when touch screen is placed in remote
2. The following inputs shall be provided from the plant PLC and SCADA system

a. Remote Command: 4-20 mA input for remote control of blower speed
b. Remote start: input
c. Remote stop: input

H. System Function

1. Each blower LCP shall consist of a PLC-based control system physically located inside the blower enclosure with the following:
   a. True Programmable Logic Controller:
      1) Allen Bradley CompactLogix L24 PLC with Multifunctional Panel View 600 touch screen display capability.
      2) The PLC shall provide local and remote control, monitoring, and diagnostic capability.
   b. Blower controls shall provide real time monitoring of discharge pressure vs. suction air flow graph indicating current operating point and boundaries.
   c. Each blower shall have the ability to be controlled in four different modes.
      1) Speed (blower functions independently on speed control)
      2) Pressure
      3) Flow
      4) Dissolved Oxygen
   d. The blower PLC shall have a minimum of 4 operating methods.
      1) Local control
      2) TCP/IP control
      3) Remote Terminal Block control
      4) Remote Terminal Block start/stop & Touch screen mode
   e. Each blower PLC shall allow the blower to automatically restart, when operating in Terminal Block Mode, in the event of a power failure. The blower PLC shall automatically reset all faults and alarms in the PLC and restart the blower.
   f. Each blower LCP shall automatically perform dynamic adjustments to the blower operating range during seasonal ambient temperature variations such that attainable maximum and minimum flow is always optimized. Dynamic adjustments shall not expose the blower to surge. For micro-communicator CPU's, setting input current for flow and pressure shall not be permitted as an alternative to dynamic adjustment.
   g. Each Blower PLC shall be capable of time control blower synchronization based on pre-set, user defined settings for flow and speed. The user shall define pre-set operating schedule in the blower PLC. The blower PLC shall allow for a minimum of 6 daily set points for time control ability.
   h. Each Blower shall have built in provisions for remote access via VPN or cellular communication for the blower manufacturer to monitor operation and troubleshoot remotely.
   i. The blower PLC shall allow for alternating operating schedules such that the service hours per blower is either 2:1, 3:1, 4:1 or 5:1 with respect to the standby unit. Ratio Alternation function permits the owner to balance the run time of all blowers or stagger the hours of use to facilitate maintenance scheduling.
   j. Blower PLC controls shall include intuitive, user friendly fault menus for ease of monitoring diagnostics and troubleshooting.
   k. Each blower shall include built in automatic surge protection.
   l. Blower controls shall include built in measurement or calculation for the following parameters:
      1) Flow (calculated)

2) Speed
3) Temperature (inlet and discharge air, motor, bearing)
4) Pressure

m. The blower PLC shall be accessible through a touch screen control panel and shall control the blow-off valve for each blower.

n. All integrated controls shall be enclosed in a sub-panel located inside the blower enclosure.

o. Turbo Blower PLC shall be capable for communication through Ethernet /IP communication protocol.

2.10 SHOP PAINTING

A. The blower enclosure shall be painted in manufacturer's standard color. Painted carbon steel enclosures shall be primed and painted with two coats of Manufacturer’s standard coating.

2.11 FACTORY ACCEPTANCE TESTS

A. All equipment shall be factory tested in accordance with a pre-approved Test Procedure by the Engineer during submittals approval.

B. Tests shall be performed on the actual assembled unit being supplied for this project. Prototype model tests and calculated values based on previous model testing will not be acceptable.

1. Functional Package Test: Blower(s) shall be given a factory mechanical test to assure mechanical integrity. If the test indicates that adjustments are necessary to ensure conformance with specifications, such adjustments shall be made prior to shipment. Unless otherwise specified, a certified report of a mechanical test of each blower furnished shall be provided. The mechanical test shall consist of operating the units at or near design conditions for a minimum of one (1) hour. Test data shall include duration of the test, bearing temperatures, speed, brake horsepower, pressure and temperature rise, noise and vibration level.
2. Performance Test: A certified report of a performance test of the blowers furnished shall be submitted to the Engineer for review. The performance test shall be performed in accordance with the American Society of Mechanical Engineers (ASME-PTC10-1997 (TYPE 2) Power Test Code for Displacement Compressors, Vacuum Pumps and Blowers and shall demonstrate the durability with the applicable performance criteria specified.

C. Any subsequent tests as may be necessary to ensure compliance with these Specifications shall be performed at no additional cost to the Owner.

D. Performance tests shall cover all the design points 1, 2, 3, 4 and 5 contained in paragraph 2.1.B – Table 1 of this specification.

E. The Manufacturer/SUPPLIER shall notify the Engineer and Owner at least 30 days prior to conducting the factory acceptance tests. The SUPPLIER, owner, and engineer shall confirm their decision and/or acceptance of the proposed date within five (5) days of receipt of the manufacturer’s notification.

F. The manufacturer shall complete production and acceptance testing of the product on a schedule pre-agreed to with the owner and SUPPLIER. Should there be a delay of more than fifteen (15) days for the owner and/or SUPPLIER to take delivery, the manufacturer shall invoice the amount allocated for delivery on the order and store the product on their premises until delivery is approved.

PART 3 - EXECUTION

3.1 GENERAL

A. Install and adjust equipment in accordance with the Drawings, approved shop drawings and the manufacturer's instructions. Do not operate the equipment until the installation is approved by the manufacturer's representative.

B. ASSEMBLY AND INSTALLATION
   1. Do not drill, cut or weld any component to the blower enclosure or accessories. Only bolted connections will be allowed in the field.
   2. Manufacturer to certify installation readiness prior to start-up for conformance to manufacturer's instructions.

C. MANUFACTURER'S SERVICES:
   1. Provide the services of a qualified, factory-trained representative of the manufacturer for review of each part of the installation before approval. The SUPPLIER shall provide a firm date for the required services with a minimum of four (4) weeks advanced notice.
   2. Hold a Pre-Start-Up meeting with the manufacturer to verify proper blower installation, Start-Up procedure and operating conditions.
   3. Each day shall consists of eight (8) hours at the project site excluding travel time and breaks. Provide services at no additional cost to the OWNER.
      a. Installation assistance – one (1) day
      b. Equipment check out and start-up – two (1 1/2) day
      c. Training of OWNER's personnel – one-half (1/2) day
   4. Prior to equipment start-up, the SUPPLIER, with the assistance of the manufacturer's representative, shall re-inspect all equipment for proper assembly, installation, and calibration:
      a. All components shall operate without alarms or shut downs, except as intended, for eight consecutive hours.
      b. Equipment shall operate through the design performance range consistent with available flows. Adjust, balance, calibrate and verify that the equipment, safety devices, controls and process system operate within the design conditions.
   5. MANUFACTURER'S field representative shall provide a certification that equipment is properly installed and ready for operation.

END OF SECTION

SECTION 15061
STAINLESS STEEL PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. All piping systems, components, and accessories; except those supplied by Blower Manufacturer.

1.2 QUALITY ASSURANCE

A. Reference Standards: see Part 2 - Products

1.3 SUBMITTALS

A. Shop Drawings
   1. See Section 01300 for submittal requirements.
   2. Method of connections to existing piping.
   3. Piping layouts with sizes, dimensions, fittings, connections and bill of materials.
   4. Product technical data showing compliance with specifications.
      a. Pipe
      b. Fittings
      c. O-rings and gaskets
      d. Other components
   5. Piping pressure test date notification and test results.

B. Operation and Maintenance Manuals
   1. See Section 01340 for:
      a. The submittal process
      b. The submittal contents

1.4 DELIVERY AND HANDLING

A. Protect pipe during transit and handling per manufacturer's recommendations

B. Repair damage to pipe per manufacture's recommendations. Replace pipe which cannot be repaired satisfactorily.

PART 2 - PRODUCTS

2.1 PIPING COMPONENTS

A. Reducers
   1. As required to mate pipe to equipment connections

B. Flexible couplings
   1. Neoprene single expansion joint or stainless steel bellows
   2. Rated at 250 degrees Fahrenheit
   3. Flanged connections
   4. Stainless steel backing flange.
   5. Provide restraining rods

C. Pipe transitions for differing pipe and sizes
   1. Adapters and special connections pieces as required

D. Pressure gages
   1. Ashcroft, Ametek, or equal
   2. Materials:
      a. Bourdon tube: 316 stainless steel
      b. Diaphram seal housing: 316 stainless steel
      c. Case: Phenolic
   3. Isolation valve at pipe connection
   4. 4-1/2 IN Dial, ½ IN connection
   5. 1 percent of full scale accuracy
   6. Normal operating pressure value in the middle of the gage dial
   7. Provide where shown.

E. 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-FT^2-DegF) at mean temperature of 75 DegF.
      d. Fire hazard rating:
         1) UL 723, ASTM E84, NFPA 255.
         2) Flame spread not exceeding 25 and smoke developed not exceeding 100.
   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 jacket:
      a. PVC: Preformed 0.028 IN thick PVC jackets fabricated from B.F. Goodrich PVC sheeting V-66 with proven resistance to ultraviolet degradation when temperatures do not exceed the limits of PVC.
   5. Provide minimum insulation thickness of 1” with PVC jacket where indicated on drawings.

2.2 PIPE

A. Stainless steel pipe
   1. General:
      a. Piping symbol and service:
         1) Low Pressure Air
      b. Test requirements:
         1) Test medium: Air.
         2) Pressure: 20 psig.
         3) Duration: 6 HRS.
      c. Temperature:
         1) Normal: 180 DegF.
         2) Maximum: 250 DegF.
   2. Pipe
      a. Pipe: Stainless steel 304L, Schedule 10.
      b. Material: Reference: ASTM A778.
      c. Lining: None.

d. Coating: None.
e. Fittings: Seamless steel 304L meeting ASTM A774.
f. Flanges: ASTM 182, Grade 304L.
g. Nuts and bolts: Type 304 or 316, threaded per ANSI B1.1, with ends projected ¼ IN beyond nuts
h. Gaskets: EDPM, 250 degrees F
i. Joints:
    1) Butt welded with flanges at equipment and valves.
    2) Harnessed compression sleeve couplings where indicated on Drawings.

3. Manufactured units
    a. Flanged coupling adaptors
        1) Dresser Style 39 steel, or equal
        2) Same pressure rating as piping system
    b. Compression sleeve couplings
        1) Dresser Style 38 steel, or equal
        2) Same pressure rating as piping system
4. Installation
    a. Install per manufacturer's instructions
    b. Flange joints
        1) Maximum tolerance for flange face from normal to pipe axis: 0.005 IN per foot of pipe diameter
        2) Coordinate bolt drilling locations with piping, valves, and equipment.
    c. Welded joints
        1) Welding to conform with ANSI B31.3
        2) Weldolets allowed for 5 IN and larger piping.

