CITY OF GREELEY
Purchasing

Request for Proposal
RFP #F23-07-066

Equipment Procurement Package
WTRF Power Generation

for

Water & Sewer Department

REQUEST FOR PROPOSAL (RFP)
RFP #F23-07-066

Procurement Contact:	Alex Adame
Email Address:	Purchasing@greeleygov.com
Telephone Number:	970-350-9325

Proposals must be received no later than the date indicated in the Schedule of Events below.

Proposals received after this date and time will not be considered for award.

ONLY ELECTRONIC RFP RESPONSES WILL BE ACCEPTED DURING THE COVID-19 EVENT

Email your RFP Response to purchasing@greeleygov.com. Only emails sent to purchasing@greeleygov.com will be considered as responsive to the request for proposals. DO NOT submit your RFP Response to multiple email addresses. Emails sent to other City emails may be considered as non-responsive and may not be reviewed.

Proposals shall be submitted in a single Microsoft Word or PDF file under 20MB. The Proposal must not exceed 20 total pages, excluding cover letter, index or table of contents, front and back covers, and title pages/separation tabs. Pages shall be 8 ½ x 11 inch except for up to four (4) pages of 11 x 17 inches. Eleven-point font or larger must be used for the proposal and appendices.

The RFP number and Project name must be noted in the subject line, otherwise the proposal may be considered as non-responsive to the RFP.

Electronic submittals will be held, un-opened, until the time and date noted in the RFP documents or posted addenda.

Schedule of Events (subject to change)	All times are MST
RFP Issued	July 31, 2023
Optional Pre-Proposal Conference	August 9, 2023; 11:00am-12:30pm 306 East 8th Street Greeley, CO 80631
Inquiry Deadline	August 18, 2023 before 2:00 PM
Final Addendum Issued	August 23, 2023
Proposal Due Date	August 28, 2023 by 2:00 PM
Interviews (tentative)	TBD
Notice of Award (tentative)	September 14, 2023

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EXHIBITS

ATTACHMENTS

*"**Public Viewing Copy**: The City is a governmental entity subject to the Colorado Open Records Act, C.R.S. §§ 24-72-200.1 et seq. ("CORA"). Any proposals submitted hereunder are subject to public disclosure by the City pursuant to CORA and City ordinances. Vendors may submit one (1) additional complete proposal clearly marked "FOR PUBLIC VIEWING." In this version of the proposal, the Vendor may redact text and/or data that it deems confidential or proprietary pursuant to CORA. Such statement does not necessarily exempt such documentation from public disclosure if required by CORA, by order of a court of appropriate jurisdiction, or other applicable law. Generally, under CORA trade secrets, confidential commercial and financial data information is not required to be disclosed by the City. Proposals may not be marked "Confidential" or 'Proprietary' in their entirety. **All provisions of any contract resulting from this request for proposal will be public information."***

SECTION I. BACKGROUND, OVERVIEW, AND GOALS

A. Background

The City of Greeley is a home rule municipality with a council-manager form of government and is the county seat and the most populous municipality of Weld County, Colorado. Greeley is in northern Colorado and is situated 52 miles north-northeast of the Colorado State Capitol in Denver. According to the U.S. Census Bureau, the population of the city is roughly 111,000 which makes it the 12th-most populous city in Colorado. The City has an annual budget of ~$490M with a fiscal year that starts Jan 1st, and employs over 1,100 employees. Greeley is a major city of the North Front Range Urban Corridor and home to the University of Northern Colorado which is a public baccalaureate and graduate research university with approximately 12,000 students and six colleges as well as Aims Community College, which has served the community since 1967.

B. Overview

The City of Greeley's (City or Owner) Primary and Phosphorus Treatment (4P) Project includes Phosphorus Side Stream Treatment, Headworks Influent Screen, and Generator improvements. The project provides for a new phosphorus side stream treatment process, new influent screening system and backup power generation to the City of Greeley's 14.7 MGD Water Treatment and Reclamation Facility (WTRF). The City's intent through this Request for Proposal is to procure the specified power generation equipment package needed to supply the WTRF with backup power generation. Multiple alternative approaches to the work may be taken and are described below.

Please note that a complete set of specifications and drawings has been created by the Engineer to support this equipment procurement RFP. Each proposing Vendor can choose to submit on any or all of the alternatives in this RFP as supported by the specifications.

C. Goals

The goals of this project are to procure a new power generation system, and supply this equipment to our Contractor for installation, startup, and testing. The construction phase of the work is expected to begin in late 2024 and be complete in 2026.