2.3 PIPE SUPPORTS

A. See Drawings for pipe support types and construction

PART 3 - EXECUTION

3.1 INSTALLATION OF EXPOSED PIPING

A. Equipment piping connections
    1. Install pipe in a manner to minimize stresses on equipment flanges.

3.2 CONNECTIONS TO EXISTING PIPING

A. Provide appropriate pipe fittings

B. Make connections in a timely manner

3.3 PIPE TESTING

A. Test pipe for time periods and pressures listed above

B. Zero leakage rate allowed, unless otherwise specified.

C. Provide 24 hours notice before testing

D. Provide a written test report

E. Repair and retest all pipe that fails pressure test.

3.4 CLEANING

A. Clean interior of piping systems

END OF SECTION

SECTION 16010

ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall install, ready for use, the electrical and instrumentation system as specified herein and shown on the Contract drawings. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary/required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter.

B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide a complete and operational electrical & instrumentation system as shown on the E&I - Series Drawings, included in these Specifications, or required for fully operating facility.

C. The major areas in the scope of work shown on E&I - Series Contract Drawings which includes both the furnishing and installation are:
   1. Instrumentation and other miscellaneous devices. This includes all wiring and cables.
   2. PLC to be programmed by others.
   3. SCADA PC (OI) graphic and programming additions by others.
   4. Conduits and the field interconnection wiring between all equipment, instrumentation, lighting, receptacles, etc.
   5. Provide all necessary hardware, fittings, and devices to connect the designated equipment and wiring.
   6. Installation, mounting supports, interconnection drawings, wiring, start-up, testing and warranty for all equipment and systems.
   7. Provide trenching, backfilling, and compaction for all underground conduit routes, concrete pads, and pull boxes.
   8. All necessary miscellaneous shut off, sample, and calibration valves to sensors.
   9. Grounding system and equipment grounding.
   10. Remove and dispose of all excess dirt, paving, concrete, and other materials from site work.

D. The following specifications incorporate specific equipment and devices that are standards of the Owner because of their serviceability, because of the local availability of labor, parts and materials, or because of the ability of the Owner to umbrella the equipment under existing maintenance contracts; however, favorable alternatives proposed in writing will be considered by the Owner.

E. All electrical equipment and materials, including installation and testing, shall conform to the applicable codes and standards listed in this and other Sections. All electrical work shall conform with the National Electric Code (NEC) 2013 issue or applicable sections of the California Electric Code (CEC) 2012 issue. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

F. It is the intent of the Owner to secure the highest quality of work for this project. System Supplier shall be responsible for supplying the control panels, pedestals, all field instruments listed for Section 16010, drawings, submittals, startup and testing, training and operations & maintenance manuals.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Provide electrical system that interfaces to work performed under other mechanical and equipment plans.

1.03 CONTRACT DOCUMENTS

A. The contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error, omission, or minor details missing in either shall not relieve the contractor from the obligations thereunder to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.

B. The Contract drawings are generally diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in this Section shall take precedence in the event of conflict.

C. Location at facilities of new equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by existing conditions and coordination with other trades at no additional cost.

D. The Contractor shall examine the architectural, mechanical, structural, electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment.

E. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.

F. Provide means to furnish equipment and accessories, do the installation, complete connections, submit documentation, perform start-up, and be responsible for the warranty.

G. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc., as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.

H. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review.

I. The resolution of conflicting interpretation of the Contract documents shall be as determined by the Engineer.

J. It is the system suppliers responsibility for obtaining and instrumentation transmitter configuration software, manuals and disks necessary for the Contractor to program and configure the instrumentation transmitters.

1.04 SUBMITTAL AND DRAWING REQUIREMENTS

A. Submit six (6) sets of shop documents and drawings for approval in accordance with this subsection and the Section 01300.

1. Interconnection diagrams shall show for each piece of equipment all wiring between all devices, panels, cabinets, terminal boxes, control equipment, motor control centers and any other devices and equipment. An interconnection diagram shall be furnished for each electrical and instrumentation system, even if one was not shown explicitly on the Contract Drawings. Interconnection diagrams shall be prepared for all conduits listed in the Conduit and Wire Routing Schedule. Each interconnection diagram shall show the following as a minimum:
    a. Interconnects shall include list of all applicable reference Drawings, request for clarifications, field instructions, and change orders.
    b. The diagrams shall be utilized by the electrician during all phases of installation and connection of all conductors to ensure coordination of equipment interconnect.
    c. The diagrams shall show wiring as field labeled at the end of the project when as-builts are submitted.
    d. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter. This identification of terminations includes terminal blocks, junction boxes, all devices, computer I/O points, etc.
    e. Diagrams shall include raceway numbers, raceway size, raceway type, cable numbers, wire color code, and wire numbers.
    f. Each wire size, and cable size and color code shall be shown. Each conduit with the conduit label and conduit size and wire fill shall be shown. Wire and cable routing through conduits, wireways, manholes, handholes, junction boxes, terminal boxes and other electrical enclosures shall be shown with the appropriate equipment labels. All spare wires, cable, and termination points shall be shown. Cable shields shall be shown.
    g. Labeling codes for terminal blocks, terminals, wires, cables, panels, cabinets, instruments, devices, and equipment shall be shown. Place “øA”, “øB”, and “øC” label next to each breaker to identify phase connected to.
    h. Schematic symbols shall be used for field devices, showing electrical contacts. Signal and DC circuit polarities shall be shown.
    i. The diagrams shall show all other Contract and Supplier Drawing numbers, for reference, that are associated with each device that is interconnected.
    j. The diagrams shall show all other Contract and Supplier drawing numbers, for reference, that are associated with each device that is interconnected. Attached to each interconnect, a copy of all the support documents used in preparing interconnects shall be submitted. This includes current issues of panel schematics, elementary diagrams, panelboard schedules, conduit schedules, one-line diagrams, connection diagrams, terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the “Reference Documents” corner of interconnect drawings.
    k. Field wiring shall not start before the interconnection Drawing has been submitted by the Contractor and approved by the Owner.
    l. Do not show the same wires or jumpers, or panel wiring on both the connection and interconnection diagrams. All jumper, shielding, and grounding termination details not shown on the connection diagrams shall be shown on the interconnection diagrams.

m. Only field wiring between pedestals, Panelboards, Control Panels, and other electrical and instrumentation devices or equipment shall be shown on interconnection drawings. No internal panel wiring shall be shown on interconnect drawings except jumper or other wiring to be installed in field by Electrical Contractor.
n. Provide a notes section on each interconnect drawing. In the note section, list any variances from the Contract conduit schedule necessary for completing the interconnections. Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires will not be processed until interconnect drawings have been received for such work.
o. The field electrician shall mark-up all interconnection diagrams during installation to show accurate as-built wiring, conduits runs, terminations, etc
p. The system supplier shall be responsible to collect all information necessary to complete each interconnection drawing. This includes making field trips to collect all terminal connection data for new and existing, pedestals, switchboards, panelboards, instruments, equipment and electrical panels.

2. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the Owner. Submittal to include the following:
   a. Dimensions of nameplate
   b. Exact lettering and font for each nameplate
   c. Color of nameplate
   d. Color of lettering
   e. Materials of construction
   f. Method and materials for attachment
   g. Drawing showing location of nameplates on each pedestal, panel, and enclosure

B. The electrical submittals shall include but not be limited to data sheets and drawings for each product together with the technical bulletin or brochure. No fax copies of documents are allowed. Color copies shall be provided when black and white copies do not show adequate clarity. The electrical submittals shall include:
   1. Product (item) name used herein and on the Contract Drawings.
   2. The manufacturer's model or other designation.
   3. Tag name/number per the drawings, schedules, and indexes.
   4. Detailed electrical one or three line, elementary and loop diagrams showing all wiring requirements for each system.
   5. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.
   6. Location of assembly at which it is installed.
   7. Input-output characteristics.
   8. Range, size, and graduations as required.
   9. Physical size with dimensions and mounting details.
   10. Enclosure fabrication and color.
   11. Enclosure layout and elevation drawings to scale.
   12. Quantity and quality requirements for electric power.
   13. Materials of construction of components.
   14. Nameplate schedule.
   15. Interconnection diagrams.

16. Bill of Materials: A complete Bill of Materials list shall be provided at the inside of the front cover. The Contractor shall provide Bill of Material for electrical components formatted as shown in Appendix "A". A separate set of Material Listing forms shall be provided for each control panel and another listing all field equipment. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.
17. A separate instrument data sheet shall be provided for each instrument per ISA S20 standards or approved equal. Data sheets shall be printed on blue or pink paper. Provide an index with proper identification and cross-referencing of each data sheet.

C. Shop documents and drawings shall be submitted for all devices and components in the electrical system. The Contractor is notified that this is a "Fast Track" project and all electrical & instrumentation drawings shall be submitted in a timely manner as not to delay completion of the project.

D. Exceptions to the Specifications or Drawings shall be clearly defined by the equipment supplier. Submittal data shall contain sufficient details so a proper evaluation may be made by the Engineer.

E. The Contractor shall coordinate submittal with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittal, so that one will not be delayed for lack of coordination with another.

F. No material or equipment shall be allowed at the job site until the submittal for such items has been reviewed by the Engineer and marked "Resubmittal not Required - No Exceptions Taken" or "Resubmittal not Required - Make Corrections Noted".

G. The equipment specifications have prepared on the basis of the equipment first named in the Specifications. The Supplier shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required, at no additional cost, to meet Specifications.

H. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Contractor's expense, by an unbiased laboratory that is satisfactory to the Engineer.

I. Electrical submittals shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

J. Request for information (RFIs) shall not be included in submittals. RFIs shall be submitted separately with its individual submittal number.

1.05 COORDINATION

A. The contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the engineer; with due regard to their work, towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the contractor shall bear expense of such changes as necessary to be made in the work of others.

B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.

C. The Contractor shall schedule all the required work with the Owner, including each utility or equipment shutdown period. Each shutdown shall be implemented to minimize disruption of the existing operations. The work to be provided under this Contract shall not disrupt any of the existing operations without prior approval.
   1. The Contractor shall limit all unscheduled shutdown periods to less than 2 hours and only with written prior approval of the Construction Manager and Owner.
   2. Carry out scheduled shut downs only after the time, date, and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Construction Manager and Owner. Submit shutdown plans at least 72 hours in advance of when the scheduled shutdown is to occur. Utility outages to be limited to maximum of 2 hours. Equipment outages that affect existing operations shall not exceed 2 hours or as otherwise approved by Construction Manager and Owner.
   3. The Owner reserves the right to delay, change, or modify any shutdown at any time, at no additional cost to the Owner, when the risk of such a shutdown would jeopardize the operation of system.

D. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Engineer it is necessary to do so.

E. Prior to commencing the first submittal, the Contractor shall arrange a conference with the Owner, and Electrical Contractor, System Supplier vital to the current phase of work, and shall verify types, sizes, locations, and installation requirements. The Contractor shall, in writing, inform the Engineer that all phases of coordination of this equipment have been covered and if there are any unusual conditions, they shall be enumerated at this time. The conference shall be held at the Owner's facility and is expected to last six hours.

1.06 SUPERVISION

A. The Contractor shall schedule all activities, manage all technical aspects of the project and attend all project meetings associated with this Section.