SECTION II. STATEMENT OF WORK

A. Scope of Services

The City desires to Contract with the Vendor to provide either a natural gas or a diesel generator. Proposals shall be provided through one of the three alternatives described below:

1) Alternative 1: City Owned/Contractor Installed Equipment

   Through this approach, the Vendor will propose a recommended generator package. The recommended generator package shall be supplied directly to the City. The Vendor shall propose to develop submittals and shop drawings to meet the technical specifications and criteria within this RFP; develop a project schedule, fabricate all materials, complete factory testing of equipment, furnish factory acceptance reports, deliver all materials to the site, and complete field acceptance testing. For this delivery approach, the Owner's Contractor will accept all materials at the job site, verify against the stated Bill of Materials, complete all on-site installation, and manage the startup and testing process.

   Upon successful startup and testing of equipment, the City will be responsible for Operations and Maintenance of generators. Vendor shall provide a two (2) year, and optional five (5) year warranty for the generator system.

   Alternative 1 shall include:

- The Vendor shall provide a complete proposal, broken out with individual pricing, to meet the specifications.
- The selected Vendor shall provide product submittals, prepared, and submitted directly to the City of Greeley, for review and approval by Engineer and the City (or its representatives).
- The selected Vendor shall address all submittal review comments to the satisfaction of the City and Engineer. Multiple submittal packages and comment responses are expected.
- After approved submittals, the selected Vendor shall allow the City to assign the procurement and installation contract to the Contractor of the City's choice. The selected Contractor will then place the final equipment order, address delivery logistics, staging and coordinate final installation, start up and testing with the Vendors.
- The Vendors will provide support for Vendor-furnished control panels, equipment, programming, startup and operations during the procurement, installation, and startup phases of the project.

2) Alternative 2: Vendor-Supplied, Vendor-Owned, Vendor-Operated Equipment Alternative

Through this approach, the Vendor will propose a recommended generator package. The Vendor will retain ownership, furnish the generator system, operate and maintain the equipment. The Vendor shall provide a proposed operating agreement for the generator(s) for review by the City. The Vendor will have the opportunity to operate the generator(s) to optimize energy use for the Vendor's benefit. Energy optimization operation is entirely up to the Vendor. However, the generator(s) shall be available at all times in the event of power loss at the Water Reclamation and Treatment Facility, in order to provide backup power to all City systems. Operations of the generator, energy use, peak shaving, and costs associated with this approach shall be outlined in the proposed operating agreement. If generator is to be used outside of power loss or other emergency situations, a minimum performance guarantee shall be agreed upon between Vendor and City to maintain operations of the WTRF.

For this alternative, the Vendor shall develop shop drawings and submittals to meet the technical specifications and criteria within this RFP, develop a project schedule, fabricate all materials, complete factory testing of equipment, furnish factory acceptance reports, deliver all equipment to site, offload equipment, install the generator(s) systems (complete in place), complete field wiring, and field acceptance testing. For this delivery approach, the City will provide a "pad-ready" site to accept the generators. The City will fabricate a foundation for the generator(s), as designed and specified by the Vendor or Vendor's engineer. The City will install conduit and conductors, extended to the generator pad, for Vendor extension and termination at the generator. Vendor shall provide design information for termination locations at generator pads. Any on or off-site improvements necessary to bring natural gas capacity and distribution to the generator(s) is the responsibility of the Vendor.

Upon successful termination of conductors at generators, startup and testing of equipment, Vendor will be responsible for Operations and Maintenance of generators for a minimum of 5 years or as agreed to in the operating agreement. Vendor shall coordinate with City for regular testing of generator system. Vendor shall also describe their control system and any cross-over or interface with the City's SCADA network which will continuously monitor generator operation. The City requires the SCADA network to be 100% secure and separate from external internet connections.

Alternative 2 proposals shall include, at a minimum:

- A complete proposal, broken down with pricing to provide the generator package, including initial design and capital costs as well as annual operation and maintenance fees
- Vendor shall provide design and sizing of the system, including any pads, support structures, or other miscellaneous items needed for the Vendor's package. Design must be stamped by a Colorado licensed Professional Engineer.
- Vendor supplied package must meet specifications, at a minimum, that apply to Alternative 1 of this RFP. Vendor must provide a performance guarantee to the City of Greeley providing a minimum amount of power during emergency situations. If generator is to be run and/or power to the WTRF is to be interrupted by Vendor during any other times, Vendor must include that in

Proposal and provide a performance guarantee for those planned operations to ensure sufficient power is supplied to the WTRF.
- The Vendor shall include their proposed terms/Contract to the City for the City's review with their Proposal.
- The Vendor shall include information on how their SCADA system shall work and maintain security for the SCADA system at the WTRF with their Proposal.
- The selected Vendor shall provide product submittals, prepared, and submitted directly to the City of Greeley, for review and approval by Engineer and the City (or its representatives).
- The selected Vendor shall address all submittal review comments to the satisfaction of the City and Engineer. Multiple submittal packages and comment responses are expected.

3) Alternative 3: Vendor-Open Ended Alternative

Through this alternative, the Vendor will propose a recommended solution to meet the City's need for backup power. The City desires creative solutions from Vendors that will meet their need for 2 MW of backup power generation. The City is open to options to own or lease equipment, operate the equipment, or contract with a Vendor to operate and maintain the equipment. Generator(s) shall be available at all times in the event of a power failure at the Water Reclamation and Treatment Facility, in order to provide backup power to all City systems.

With this approach, the Vendor shall provide a proposed operating agreement for the generator(s) for review by the City. Ownership, operations of the generator, maintenance, energy use, approach to energy optimization, and all cost responsibility associated with this approach (both to Vendor and to Owner) shall be outlined in the proposed operating agreement.

Alternative 3 proposals shall include, at a minimum:

- A complete proposal, broken down with pricing to provide the generator package and any additional services included in proposed scope of work
- Vendor supplied package must meet specifications, at a minimum, that apply to Alternative 1 of this RFP. Vendor must provide a performance guarantee to the City of Greeley providing a minimum amount of power during emergency situations. If generator is to be run and/or power to the WTRF is to be interrupted by Vendor during any other times, Vendor must include that in Proposal and provide a performance guarantee for those planned operations to ensure sufficient power is supplied to the WTRF.
- The Vendor shall include their proposed terms/Contract to the City for the City's review with their Proposal.
- The Vendor shall include information on how their SCADA system shall work and maintain security for the SCADA system at the WTRF with their Proposal, if applicable.
- The selected Vendor shall provide product submittals, prepared, and submitted directly to the City of Greeley, for review and approval by Engineer and the City (or its representatives).
- The selected Vendor shall address all submittal review comments to the satisfaction of the City and Engineer. Multiple submittal packages and comment responses are expected.
- The selected Vendor shall allow the City to assign the procurement and installation contract to the Contractor of the City's choice. The selected Contractor will then place the final equipment order, address delivery logistics, staging and coordinate final installation, start up and testing with the Vendor, if applicable.

B. Period of Award

The completion date of providing the required product and services shall be based on proposed scheduled and mutually agreed upon by the project team. Completion date shall remain the same even if the City chooses to assign the contract to the Contractor of the City's choice.

Vendors shall submit a fixed price proposal to the City. The initial fixed price proposal shall be the basis for evaluation and award through this RFP. Prior to contract assignment to the City's Contractor, the City will accept

updated cost proposals from the Vendor to account for inflationary costs from October 2023 to January 2025. The inflationary cost adjustment must include supporting information showing validity of adjustment and shall be evaluated against known construction cost indices such as ENR, McGraw-Hill or others to ensure the cost adjustment is legitimate for current market conditions.

If the City desires to extend the contract, no later than thirty (30) days prior to expiration, the City's Purchasing Contact may send a notice in writing to the vendor requesting firm pricing for the next twelve-month period. All awards and extensions are subject to annual appropriation of funds. The provisions of the foregoing paragraphs with respect to extensions of the terms of the contract shall be null and void if the contract has been terminated or revoked during the initial term or any extension thereof. All decisions to extend the contract are at the option of the City.

C. Minimum Mandatory Qualifications of Offeror

Successful installation and proven operation of equipment noted in this RFP in at least five (5) locations in the United States, which have been in operation for at least five (5) years. Vendors shall provide references for Owner verification of system installation/operation. The Owner reserves the right to visit referenced installations, contact Vendor provided references and use information provided by references to evaluate and select the successful Vendor of any equipment named in this RFP.

SECTION III. ADMINISTRATIVE INFORMATION

A. Issuing Office

The City's contact name listed herein is to be the sole point of contact concerning this RFP. Offerors shall not directly contact other personnel regarding matters concerning this RFP or to arrange meetings related to such.

B. Official Means of Communication

All official communication from the City to offerors will be via postings on an electronic solicitation notification system, the Rocky Mountain Bid System (www.rockymountainbidsystem.com). The Purchasing Contact will post notices that will include, but not be limited to, proposal document, addenda, award announcement, etc. It is incumbent upon offerors to carefully and regularly monitor the Rocky Mountain Bid System for any such postings.

C. Inquiries

Prospective Offerors/Vendors may make written inquiries by e-mail before the written inquiry deadline concerning this RFP to obtain clarification of requirements. There will be an opportunity to make inquiries during the pre-proposal conference, if any. No inquiries will be accepted after the deadline. Inquiries regarding this RFP (be sure to reference RFP number) should be referred to:

E-Mail: Purchasing@greeleygov.com
Subject Line: RFP #F23-07-066

Response to Offeror's inquiries will be published as addenda on the Rocky Mountain Bid System in a timely manner. Offerors cannot rely on any other statements that clarify or alter any specification or other term or condition of the RFP.