B. The Contractor shall supervise all work in this Division, including the electrical system general construction work, from the beginning to completion and final acceptance.

C. The Contractor shall supervise and coordinate all work in this Division to insure that each phase of the project, submittal, delivery, installation, and acceptance testing, etc., is completed within the allowable scheduled time frames.

D. The Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Section, which shall include transmittals, submittal, forms, documents, manuals, instructions, and procedures.

INSPECTIONS

E. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the Owner. If any material does not conform to the Contract documents, or does not have an "No Exceptions Taken" or "Make correction Noted" submittal status; then the Contractor shall, within three days after being notified by the Owner, remove the unacceptable material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.

F. Work shall not be closed in or covered over before inspection and approval by the Owner. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.

G. The Contractor shall cooperate with the Owner and provide assistance for the inspection of the electrical system under this Contract. The Electrical Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

1.07 JOB CONDITIONS

A. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Owner. Where equipment is stored or installed in moist areas, such as unheated buildings, provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.

B. The normal outdoor, not in direct sunlight, ambient temperature range of the job site will vary between 0 to 120 degrees Fahrenheit. All equipment shall be rated to operate in these temperature ranges or provisions for adequate heating and cooling shall be installed, at no additional cost to Owner.

PART 2 - MATERIALS

2.01 QUALITY

A. It is the intent of the Contract specifications and drawings to secure the highest quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.

B. Products that are specified by manufacturer, trade name or catalog number established a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.

C. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment.

D. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator

interaction when power is restored.

E. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 VDC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.

F. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.

2.02 WIRE

A. This Section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.

B. Material - Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name. All wire shall conform to the following:
   1. Conductors shall be copper, with a minimum of 98% conductivity.
   2. Wire shall be Class B stranded.
   3. Insulation of all conductors and cables shall be rated 600 volt.
   4. Insulation type for conductors smaller than #6 AWG shall be moisture and heat resistant thermoplastic NEC Type THHN/THWN, rated 90 °C in dry locations and 75 °C in wet locations, or approved equal. Conductors #6 AWG and larger shall be XHHW insulation rated 90 °C in dry locations and 75 °C in wet locations.
   5. Field wire minimum AWG sizes
      a. #12 for wires used for individual conductor circuits 480 volt and above. #12 for wires used for individual conductor circuits 100 volt and above, except for PLC I/O which may be #14 AWG.
      b. #14 for wires used for individual conductor circuits below 100 volt.
   6. Nonfield or panel wire minimum AWG sizes if properly protected by fuse or breaker:
      a. #14 for wires used for individual conductor circuits 100 volt and above.
      b. #18 for wires used for individual conductor circuits below 100 volt and above if properly protected by fuse or breaker.
   7. Instrument Wiring
      a. Field: Instrument cables shall have 600V tray cable rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.P.R.) Cables shall be Belden, Manhattan, or approved equal.
      b. Non-Field: Instrument cables shall have 300V rated insulation and 100% individual shielded twisted pair #18 conductors with drain wire. Single twisted shielded pair (T.S.P.R.) cables shall be Belden, Manhattan, or approved equal.

C. Wire Marking
   1. Wire identification: All wire terminations including field interconnect as well as wiring interior pedestal, switchboard, panels, equipment, junction panels and boxes shall be identified with machine printed labels. Hand lettered labels are not acceptable and shall be replaced at the Contractor's expense. The wire identification code for all field interconnect and panel interior wiring, shall be similar to the designations shown on the Contract Drawings.

2. Wire Labels: The labels shall be machine printed with indelible ink, heat shrink type capable of accepting a minimum of 23 machine printed characters per sleeve label by Brady "Bradysleeve" or equal. Labeling shall be neatly installed for visibility and shall be clearly legible. Each wire and conductor shall be labeled with wire label as shown on approved loop, elementary and interconnect Drawings. Labels shall not be wrap around or snap-on type.
3. Where there is insufficient space for labels on locally interconnected neutral wires such as jumpers between adjacent auxiliary relay coil neutral terminals, these labels may be omitted. "Locally" is defined as wires no longer than 8".
4. Wire labels for lighting and receptacles shall be installed and consist of the panelboard and circuit number (i.e., Panelboard "LP100", circuit breaker #3 would have wire label line "LP100-L3" and neutral "LP100-N3").
5. All spare wires shall be labeled with equipment number followed by SP1, SP2, etc. (i.e. P11001-SP1 for first spare wire).
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

D. Special Purpose Wiring
1. Manufacturer Supplied Cables (MNFR CBL): Cables and wiring for special systems shall be provided by the manufacturer with the equipment and installed per the manufacturer's recommendations.
2. Color code of all wire shall conform with the following table.

WIRES COLOR CODE TABLE

DESCRIPTION	PHASE/CODE LETTER	FIELD WIREWIRE OR TAPE COLOR	NON-FIELD WIRECOLOR
480 V, 3 PHASE	A	BROWN	BROWN
	B	ORANGE	ORANGE
	C	YELLOW	YELLOW
240 V or 208 V, 3P	A	BLACK	-
	B	RED (ORANGE if high leg)	-
	C	BLUE	-
240 / 120 V, 1 P	L1	BLACK	BLACK
	L2	RED	-
12 V POSITIVE	12P	DARK BLUE	DARK BLUE
12 V NEGATIVE	12N	BLACK/RED STRIPE	BLACK/RED STRIPE
24 V POSITIVE	24P	PINK	PINK
24 V NEGATIVE	24N	BLACK	BLACK
AC CONTROL		VIOLET	RED (YELLOW FOR FOREIGN CIRCUITS)
DC CONTROL		LIGHT BLUE	LIGHT BLUE
NEUTRAL	N	WHITE	WHITE
GROUND	G	GREEN	GREEN
SHIELDED PAIR	+	RED	RED
	-	BLACK	BLACK

3. No other colors shall be used without prior approval of the Owner.
4. The same color shall be connected to the same phase throughout the panel.
5. Phase color insulation shall be provided for complete exposed length of #8 wire or larger, colored phase tape is <u>not</u> allowed on #8 and smaller wire.

2.03 COMPONENTS

A. Terminal Blocks
   1. General
      a. Each terminal block shall have a unique identifying alphanumeric code. Terminal numbers shall be assigned starting lowest number at one end, incrementing in sequence top to bottom or left to right (i.e., 1,2,3,4....).
      b. Numbers shall be assigned to all blocks except grounding blocks.
      c. A plastic marking tab shall be provided to label each individual terminal block. Each tab shall have a unique number/letter for each terminal which is identical to the "elementary" and "loop" diagram wire designation. Numbers on tabs shall be machine printed and 1/8-inch high.
      d. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.
      e. As a minimum, provide a ground terminal or connection point for the power system grounding conductor for each terminal block group.
      f. Terminate field wiring on the "field side" of the terminal blocks. Do not connect internal panel wiring to the "field side" of the terminal blocks. Do not connect field wiring to the "panel side" of the terminal block.
      g. Provide a separate common or neutral terminal for every two (maximum) inputs and/or outputs or as coordinated with the interconnect diagrams.
      h. Terminal blocks shall be, DIN rail, and 600V rated.
      i. Provide terminal blocks with "follower" plates which compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks which compress the wires with direct screw compression are unacceptable.
      j. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks.
   2. Miscellaneous - Terminal Blocks, for locations other than Control Panels
      a. Provide terminal blocks rate a minimum of 400 amps at 600VAC for power connection.

2.04 CONDUIT, RACEWAYS, AND WIREWAYS

A. General - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.
   1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
   2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.
   3. The minimum size conduit shall be 1-inch unless indicated otherwise on the Drawings or for special connections to equipment. Buried, encased, or conduits located in walls shall be 1-inch minimum.
   4. Conduit stubs for future use shall be capped with coupling, nipple, plug, and cap and each end identified with conduit labels.

B. Conduit Marking
   1. All conduits listed in the “Conduit and Wire Routing Schedule” shall have conduit tags at both

ends of each conduit segment. This includes all conduits in pullboxes and vaults.

2. Tag material shall be rigid laminated red phenolic with white lettering. The size of the tag shall be 2" diameter. No letters are allowed smaller than 7/16". Tags shall be heat and UV resistant, stainproof, electrically non-conductive and non corroding. Securely fasten tags in place using UV resistant, black plastic tie-wraps. Engrave the tags, on both sides, with the conduit number as listed in the Conduit and Wire Routing Schedule on the Contract "E"-series Drawings. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Custom B-1, or approved equal.
3. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have ½-inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

C. Galvanized Rigid Steel Conduit - PVC Coated (GRS-PVC)

1. Standard weight, galvanized conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. GRS-PVC conduit to be Robroy Plasti-bond Red, Perma-Cote, or approved equal.
2. Provide PVC coated galvanized rigid steel factory elbows for 90 degree transitions.
3. Fittings shall be hot dipped galvanized steel or galvanized cast ferrous metal with a PVC 40 mils thick coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable. Fittings shall be Robroy Liquitite coated fittings or approved equal.
4. All junction boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness except where stainless steel boxes are called out.
5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
6. Support channel and pipe straps shall be PVC coated. Exposed metal/nuts, all-thread rod shall be 316 stainless steel.
7. PVC coating patching material shall be as provided by the manufacturer.

D. PVC Conduit (PVC-40 OR PVC-80)

1. Shall be high impact polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. PVC conduits shall be UL listed and labeled for "direct" burial.
2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.
    3. Risers shall be made with PVC coated galvanized rigid steel (GRS-PVC) conduit using threaded adapters. Bond each metallic portion to each other and to equipment connected at each end of conduit run.
4. PVC fittings shall have watertight solvent-weld-type conduit connections.
5. PVC conduit shall be stored on a flat surface and shielded from the sun.
6. PVC conduit shall not be used above grade.

E. Liquid Tight Flexible Metal Conduit - (FLEX)

1. All flex conduits shall be metallic with water tight outer jackets.
2. Connectors:
    a. All areas: PVC coated metallic with insulated bushings.
3. Final connections to vibrating equipment such as motors and fans shall be made with flexible conduits.

4. Flexible conduit lengths shall not be greater than 36 inches (exception, at blower connection).
5. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.
6. Flexible conduit shall only be installed in exposed or accessible locations.
7. Flexible conduits shall be used for conduit coupling to all vibrating and shifting equipment.

2.05 INSTRUMENTATION (NOT USED)

2.06 MISCELLANEOUS DEVICES

A. RFI filters to be for power line radio frequency protection, CORCOM VK series or approved equal.

B. Analog 4-20 mA signals on wiring to all field instruments shall have surge protection terminals installed at panel originating loop power. Surge protection terminal blocks shall be fused and limit maximum working voltage to 32 VDC and rated for 50 mA. Loop surge protection terminal blocks to be MTL, or approved equal.

C. Data wiring (wiring in "D" Series conduits) between communication devices shall be protected on both ends by fused terminal surge protectors rated for use with data signal. Data terminal surge protectors shall be MTL or approved equal.