Should any interested Offeror, sales representative, or manufacturer find any part of the listed specifications, terms and conditions to be discrepant, incomplete, or otherwise questionable in any respect, it shall be the responsibility of the concerned party to notify the Purchasing Contact of such matters immediately upon discovery.

D. Insurance

The successful Vendor(s) will be required to provide a Certificate of Insurance (**Exhibit 3**) or other proof of insurance naming the City of Greeley as "additional insured". Coverage must include COMMERCIAL GENERAL

LIABILITY coverage with minimum limits of $2,000,000, and WORKER'S COMPENSATION coverage with limits in accordance with State of Colorado requirements.

COMPREHENSIVE AUTOMOBILE LIABILITY with minimum limits for bodily injury and property damage coverage of at least $1,000,000, plus an additional amount adequate to pay related attorneys' fees and defense costs, for each of Consultant's owned, hired or non-owned vehicles assigned to or used in performance of this Agreement.

The City shall be named as additional Insured for General and Auto Liability Insurance.

E. Modification or Withdrawal of Proposals

Proposals may be modified or withdrawn by the offeror prior to the established due date and time.

F. Minor Informalities

Minor informalities are matters of form rather than substance evident from the response or insignificant mistakes that can be waived or corrected without prejudice to other vendors. The Purchasing Manager may waive such informalities or allow the Vendor to correct them depending on which is in the best interest of the City.

G. Responsibility Determination

The City will make awards only to responsible Vendors. The City reserves the right to assess the Offeror's responsibility at any time in this RFP process and may not make a responsibility determination for every Offeror.

H. Acceptance of RFP Terms

A proposal submitted in response to this RFP shall constitute a binding offer. The autographic signature of a person who is legally authorized to execute contractual obligations on behalf of the Offeror shall indicate acknowledgment of this condition. A submission in response to this RFP acknowledges acceptance by the Offeror of all terms and conditions as set forth herein. An Offeror shall identify clearly and thoroughly any variations between its proposal and the RFP in the cover letter. Failure to do so shall be deemed a waiver of any rights to subsequently modify the terms of performance, except as outlined or specified in the RFP.

I. Protested Solicitations and Awards

Right to protest. Any actual or prospective bidder, offeror, vendor or contractor who is aggrieved in connection with the solicitation or award of a contract must protest in writing to the City Manager as a prerequisite to seeking judicial relief. Protestors are urged to seek informal resolution of their complaints initially with the Purchasing Manager. A protest shall be submitted within ten (10) calendar days after such aggrieved person knows or should have known of the facts giving rise thereto. A protest with respect to an invitation for bids or request for proposals shall be submitted in writing prior to the opening of bids or the closing date of proposals, unless the aggrieved person did not know and should not have known of the facts giving rise to such protests prior to bid opening or the closing date for proposals.

Stay of procurement during protests. In the event of a timely protest under Subsection I of this Section, the Purchasing Manager shall not proceed further with the solicitation or award of the contract until all administrative and judicial remedies have been exhausted or until the City Manager makes a written determination on the record that the award of a contract without delay is necessary to protect substantial interest of the City. (Ord. 75, 1984 §2 (part))

J. Confidential/Proprietary Information

All proposals will be confidential until a contract is awarded and fully executed. At that time, all proposals and documents pertaining to the proposals will be open for public inspection, except for material that is proprietary or confidential. However, requests for confidentiality can be submitted to the Purchasing Contact provided that the submission is in accordance with the following procedures. This remains the *sole responsibility* of the Offeror.

The Purchasing Contact will make no attempt to cure any information that is found to be a variance with this procedure. The offeror may not be given an opportunity to cure any variances after proposal opening. **Neither a proposal in its entirety, nor proposal price information will be considered confidential/proprietary.** Questions regarding the application of this procedure must be directed to the Purchasing Contact listed in this RFP.

K. Acceptance of Proposal Content

The contents of the proposal (including persons specified to implement the project) of the successful Vendor shall become contractual obligations into the contract award. Failure of the successful Offeror to perform in accordance with these obligations may result in cancellation of the award and such offeror may be removed from future solicitations.

L. RFP Cancellation

The City reserves the right to cancel this RFP at any time, without penalty.

M. Negotiation of Award

The City will evaluate responsive proposals based on the criteria described in this Request for Proposal and select a Vendor based on that evaluation. After selection of the most qualified proposal, the City reserves the right to negotiate the award for services with the offeror submitting the proposal in lieu of accepting the proposal as is. Final Scope of Services, fee, and schedule may all be determined during these negotiations.

N. Contract

A sample copy of the contract the City will use to contract for the services specified in this RFP is attached as **Exhibit 2**. The attached contract is only a sample and is not to be completed at this time.

O. RFP Response/Material Ownership

All material submitted regarding this RFP becomes the property of the City of Greeley, unless otherwise noted in the RFP.

P. Incurring Costs

The City is not liable for any cost incurred prior to issuance of a legally executed contract and/or a purchase order.

Q. Utilization of Award by Other Agencies

The City of Greeley reserves the right to allow other State and local governmental agencies, political subdivisions, and/or school districts to utilize the resulting award under all terms and conditions specified and upon agreement by all parties. Usage by any other entity shall not have a negative impact on the City of Greeley in the current term or in any future terms.

R. Non-Discrimination

The Offeror shall comply with all applicable state and federal laws, rules and regulations involving non-discrimination on the basis of race, color, religion, national origin, age or sex.

S. News Releases

Neither the City, nor the Offeror, shall make news releases pertaining to this RFP prior to execution of the contract without prior written approval of the other party. Written consent on the City's behalf is provided by the Public Information Office.

T. Certification of Independent Price Determination

1. By submission of this proposal each Offeror certifies, and in the case of a joint proposal each party, thereto certifies as to its own organization, that in connection with this procurement:

   a) The prices in this proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Offeror or with any competitor;

   b) Unless otherwise required by law, the prices which have been quoted in this proposal have not been knowingly disclosed by the Offeror and will not knowingly be disclosed by the Offeror prior to opening, directly or indirectly to any other Offeror or to any competitor; and

   c) No attempt has been made or will be made by the Offeror to induce any other person or firm to submit or not to submit a proposal for the purpose of restricting competition.

2. Each person signing the Request for Proposal form of this proposal certifies that:

   a) He/she is the person in the Offeror's organization responsible within that organization for the decision as to the prices being offered herein and that he/she has not participated, and will not participate, in any action contrary to (1.a) through (1.c) above; or

   b) He/she is not the person in the Offeror's organization responsible within that organization for the decision as to the prices being offered herein but that he/she has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (1.a) through (1.c) above, and as their agent does hereby so certify; and he/she has not participated, and will not participate, in any action contrary to (1.a) through (1.c) above.

3. A proposal will not be considered for award where (1.a), (1.c), or (2.) above has been deleted or modified. Where (1.b) above has been deleted or modified, the proposal will not be considered for award unless the Offeror furnishes with the proposal a signed statement which sets forth in detail the circumstances of the disclosure and the City's Purchasing Manager, or designee, determines that such disclosure was not made for the purpose of restricting competition.

4. The Contract Documents may be executed in two or more counterparts, each of which shall be deemed an original but all of which together shall constitute one and the same document. The Contract Documents, including all component parts set forth above, may be executed and delivered by electronic signature by any of the parties and all parties consent to the use of electronic signatures.

U. Taxes

The City of Greeley is exempt from all federal excise taxes and all Colorado State and local government sales and use taxes. Where applicable, Contractor/Vendor will be responsible for payment of use taxes.

V. Assignment and Delegation

Vendor is required, through this contract, to accept assignment of this contract to a future construction contract entered into by City/Owner. This assignment will be to the City's Contractor who will build, install and construct the improvements. Vendor(s) responding to this RFP shall not unreasonably withhold assignment of any procurement contract to the City's future Contractor.

W. Availability of Funds

Financial obligations of the City of Greeley payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted, and otherwise made available. In the event funds are not appropriated, any resulting contract will become null and void without penalty to the City.

X. Standard of Conduct

The successful firm shall be responsible for maintaining satisfactory standards of employees' competency, conduct, courtesy, appearance, honesty, and integrity, and shall be responsible for taking such disciplinary action with respect to any employee as may be necessary.

The City may request the successful firm to immediately remove from this assignment any employee found unfit to perform duties due to one or more of the following reasons:

1. Neglect of duty.
2. Disorderly conduct, use of abusive or offensive language, quarreling, intimidation by words or actions or fighting.
3. Theft, vandalism, immoral conduct or any other criminal action.
4. Selling, consuming, possessing, or being under the influence of intoxicants, including alcohol, or illegal substances while on assignment for the City.

Agents and employees of Vendor working in City facilities shall present a clean and neat appearance. Prior to performing any work for the City, the Vendor shall require each of their employees to wear ID badges or uniforms identifying: the Vendor by name, the first name of their employee and a photograph of their employee if using an ID badge. Their employee shall wear or attach the ID badge to the outer garments at all times.