D. DC Power Supplies
1. DC power supplies to be linear type non-switching VDC, quantity and sizes per drawings, Power One International Series Linear, Sola, or approved equal.

E. Each isolator shall provide complete isolation of the 4-20 mA output signal from the input signal and isolator power supply. Each isolator shall have all solid state circuitry mounted in a plug-in module. The 4-20 mA output signal shall be capable of driving a 600 ohm load. Accuracy shall be +/- 0.25% of span. The isolator shall be powered as shown on Contract Drawings. Each isolator shall have a seven year warranty. The isolators shall be as manufactured by AGM Electronics, Action Instruments, or approved equal.

2.07 GROUNDING SYSTEM

A. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney Type GRC, Burndy Type GAR or GP, or approved equal.

B. All ground rod, pipe, and steel plate and buried bond connections shall be made by welding process equal to Cadweld.

C. Ground buses shall be provided in all electrical enclosures. Each ground bus shall be sized as shown on the Contract drawings or specified herein. The ground bus shall be adequately sized for the connection of all grounding conductors required per NEC. Screw type lugs shall be provided on all ground busses for connection of grounding conductors.

D. Each ground bus shall be copper. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO CAN series, or approved equal.

E. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point

for ground conductors.

F. All raceway systems, supports, enclosures, panels, and equipment housings shall be permanently and effectively grounded.

G. One side of the secondary on all transformers shall be grounded.

H. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main over-current protection.

I. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.

J. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC table 250-122, whichever is larger.

K. Grounding and bonding wires shall be installed in all conduits and raceways and connected to the ground bus and all equipment.

L. Conduit grounding bushings shall be installed on all metallic conduits. Conduit grounding bushings shall be set screw locking type electra-galvanized malleable iron with insulation collar and shall be provided with a feed through compression lug for securing the ground bonding wire. Ground bonding wire shall be bare wire and shall be sized per NEC.

M. All receptacles shall have their grounding contact connected to a grounding conductor.

N. Branch circuit grounding conductors for receptacles, or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.

O. Connect new blower ground to existing blower ground or circuit ground.

P. Provide ground conductor in each conduit per NEC requirements. Ground conductor might not be shown on drawings.

2.08 ELECTRICAL ENCLOSURES AND BOXES

A. Enclosures to be NEMA rated per Indexes with fast access door latches. Enclosure construction shall be 14 gauge minimum with continuously welded seams. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in each box. Provide thermoplastic data pocket mounted on inside door. Provide enclosures with accessories consisting of breaker to disconnect incoming power, padlockable disconnect for breakers used in circuits above 120VAC, heater, fan, removable metal filters, louvers, and thermostats. Enclosure shall be Hoffman, Circle AW, or approved equal.

PART 3 - EXECUTION

3.01 ELECTRICAL WORKMANSHIP

A. All work in this Section shall conform to the codes and standards outlined herein.

B. The Electrical Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.

C. Ensure that all equipment and materials fit properly in their installations and all doors open a minimum of 90°.

D. Perform any required work to correct improper installations at no additional expense to the Owner.

E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

3.02 ELECTRICAL CONSTRUCTION METHODS, GENERAL

A. All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainer. Where space is available, such as in electrical cabinets, all wiring shall be run in slotted plastic wireways or channels with dust covers. Wireways or channels shall be sized such that the wire fill does not exceed 60%. Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wireways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles. Tie-wraps shall be T & B TY-RAP's, or approved equal.

B. All devices shall be permanently labeled and secured in accordance with subsections labeled “NAMEPLATES AND TAGS”.

C. All field wires and panel wires have wire markers as specified in the “WIRE” subsection.

D. All components associated with a particular compartment's or enclosure's function shall be mounted in that compartment or enclosure.

E. Spacing and clearance of components shall be in accordance with UL, JIC, and NEC standards.

F. Wires shall not be spliced except where shown. Devices with pigtails, except lighting fixtures, shall be connected at terminal blocks. Equipment delivered with spliced wires shall be rejected and the Contractor required to replace all such wiring, at no additional cost to the Owner.

G. No wires shall be spliced without prior approval by the Engineer.

H. Where splices are allowed or approved by the Engineer they shall conform with the following:
   1. Splices of #10 and smaller, including fixture taps, shall be made with see-thru nylon self-insulated twist on wire joints; T & B "Piggys", Ideal “Wing Nut”, or approved equal.
   2. Splices of #8 and larger shall be hex key screw two way connectors, with built in lock washers; T & B "Locktite", O-Z type XW, or approved equal, insulated with 3M Scotch Super #88, Plymouth, or approved equal.
   3. Splices in underground pullboxes shall be insulated and moisture sealed with 3M "Scotchcast" cast resin splice kits and shall have a date marking for shelf life. Do not use splice kits with a date marking for shelf life that has expired.
   4. Wire splicing devices shall be sized according to manufacturer's recommendations.

I. Tapes shall conform to the requirements of UL 510 and be rated: 105 degrees C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mil black. Phase tape shall be 7 mil vinyl plastic, color coded as specified. Electrical insulation putty shall be rubber based, elastic putty in tape form. Varnished cambric shall be 9 mil cotton tape impregnated with yellow insulating varnish and adhesive backed.

J. Connections to terminals shall be as follows:
   1. Use connector or socket type terminals furnished with component.
   2. Connections to binding post screw, stud or bolt use:
      a. For #10 and smaller wire, T & B "Sta-Kon", Buchanan "Termend" or approved equal, self-insulated locking forked tongue lug.
      b. For #8 to #4/0 wire, T & B "Locktite", Burndy QA or approved equal lug of shape best suited.
   3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.

K. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written "change order" authority by the Engineer. When field changes are made, the components, materials, wiring, labeling, and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the Owner.

L. Mating fittings, bulkhead fittings, plugs, lugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.

M. All electrical and instrumentation factory as-built drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

3.03 ELECTRICAL EQUIPMENT FABRICATION, GENERAL

A. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and

smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device.

B. All doors shall be fully gasketed with nonshrinkable, water and flame resistant material.

C. Bolts and screws for mounting devices on doors shall be as specified by the manufacturer, otherwise they shall have a stainless steel flush head which blends into the device or door surface. No bolt or screw holding nuts shall be used on the external surface of the door.

D. No fastening devices shall project through the outer surfaces of equipment.

E. Each component within the equipment shall be securely mounted on an interior subpanel or backpan and arranged for easy servicing, such that all adjustments and component removal can be accomplished without removing or disturbing other components. Mounting bolts and screws shall be front located for easy access and removal without special tools. Access behind the sub panel or backpan shall not be required for removing any component.

F. TERMINATIONS: Single wire and cable conductors shall be terminated according to the requirements of the terminal device. All terminations must be made at terminals or terminal blocks. Use of spring or buttsplice connectors are not allowed.
   1. Provide 2" minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of the Owner.
   2. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.
   3. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp on type that form gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug type and size being crimped.
   4. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor.
   5. Heat shrink shall be placed on ends of shielded cable to cover foil.
   6. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e., solenoid valves, level probe, etc.).

G. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250-122, whichever is larger.

H. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC tables 373-6 (a) & (b).

I. Doors shall swing freely and close with proper alignment.

3.04 DAMAGED PRODUCTS

A. Damage products will not be accepted. All damaged products shall be replaced with new products at

no additional cost to the Owner.

3.05 FASTENERS & LUGS

A. Fasteners for securing equipment shall be stainless steel. The fastener size shall match equipment mounting holes.

B. All wire & cable lugs shall be copper; aluminum or aluminum alloy lugs shall not be used. The Electrical Contractor shall supply all lugs to match the quantity & size of wire listed in the conduit & wire routing schedule.

3.06 INSTALLATION, GENERAL

A. System
   1. Install all products per manufacturer's recommendations and the Drawings.
   2. Contract Drawings are intended to show the basic functional requirements of the electrical system and instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.

B. Provide all necessary hardware, conduit, terminal blocks, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the Owner:
   1. Provide additional devices, wiring, terminal block, conduits, relays, signal converters, isolators, boosters, and other miscellaneous devices as required to complete interfaces of the electrical and instrumentation system.
   2. Changing normally open contacts to normally closed contacts or vice versa.
   3. Adding additional relays to provide more contacts as necessary.
   4. Installing additional terminal blocks to land wires.

C. Panels and Enclosures
   1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.
   2. Install level and plumb.
   3. Clearance about electrical equipment shall meet the minimum requirements of NEC 110-26.
   4. Box supports shall be located and oriented as directed in field by Owner.

D. Conduits and Ducts
   1. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.
   2. Install conduit free from dents and bruises.
   3. All conduits shall be labeled on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations.
   4. A maximum of three equivalent 90 degree elbows are allowed in any continuous runs. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.
   5. Route all above grade outdoor conduits or conduits in rated areas parallel or perpendicular to structure lines and/or piping.
   6. Conduits installed outdoor or in NEMA 4X rated areas above grade shall be braced in place with stainless steel Unistrut stanchions or PVC coated clamps with backplates.

7. Conduit entrances: Seal each conduit entrance from below grade into the panels, and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents.
8. Special "Soft–Jaw" type pipe clamps shall be used to prevent damage to PVC-coated conduits while field threading, cutting to length, and coupling sections.
9. Conduits shall be painted to match the color of surface attached to as directed by Owner.
10. All spares shall be mandrel and have pull ropes installed.

E. Conduit and Wire Routing Schedule
1. Conduit material, wire size, and quantity listed in schedule take precedence over Division 16 Specifications.
2. All of the entries for each line in the conduit schedule apply to each conduit when multiple quantity of conduits multiple quantity of conduits (quantity of which are indicated by number entered in conduit no. column in schedule) are listed in the schedule.
3. Wire sizes listed are in AWG or Kcmil and are copper conductors.
4. Extra wire was intentionally placed in the "Conduit & Wire Routing Schedule" which shall be labeled on both ends with a unique wire label.
5. Contractor to supply and install all conduits and wiring as shown on Utility Engineered Design drawings. Utility primary and secondary conduit and wiring shown in "Conduit and Wire Routing Schedule" is for bid purposes only. A credit or add-on will be provided by Contractor based on the actual work performed by Contractor for the Utility service.
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.
7. Conduit entries listed as "GRS-PVC" in the Conduit & Wire Routing Schedule are to be "Galvanized Rigid Conduits with PVC coating" the entire length.
8. Vertical offsets and sloping of conduits are not detailed on plans, the Electrical Contractor shall include in his bid the price for the complete conduit run utilizing the civil & mechanical plans to measure vertical & slope distances.

F. Excavation and Back Filling
1. The Electrical Contractor shall provide the excavation for equipment foundations, and trenches for conduits or buried cables. Repave any area that was paved prior to excavation.
2. Underground conduits outside of structures shall have a minimum cover of 24 inches except for utility conduits depth shall be as required by the governing utility requirements. Back filling shall be done only after conduits have been inspected.
3. Excavation and back fill shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans.
4. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

G. Wiring, Grounding, and Shielding - It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only (source end), the shield at the other end (receive end) shall be encased in an insulated material to isolate it from ground.

H. Cutting and Patching - The Contractor shall do all cutting and patching required to install his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching. Paint patched surfaces to match the original color.

I. Cleaning and Touch up
   1. Vacuum and clean the inside of all enclosures prior to applying power and at the end of the project prior to final acceptance.
   2. At the completion of the work, all parts of the installation, including all equipment, exposed conduit, and fittings, shall be thoroughly cleaned of grease and metal cuttings. Any discoloration or other damage to parts of the finish, or the furnishings, due to the Contractor's failure to properly clean the system, shall be repaired by the Contractor without cost to the Owner.
   3. The Contractor shall paint scratched or blemished surfaces with the necessary coats of quick drying paint to match existing color, texture and thickness. This shall include all prime painted electrical equipment including but not limited to enclosures, poles, boxes, devices, etc.

3.07 ELECTRICAL TESTING

A. General requirements
   1. It is the intent of these tests to assure that all equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design plans and specifications.
   2. All equipment setup and assembled by the Contractor shall be in accordance with the design plans and Drawings and the manufacturer's recommendations and instructions and shall operate to the Engineer's satisfaction. Follow all manufacturer's instructions for handling, receiving, installation, and pre-check requirements prior to energization. After energization, follow manufacturer’s instructions for programming, set-up and calibration of equipment. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment which, in the opinion of the Engineer, has been caused by faulty mechanical or electrical assembly by the Contractor. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the Owner.
   3. The testing shall not be started until the manufacturer has completed fabrication, wiring, and setup; performed satisfactory checks and adjustments; and can demonstrate the system is complete and operational. Certification of completion of Contractor’s in-house tests shall be submitted prior to scheduling of factory testing.
   4. The first Pre-Energization tests shall be performed to determine the suitability for energization and shall be completed with all power turned off and complete prior to the start of any of the Post-Energization Tests. The Electrical Contractor shall have qualified personnel on the job site for all Pre-Energization and Post-Energization tests.
   5. All tests shall be witnessed by the Engineer and/or Owner personnel. The test forms shall be completed by the testing person for field checkout, testing, and calibration of all equipment and instruments. All filled in test forms shall be given to the Engineer and/or Owner the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy. All tests shall be documented in writing by the supplier and signed by the Engineer as satisfactory completed. The supplier shall keep a detailed log of all tests that failed or did not meet specifications, including date of occurrence and correction. Completed forms with proper signatures and dates shall be included and become a component of the Operations and Maintenance Manual for each of the respective systems.
   6. Prior to any field testing, Interconnection Drawings and Operation & Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer.
   7. The Contractor shall notify the Owner and the Engineer of the Supplier's readiness to begin all factory and field tests in writing (a minimum of ten working days prior to start), and shall schedule system checkout on dates agreed to by the Owner and the Engineer in order that the testing be scheduled and witnessed.
   8. The supplier shall submit for approval, the proposed factory & field testing sheets at least 24 days

prior to the start of the tests. Each testing sheet shall have a title giving the type of test and entry spaces for the name of the person who performed the test, name of the person who witnessed the test, and the date. Tests performed without approved forms shall be retested at no additional cost to Owner.

9. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineering; these additional tests shall be done at no additional cost to the Owner.

B. Failure to Meet Test

1. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported to the Engineer. The Contractor shall replace the defective material or equipment and have tests repeated until test proves satisfactory to the Engineer without additional cost to the Owner.

C. Electrical Field Tests

1. The Contractor shall engage and pay for the services of an approved qualified testing company for the purpose of performing inspections and tests as herein specified. The testing company shall provide all material, equipment, labor and technical supervision to perform such tests and inspections. The Electrical Contractor shall be present on site for all field tests.
2. Pre-Energization Tests: These tests shall be completed prior to applying power to any equipment.
    a. Inspections
        1) Visual and mechanical inspections
            a) Inspect for physical damage, proper anchorage and grounding.
            b) Compare equipment nameplate data with design plans and starter schedule.
            c) Compare overload setting with motor full load current for proper size.
        2) Performed NETA acceptance testing for each piece of equipment.
        3) The Contractor shall fill in, for each piece of equipment, NETA Test Form.
    b. Torque Connections
        1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC 110-14 for torque values as guidelines.
    c. Wire Insulation & Continuity Tests
        1) All devices that are not rated to withstand the 500V megger potential shall be disconnected prior to the megger tests.
        2) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for 10 seconds. Make tests with circuits installed in conduit and isolated from source and load. Each field conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.
        3) Each megger reading shall not be less than 10 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 10 Meg-ohms shall be replaced.
        4) Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no

additional cost to the Owner.

5) Contractor to test existing conductors to be reused as shown on drawings.

d. Grounding System Tests
   1) Visual and Mechanical Inspection
      a) Verify ground system is in compliance with Drawings and Specifications.

3. Post Energization Tests
   a. Phase Rotation Tests
      1) Check connections to all equipment for proper phase relationship, this includes all three-phase panels and electrical enclosures and all motor loads. During this test, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence. Three phase equipment shall be tested for the phase sequence "ABC" front to back, left to right, and top to bottom.
      2) All three phase motors shall be tested for proper phase rotation. Revise wire color codes to indicate correct phase color if wires are swapped.
      3) The Contractor shall fill in Phase Rotation Test Form TF7 located in Section 16010 Appendix “A”.
   b. Motor Testing
      1) Record the amperage draw on all phases of each motor operating under full load. Ensure that these values do not exceed the motor nameplate full load amperage.
      2) Record the voltage between all phases of each motor operating under full load. If the voltage balance is not within plus or minus 5 percent of nominal, request the Utility power company or other responsible party to correct the problem.
      3) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form and be placed in the O&M manual:
         a) Equipment driven.
         b) Motor horsepower.
         c) Nameplate amperes.
         d) Service factor.
         e) Temperature rating.
         f) Overload catalog number.
         g) Overload current range and setting.
         h) Circuit breaker rating.
         i) Circuit breaker trip setting, for magnetic only circuit breakers.
         j) The Contractor shall fill in Motor Test Form TF10 located in Section 16010 Appendix “A”.
   c. VFD Measurement and Tests
      1) Measure the voltage and current 5^{th}, 7^{th}, 9^{th}, 11^{th} harmonics at the load side of the ATS with a harmonic analyzer with the each combination of pumps or as designated by Engineer at start-up in operation on the Utility source and Generator source. Measure and record the results per the Harmonic Measurements Test Form
   d. Control System Tests
      1) All the I/O points for the PLC shall be tested by the system supplier in the field for proper operation of alarms, status, analog, control, and Human Machine Interface (HMI/OI) display functions. Where practical, the final element shall be used, i.e. trip the intrusion switch or change levels. Testing shall be accomplished using simulated inputs only when necessary.

2) During this task the System supplier shall have:
   a) Qualified field technician with experience in the startup of similar systems with PLC controls, and other field devices.
   b) Test instruments as required.
   c) A pair of radios for communication.
3) Contractor to fill in "I/O Point Checkout Sheet" TF13 located in Appendix "A".

e. Trial Operations
   1) The entire electrical installation shall be either tested or trial operated to verify Contract compliance. That is, controls, heaters, fans, light switches, convenience receptacles, lights, etc. shall be trial operated. Contractor shall conduct trial operations in the presence of the Engineer and Operations and Maintenance personnel.

f. Operational Testing
   1) After all the previous tests in this subsection are complete, the Contractor shall conduct operational testing.
   2) The Contractor shall demonstrate operation of each part of the control and instrumentation system to the satisfaction of the Owner and/or Engineer. Tests shall be repeated by the Contractor at no additional cost to the Owner and at the discretion of the Owner and/or Engineer to resolve whether the system has been demonstrated that it will operate under all modes of operations and varying conditions.
   3) For the operational testing the new equipment shall be activated to automatically run for 5 days, 24 hours per day, Monday through Friday. During this five day period the Owner will run the different combinations of the monitoring options. If equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5 day operational test, Monday through Friday. This shall be continued until the new equipment functions acceptably for 5 consecutive days.

3.08 OPERATION AND MAINTENANCE MANUALS

A. Six (6) sets operating manuals covering instruction and maintenance on each type of equipment shall be furnished prior to completion of the project.

B. These instructions shall provide the following as a minimum:
   1. Each set bound in a three ring binder and organized as specified herein.
   2. "As Constructed" set of submittal shop documents, data sheets, and drawings for all items in the electrical system.
   3. A complete list of items supplied, including serial numbers, ranges, options, and other pertinent data necessary for ordering replacement parts.
   4. Full technical specifications on each item.
   5. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts lists with stock numbers shall be provided on the components that make up the assembly.
   6. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
   7. Safety precautions and procedures.
   8. Include all completed and signed test data and forms from factory and field testing.
   9. No photo copies are allowed of standard published manuals available from manufacturers. All of the manuals shall be originals.

C. At the end of the project these manuals shall be updated to show "as-built or as-installed" conditions.

3.09 FINAL ACCEPTANCE

A. Final acceptance will be given by the Owner after the equipment has passed the "operational testing" trial period, each deficiency has been corrected, as-built documentation has been provided, and all the requirements of design documents have been fulfilled.

B. Upon completion of the project, prior to final acceptance, remove all temporary services, equipment, material, and wiring from the site.

C. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall provide the following to the Owner:
   1. Listing of warranty information.
   2. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.

D. Prior to final acceptance submit each key with matching duplicate. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.

END OF SECTION

Attachment C

Project Drawings

NOT FOR CONSTRUCTION - FOR PROPOSAL PURPOSES ONLY

GENERAL NOTES:

REMOVE ALL EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTS AS REQUIRED TO INSTALL NEW BLOWER

A. REMOVE INLET FILTERS AND INLET FILTER ENCLOSURE.

B. REMOVE 12" INLET PIPING, INLET VALVE, AND FLEXIBLE COUPLING.

C. REMOVE BLOWER, MOTOR, AND FRAME.

D. REMOVE 12" DISCHARGE PIPING, CHECK VALVE, DISCHARGE VALVE, AND FLEXIBLE COUPLING.

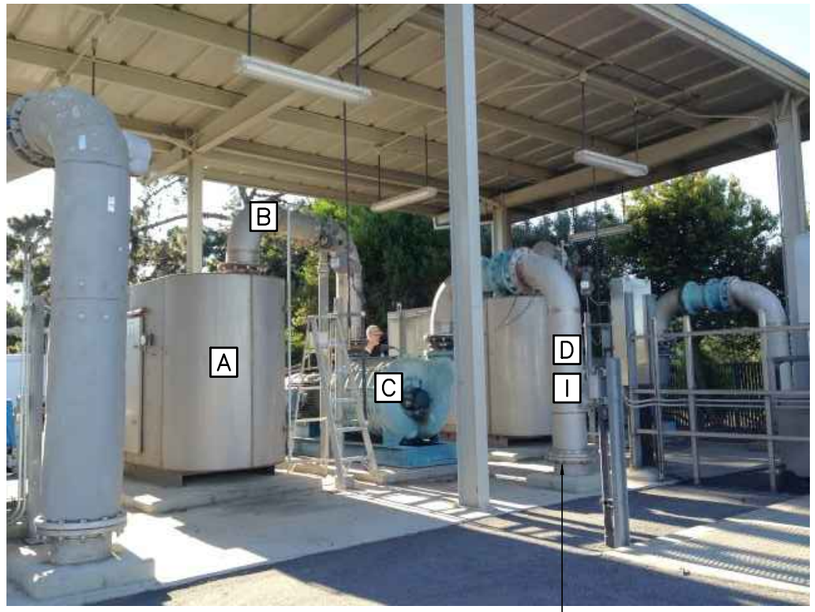
E. REMOVE PIPE SUPPORTS.