Y. Damages for Breach of Contract

In addition to any other legal or equitable remedy the City may be entitled to for a breach of this Contract, if the City terminates this Contract, in whole or in part, due to Vendor's breach of any provision of this Contract, Vendor shall be liable for actual and consequential damages to the City.

Z. Other Statutes

1. The signatory hereto avers that he/she is familiar with Colorado Revised Statutes, 18-8-301, et seq. (Bribery and Corrupt Influence) and 18-8-401, et seq. (Abuse of Public Office) as amended, and that no violation such provisions is present.

2. The signatory hereto avers that to his/her knowledge, no City of Greeley employee has any personal or beneficial interest whatsoever in the service or property described herein. See CRS 24-18-201 and CRS 24-50-507.

SECTION IV. PROPOSAL SUBMISSION

Following are the response requirements for this RFP. All specific response items represent the minimum information to be submitted. Deletions or incomplete responses in terms of content or aberrations in form may, at the City's discretion, render the proposal non-responsive.

RFP responses must be emailed to purchasing@greeleygov.com. Only emails sent to purchasing@greeleygov.com will be considered as responsive to the request for proposals. DO NOT submit your RFP Response to multiple email addresses. Emails sent to other City emails will be considered as non-responsive and will not be reviewed.

Proposals shall be submitted in a single Microsoft Word or PDF file under 20MB. The Proposal must not exceed 20 total pages, excluding cover letter, index or table of contents, front and back covers, and title pages/separation tabs. Pages shall be 8 ½ x 11 inches except for up to four (4) pages of 11 x 17 inches. Eleven (11) point font or larger must be used for the proposal and appendices.

The RFP number and Project name must be noted in the subject line, otherwise the proposal may be considered as non-responsive to the RFP.

Vendor responses shall include, at minimum, the following information:

- Scope of equipment supply and pricing summary. Provide pricing per unit, lump sum or equivalent to provide necessary details to the Owner for evaluation of equipment pricing supplied through this RFP.
- Provide proposed invoicing schedule with milestone descriptions. At a minimum provide the following milestones: Approved Product Data Submittals and Shop Drawings, Generator Delivery and Associated Spare Parts, 15kv Switchgear Delivery and Associated Spare Parts, Approved Operation and Maintenance Manuals, and Startup and Training.
- Submittal, equipment fabrication, delivery and testing durations/timelines.
- Regulatory compliance information for the proposed Vendor package.
- A complete listing of the Vendor's U.S. support capabilities, including location of service representatives, location of testing/repair facilities, and a clear indication of where all critical replacement parts specific to the proposed system will be stored, along with lead times.
- General arrangement drawings for the proposed equipment, including equipment weights, dimensions, and lifting points.
- Cutsheets for all ancillary equipment included in Vendor's scope of supply.
- With the RFP response, submit the proposed testing protocol (factory and field).
- A complete list of replaceable / maintenance components within the power generation package. The list shall include the Vendor, whether this equipment is Vendor provided or is a 3rd party item, how the item must be sourced (through the Vendor or third party), and the country of origin.
- A complete listing of O&M requirements for the proposed equipment over an anticipated system life, including expected durations between repairs/replacements, and the costs to the City for repair/replacement services and/or equipment. Clearly indicate which repair must be performed by the Vendor as well as the efforts the City's staff can undertake.
- A complete description of extended warranty and service contract options available, along with costs.
- Submit a written warranty statement for 2- and 5-year warranties. The 2-year warranty shall be considered the base bid and the 5-year warranty shall be considered by the City with an additive cost as an alternate.
- Specific operational elements of the equipment each Vendor feels important for the City to know and evaluate as part of this RFP.
- P&IDs and electrical drawings and requirements for proposed system.
- A description of the proposed controls, including cutsheets as needed to clarify project understanding.
- The Vendor shall provide integration support, as applicable to the proposal approach selected by the Vendor.
- Vendor's response to the RFP shall clarify the controls format/program used within vendor control package. Describe the Vendor's philosophy to allow Owner-access for adjustments to Vendor's program. The Vendor's control strategy and equipment must meet the City's specifications (PLCs, etc.).

Electronic submittals will be held, un-opened, until the time and date noted in the RFP documents or Posted addenda.

To facilitate the evaluation, Offeror shall submit and organize all responses in the same order as listed in Section V. Proposals that are determined to be at a variance with this requirement may not be accepted.

Late proposals will not be accepted. It is the responsibility of the Offeror to ensure that the proposal is received at the City of Greeley's Purchasing Division on or before the proposal due date and time.

SECTION V. RESPONSE FORMAT

The following items are to be included in your proposal, in the order listed. Deviation from this may render your proposal non-responsive.

A. Cover Letter

Include a cover letter introducing your company, summarizing your qualifications, and detailing any exceptions to this RFP (please note that significant exceptions may make your proposal non-responsive). This letter should also provide principal contact information for this RFP, including address, telephone number, fax number, e-mail, and website (if applicable). include primary proposal contact information, Vendor name, parent company (or other affiliations), material/trade name & manufacturer, and years of existence in the marketplace.

B. Use of Subcontractors/Partners

There may be areas for use of subcontractors or partners in this project. If you are utilizing this approach, your proposal must list the subcontractors/partners or third-party providers, their area(s) of expertise, and include all other applicable information herein requested for each subcontractor/partner. Please keep in mind that the City will contract solely with your company, therefore subcontractors/partners remain your sole responsibility.

C. Minimum Mandatory Qualifications

Include an itemized description of how your company meets each of the minimum mandatory qualifications outlined in Section II, C. Failure to meet or exceed these requirements will disqualify your response.

D. Company Information

1. Provide the following information as listed: Company Name, Address, Phone Number, and Names of Principals.

2. Identify the year in which your company was established and began providing the services and equipment contemplated through this RFP.

3. Describe any pending plans to sell or merge your company.

4. Provide a comprehensive listing of all the services and equipment you provide.

E. Evaluation Criteria

Evaluation Criterion #1 – Scope of Services

Provide a detailed Scope of Services that clearly describes all design, materials, components, assembly/installation requirements, recommended spare parts, field services, training, system warranty, as well as options, exclusions, and clarifications. Address, and propose on, any identified alternatives in the specifications.

Evaluation Criterion #2 – Value of Efforts

Provide detailed cost for scope of supply in proposed alternative. If more than one alternative is being proposed, a separate cost for each alternative must be included. Include a breakdown of all costs associated with each major part of the equipment package, long-term operations and maintenance costs, and expected life-span of the equipment and/or duration of services being provided. Evaluation of alternatives will include both initial capital costs, as well as, the long-term operations and maintenance costs.

Provide an itemized firm cost proposal (valid for 90 days) for all: labor, materials, instruments, equipment, spare parts, field service trips, and any other expenses required to complete the proposed Project and Scope of Supply/Equipment Procurement, fully commission the System, and provide training. Freight costs, direct-shipped

FOB to the project site in Greeley, Colorado, are to be included in cost proposal, as applicable to the Approach to the Project and associated alternates.

The Vendor is to include all clarifications and exceptions to the RFP documents with the cost proposal. Provide breakouts for various warranties and additive alternates as requested in the RFP. Finally, Vendor to issue draft version of their Terms and Conditions for review.

Evaluation Criterion #3 – Schedule

Provide a specific timeline or schedule for the equipment procurement. Identify key milestones, showing all performance dates; submittal review, fabrication time, delivery dates; start up and testing durations, etc., on the schedule.

Describe the methods and timeline of communication your firm will use with the City's project manager, other involved City staff, Engineer, and other interested parties.

Evaluation Criterion #4 – Company Qualifications

1. Provide information from at least three accounts of similar scope. Include, at a minimum, the following information:

   1) Company Name, 2) Contact Name, 3) Phone Number, 4) Email Address, 5) Brief description of project scope and value, 6) Status of project.

2. The City reserves the right to contact the references provided in your proposal as well as other references without prior notification to you.

3. List the current number of contracts you have as a company and highlight any overlapping equipment fabrication and deliver timeframes. Discuss how this backlog may affect the City's project and procurement schedule.

4. Provide the names and brief resumes of the personnel that will be the City's prime contacts.

5. List the names of the subcontractors or third-party vendors you expect to use and the services to be provided by these subcontractors.

6. Describe the methods and timeline of communication your firm will use with the City's project manager, other involved City staff, and other interested parties.

7. Provide information on operations and maintenance support both during the project and during future operations after the project has completed. Include, at a minimum, location of staff, expected response time, and support available.

Evaluation Criterion #5 – Product Support and Maintenance

Provide specific information regarding the Vendor's experience and capabilities to support the system after commissioning. Provide a summary of the Vendor's available local, regional, and national resources. Clarify response times and support services, as well as extended service contracts.

F. Proposal Acknowledgement

Include this form as provided in Exhibit 1.

G. Certificate of Insurance

A sample Certificate of Insurance is provided in Exhibit 3.

H. Debarment Form

Include this form as provided in Exhibit 4.

I. Appendices

At Vendor's discretion, provide supplemental and supporting documentation to proposal as required to meet the RFP requirements. Vendor shall provide PDFs of drawings for proposed units and proposed contracts arrangements and agreements.

SECTION VI. EVALUATION AND AWARD

A. Proposal Evaluation

All proposals submitted in response to this RFP will be evaluated by a committee in accordance with the criteria described below. Total scores will be tabulated, and the highest ranked firm will enter into negotiations.