F. REMOVE CONTROL PANEL AND ASSOCIATED CONDUIT AND WIRING.

G. DISCONNECT ELECTRICAL WIRING TO BLOWER MOTOR.

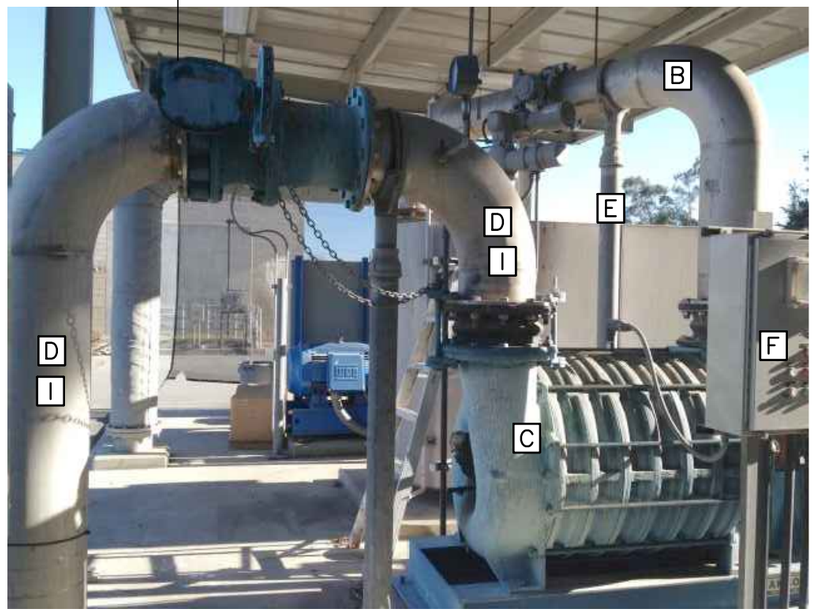
H. REMOVE ANCHOR BOLTS FLUSH AND GRIND SMOOTH.

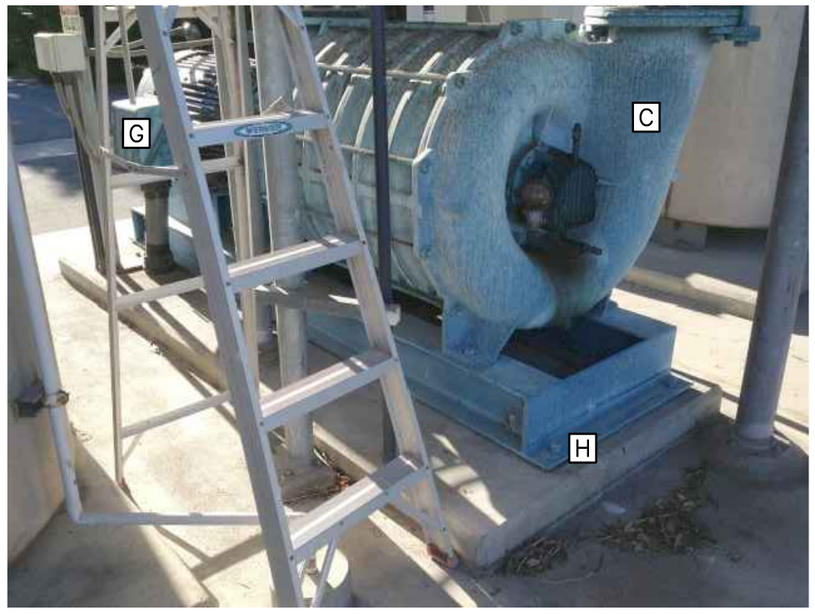
I. OPTION TO REUSE PIPING



REMOVE PIPING TO FLANGE AT CONCRETE BASE

PIPING TO REMAIN | REMOVE PIPING





DEMOLITION
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EL DORADO ENGINEERING AND ARCHITECTURE, INC.

WSC
WATER SYSTEMS CONSULTING, INC.

CITY OF SAN LUIS OBISPO

CITY OF SAN LUIS OBISPO
CALIFORNIA

BLOWER REPLACEMENT PROJECT

SPECIFICATION No. 91280

ISSUE	DATE	DESCRIPTION

PROJECT NUMBER	–
PROJECT MANAGER	–
DESIGNED	
DESIGNED	
DRAWN BY	M. HARRINGTON
CHECKED	D. PIVETTI
CHECKED	–
CHECKED	–

0 1" 2"

REQUEST FOR PROPOSALS

BLOWER REPLACEMENT PROJECT
DEMOLITION PLAN
JANUARY, 2016

SCALE	NO SCALE

C-1

FILENAME	SLO-BLOWER.dwg

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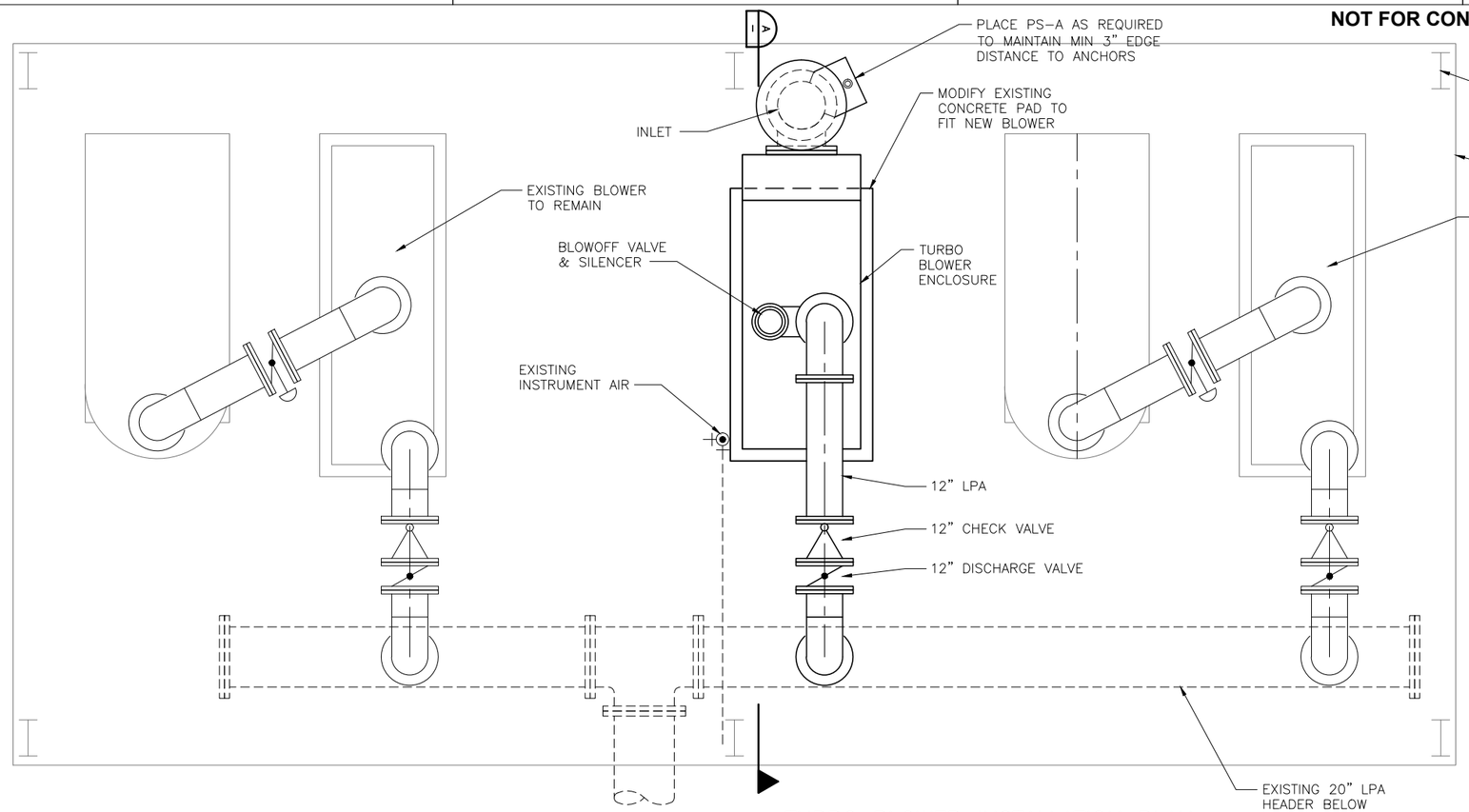


TURBO BLOWER INSTALLATION PLAN

1/2"=1'-0"

SYMBOLS:

CHECK VALVE

BUTTERFLY VALVE

AUTOMATIC VALVE

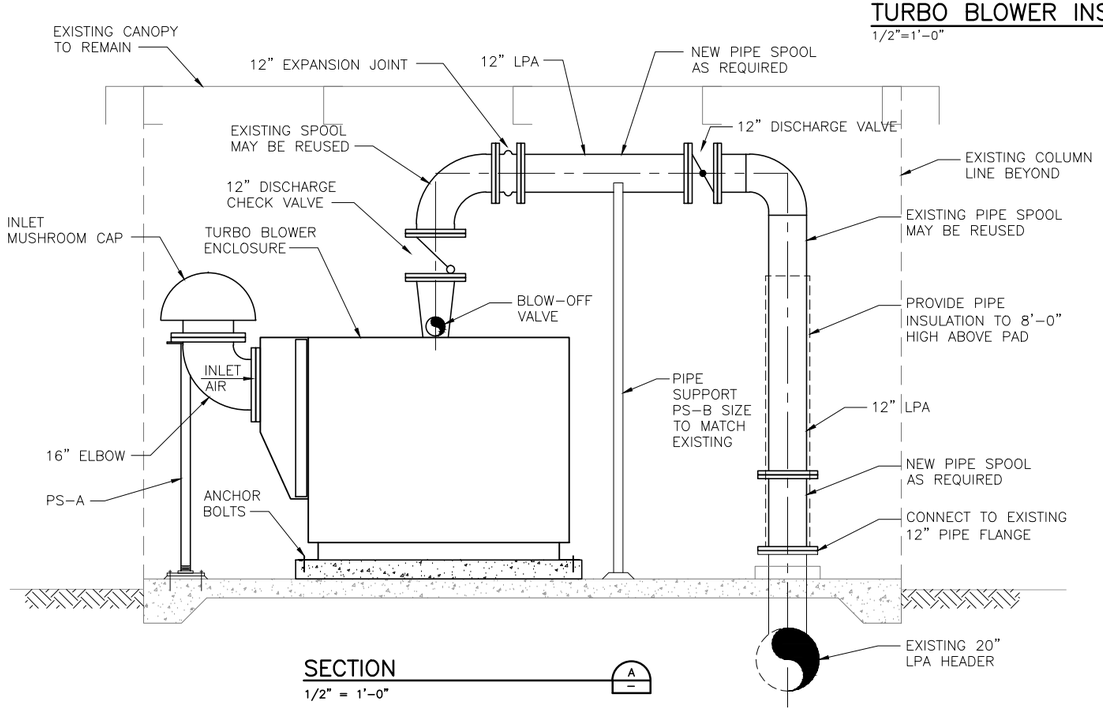
ABBREVIATIONS:

LPA LOW PRESSURE AIR

TYP TYPICAL

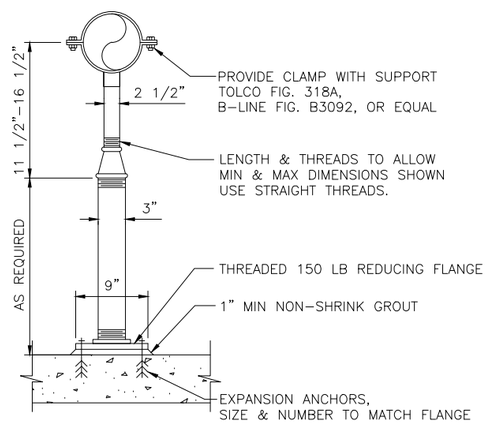
GENERAL NOTES:

1. EXPAND EXISTING CONCRETE PAD AS REQUIRED TO FIT NEW TURBO BLOWER. USE NON–SHRINK CEMENTIOUS GROUT. ROUGHEN EXISTING CONCRETE AND APPLY BONDING AGENT PRIOR TO POURING GROUT. USE FLOWABLE SIKAGROUT 212 OR EQUAL. SAW CUT AND REMOVE PORTION NOT NEEDED. GRIND SMOOTH.
2. INSTALL NEW ANCHOR BOLTS PER BLOWER MANUFACTURER'S RECOMMENDATIONS.
3. EXACT LOCATION OF EXISTING STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS NOT SHOWN. CONTRACTOR TO VERIFY IN FIELD



SECTION

1/2" = 1'-0"

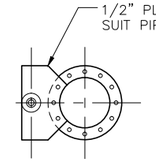


NOTES:

1. HOT–DIP GALVANIZE AFTER FABRICATION.
2. PIPE SHALL BE SCHEDULE 40.
3. EXISTING PIPE SUPPORTS MAY BE REUSED BY CUTTING AND RETHREADING OR BY REPLACING MAIN PIPE BARREL TO FIT.
4. USE DIMENSIONS GIVEN OR SIZE TO MATCH EXISTING.

ADJUSTABLE PIPE SUPPORT PS–B

NTS



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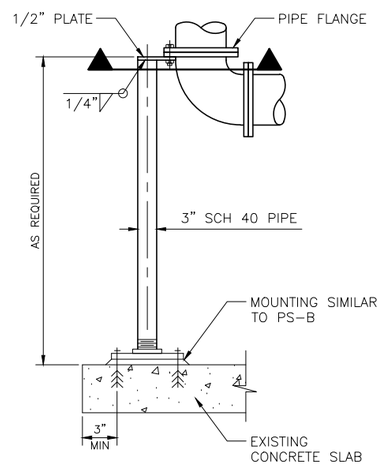

PIPE SUPPORT PS–A

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WSC Water Systems Consulting, Inc.

CITY OF SAN LUIS OBISPO

CITY OF SAN LUIS OBISPO
CALIFORNIA

BLOWER REPLACEMENT PROJECT

SPECIFICATION No. 91280

ISSUE	DATE	DESCRIPTION

PROJECT NUMBER	–
PROJECT MANAGER	–
DESIGNED	D. PIVETTI
DESIGNED	
DRAWN BY	M. HARRINGTON
CHECKED	D. PIVETTI
CHECKED	–
CHECKED	–

0 1" 2"

REQUEST FOR PROPOSALS

**BLOWER REPLACEMENT PROJECT
TURBO BLOWER INSTALLATION
JANUARY, 2016**

SCALE	NO SCALE

C-2

FILENAME	SLO–BLOWER.dwg

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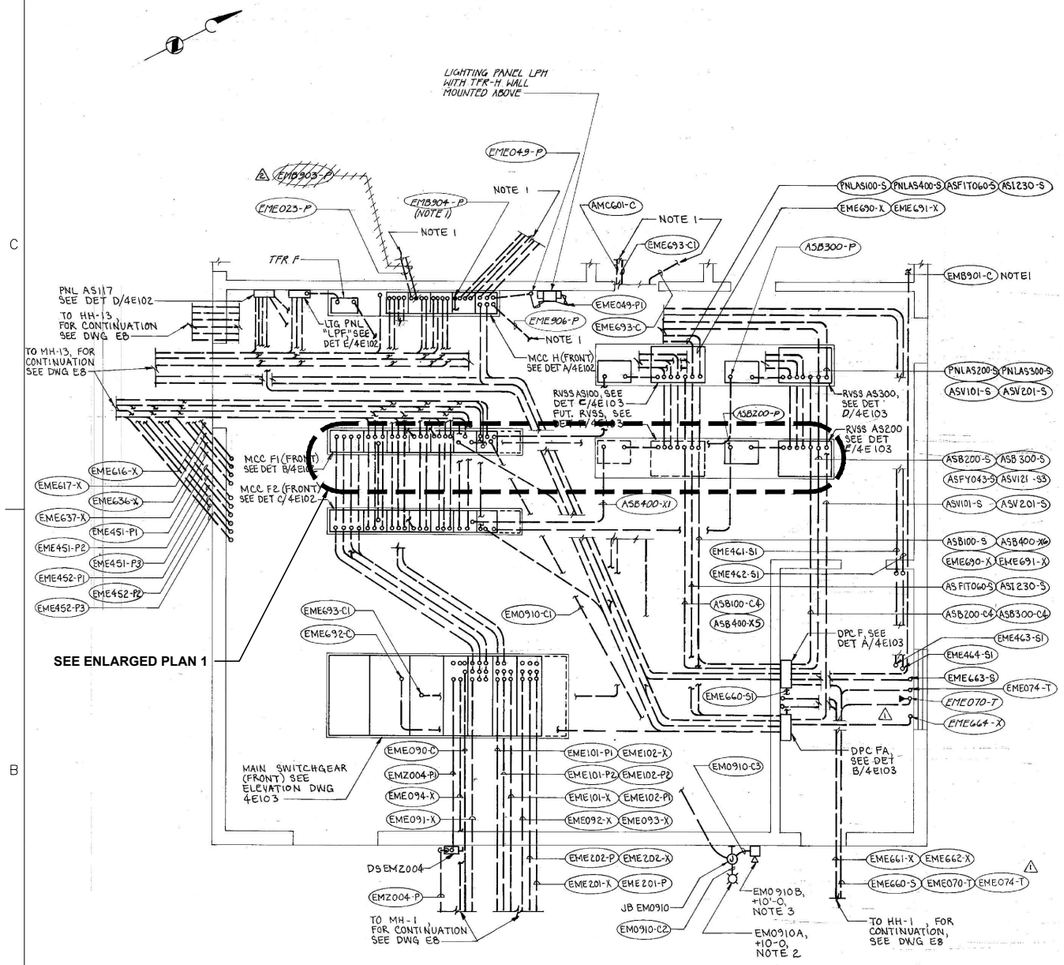

PARTIAL PLAN

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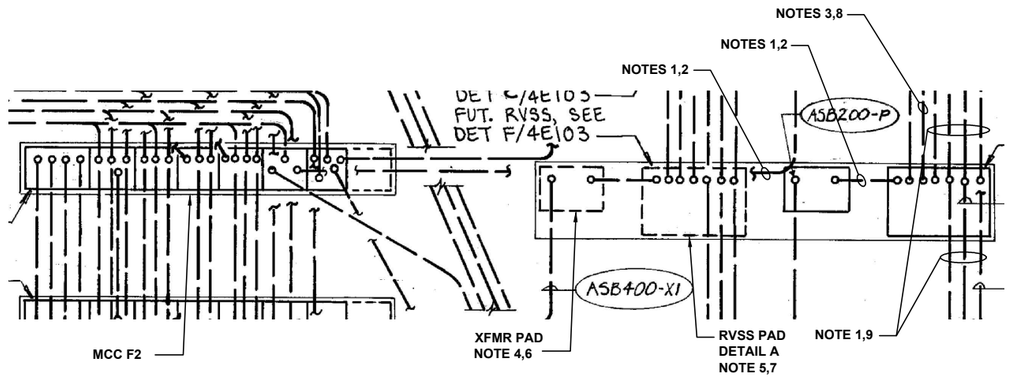
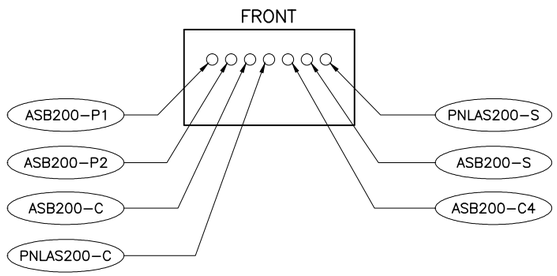


ENLARGED PLAN 1

NTS

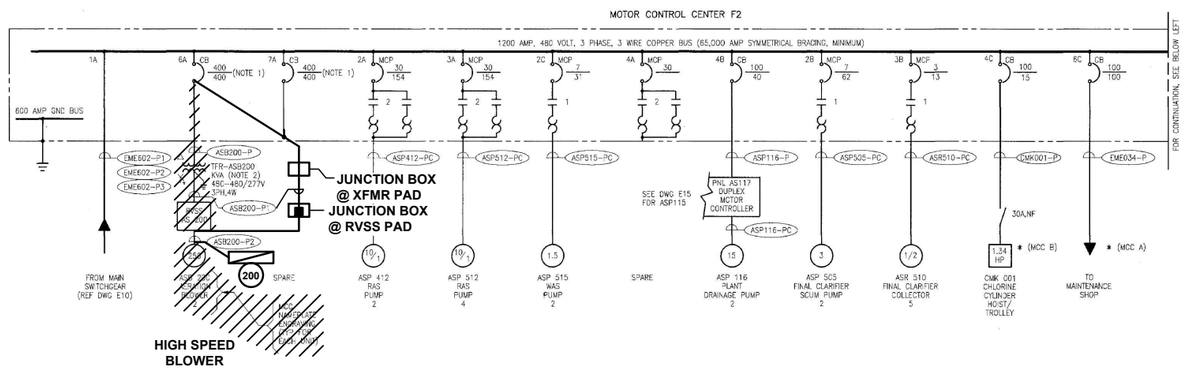
NOTES:

1. DISCONNECT AND REMOVE EXISTING CONDUCTORS.
2. INSTALL 3–500 KCMIL CONDUCTORS (CONTRACTOR TO VERIFY SIZE OF EXISTING CONDUCTORS AND MATCH EXISTING IF THEY ARE DIFFERENT THAN 500 KCMIL)
3. TEST CONDUCTORS AND VERIFY INSULATION IS ACCEPTABLE. SUBMIT REPORT INCLUDING EACH CONDUCTOR FOR APPROVAL BY OWNER.
4. INSTALL A 2' x 3' x 2' DEEP NEMA 1, METAL ENCLOSURE ON XFMR PAD. CONTRACTOR TO MEASURE PAD AND ADJUST FOR FIELD CONDITIONS. SECURE TO PAD WITH EXPANSION ANCHORS. SUBMIT INSTALLATION DRAWING FOR APPROVAL BY OWNER. ROUTE CONDUCTORS FROM ASB200–P TO ASB200–P1.
5. INSTALL 2' x 3' x 2' DEEP NEMA 1, METAL ENCLOSURE ON RVSS PAD. CONTRACTOR TO MEASURE PAD AND ADJUST FOR FIELD CONDITIONS. SECURE TO PAD WITH EXPANSION ANCHORS. SUBMIT INSTALLATION DRAWING FOR APPROVAL BY OWNER. REMOVE EXISTING CONTROL AND 120 VOLT CONDUCTORS BACK TO SOURCE. SPLICE POWER CONDUCTORS FROM BLOWER TO NEW CONDUCTORS FROM MCC F2.
6. REMOVE AND DISPOSE OF EXISTING TRANSFORMER. GRIND BOLTS DOWN TO CONCRETE AND REPAIR PAD IF REQUIRED BY CONDITIONS.
7. REMOVE AND DISPOSE OF EXISTING RVSS. GRIND BOLTS DOWN TO CONCRETE AND REPAIR PAD IF REQUIRED BY CONDITIONS.
8. DISCONNECT CONDUCTORS AT BOTH ENDS AND PROTECT WHILE INSTALLING EQUIPMENT.
9. GRIND CONDUITS DOWN TO SURFACE AND SEAL CONDUITS.



RVSS AS200 CONDUIT STUB–UPS DETAIL A

NTS



SINGLE LINE DIAGRAM

NTS

EL DORADO ENGINEERING AND ARCHITECTURE, INC.

WSC Water Systems Consulting, Inc.

City of San Luis Obispo

CITY OF SAN LUIS OBISPO
CALIFORNIA

BLOWER REPLACEMENT PROJECT

SPECIFICATION No. 91280

ISSUE	DATE	DESCRIPTION

PROJECT NUMBER	–
PROJECT MANAGER	–
DESIGNED	L. SMITHEY
DESIGNED	
DRAWN BY	M. HARRINGTON
CHECKED	D. PIVETTI
CHECKED	–
CHECKED	–

0 1" 2"

REQUEST FOR PROPOSALS

BLOWER REPLACEMENT PROJECT
ENLARGED PLAN 1
JANUARY, 2016

SCALE	NO SCALE

E-1

FILENAME	SLO–BLOWER.dwg

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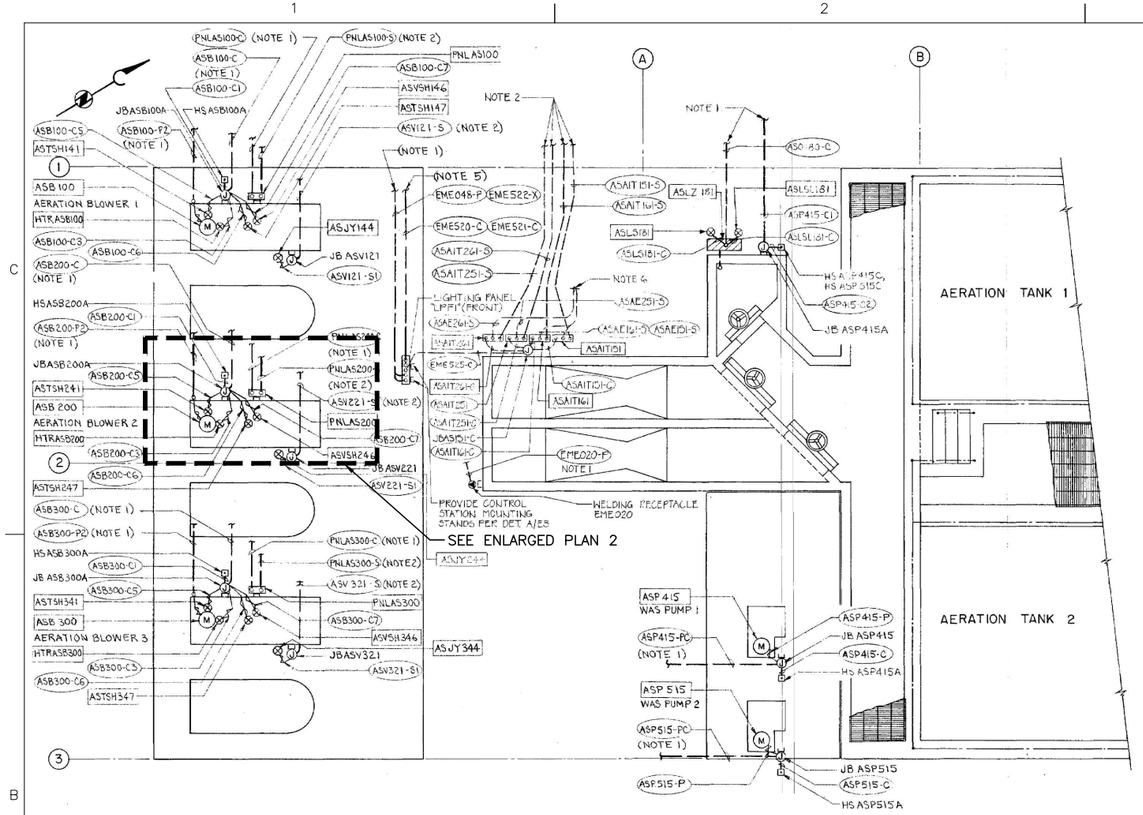
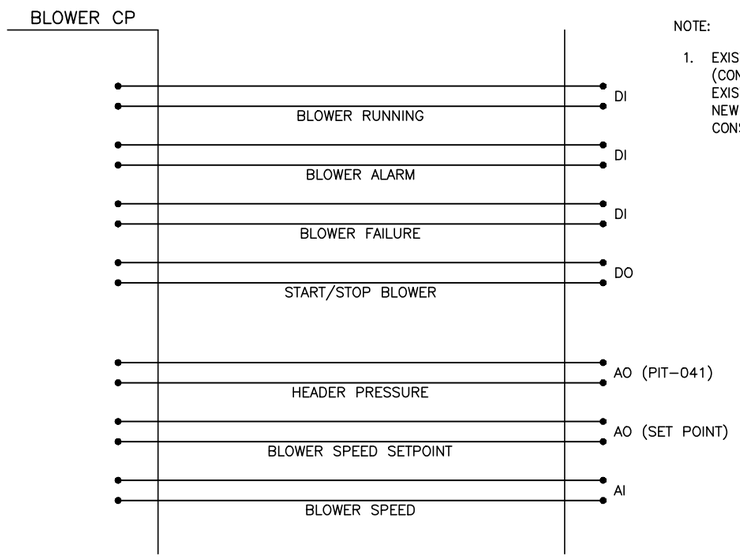


PARTIAL POWER & LIGHTING PLAN

NTS

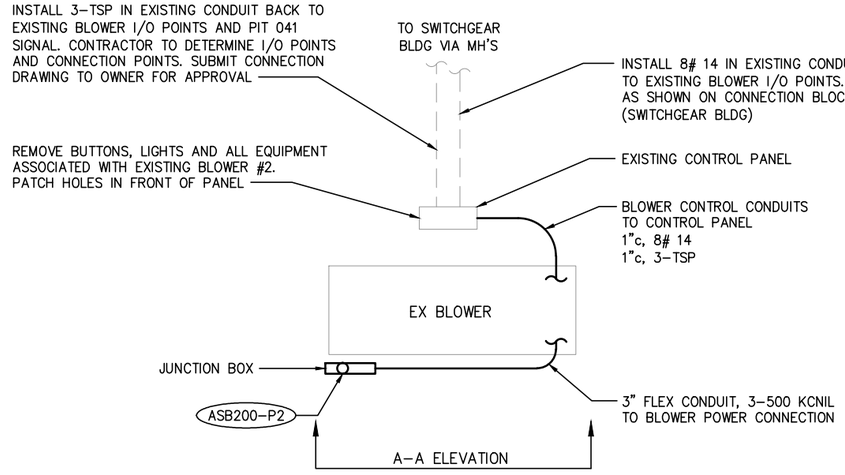


CONNECTION BLOCK DIAGRAM

NTS

NOTE:

1. EXISTING DPC F, FA AND MASTER BLOWER PANEL (CONTRACTOR TO DETERMINE LOCATION OF EXISTING I/O AND ROUTE CONDUCTORS TO PANEL, NEW I/O POINTS TO BE DETERMINED DURING CONSTRUCTION).

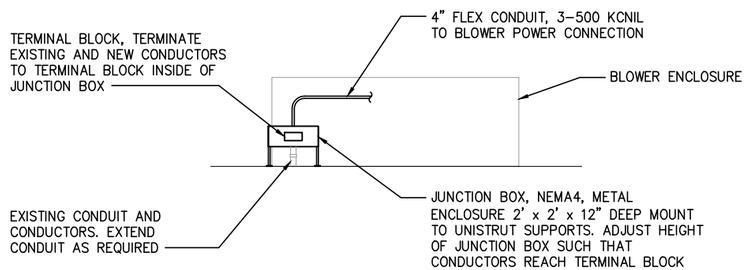


ENLARGED PLAN 2

NTS

NOTES:

1. REMOVE ALL CONDUCTIONS IN FOLLOWING CONDUIT BACK TO PANEL. ASB200-C, ASB200-C1, ASB200-C3, ASB200-C6, ASV221-S1, ASB200-C7, ASV221-S, PNLA200-S AND PNLA200-C.



ELEVATION A-A

NTS

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CITY OF SAN LUIS OBISPO

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CALIFORNIA

BLOWER REPLACEMENT PROJECT

SPECIFICATION No. 91280

ISSUE	DATE	DESCRIPTION

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DESIGNED	L. SMITHEY
DESIGNED	
DRAWN BY	M. HARRINGTON
CHECKED	D. PIVETTI
CHECKED	–
CHECKED	–

0 1" 2"

REQUEST FOR PROPOSALS

BLOWER REPLACEMENT PROJECT
BLOWER DETAILS
JANUARY, 2016

SCALE	NO SCALE

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FILENAME	SLO-BLOWER.dwg

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