If the City requests presentations by short-listed Offerors, committee members may revise their initial scores based upon additional information and clarification received in this phase. If your company is invited to give a presentation to the committee, these dates may not be flexible.

In preparing responses, offerors should describe in great detail how they propose to meet the specifications as detailed in the previous sections. Specific factors will be applied to proposal information to assist the City in selecting the most qualified Offeror for this contract. The successful Vendor(s) for this solicitation will demonstrate to the City its ability to be cost competitive, deliver equipment according to the designated schedules and according to the specifications with minimal exceptions.

Evaluation Criteria:

1. Scope of Services:…….....25 Points
2. Value of Efforts:……25 Points
3. Schedule:……..15 Points
4. Vendor Qualifications:…….....15 Points
5. Product Support and Maintenance….....25 Points

A presentation and/or demonstration may be requested by short-listed Offerors prior to award. However, a presentation/demonstration may not be required, and therefore, complete information should be submitted with your proposal.

B. Determination of Responsibility of the Offeror

The City of Greeley awards contracts to responsible Vendors only. The City reserves the right to make its Offeror responsibility determination at any time in this RFP process and may not make a responsibility determination for every Offeror.

The City of Greeley's Municipal Code defines a "Responsible Offeror" as one who has "the capability in all respects to perform fully the contract requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance." The City reserves the right to request information as it deems necessary to determine an Offeror's responsibility. If the Offeror fails to supply the requested information, the City shall base the determination of responsibility upon any available information or may find the offeror non-responsible if such failure is unreasonable.

COOPERATIVE PURCHASING STATEMENT

The City of Greeley encourages and participates in cooperative purchasing endeavors undertaken by or on behalf of other governmental jurisdictions. To the extent, other governmental jurisdictions are legally able to participate in cooperative purchasing endeavors; the City of Greeley supports such cooperative activities. Further, it is a specific requirement of this proposal or Request for Proposal that pricing offered herein to the City of Greeley may be offered by the vendor to any other governmental jurisdiction purchasing the same products. The vendor(s) must deal directly with any governmental agency concerning the placement of purchase orders, contractual disputes, invoicing, and payment. The City of Greeley shall not be liable for any costs or damages incurred by any other entity.

EXHIBIT 1
PROPOSAL ACKNOWLEDGEMENT

The offeror hereby acknowledges receipt of addenda numbers _____ through _____.

Falsifying this information is cause to deem your proposal nonresponsive and therefore ineligible for consideration. In addition, falsification of this information is cause to cancel a contract awarded based on one or both of the above preferences.

By signing below, you agree to all terms & conditions in this RFP, except where expressly described in your cover letter.

_____
Original Signature by Authorized Officer/Agent

Type or printed name of person signing	Company Name
Title	Phone Number
Vendor Mailing Address	Website Address
City, State, Zip	Proposal Valid Until (at least for 90 days)
E-Mail Address	

Project Manager:

Name (Printed)	Phone Number
Vendor Mailing Address	Email Address
City, State, Zip	

EXHIBIT 2
SAMPLE CONTRACT

(Incorporated by Reference, See Link Below)

Exhibit 2 - Sample Contract.pdf

EXHIBIT 3
SAMPLE CERTIFICATE OF INSURANCE

Client#: 12170 GRECI

ACORD. **CERTIFICATE OF LIABILITY INSURANCE**

DATE (MM/DD/YYYY): 05/14/2013

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
ABC Insurance Company P. O. Box 1234 Anywhere, USA	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	PRODUCER CUSTOMER ID #:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Sample Certificate	INSURER A : Financial Rating of A	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$1,000,000
	X COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$100,000
	[ ] CLAIMS-MADE [X] OCCUR						MED EXP (Any one person)	$5,000
							PERSONAL & ADV INJURY	$1,000,000
							GENERAL AGGREGATE	$2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$2,000,000
	[ ] POLICY [ ] PRO-JECT [ ] LOC							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	ALL OWNED AUTOS						BODILY INJURY (Per accident)	$
	SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident)	$
	X HIRED AUTOS							$
	X NON-OWNED AUTOS							$
	UMBRELLA LIAB [ ] OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB [ ] CLAIMS-MADE						AGGREGATE	$
	DEDUCTIBLE							$
	RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N						X WC STATU-TORY LIMITS [ ] OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [ ] (Mandatory in NH)	N/A					E.L. EACH ACCIDENT	$100,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$100,000
							E.L. DISEASE - POLICY LIMIT	$500,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

City of Greeley is named as Additional Insured on General Liability. Waiver of subrogation is included on Work Compensation. This insurance is primary and noncontributory to insurance policies held by the City.

CERTIFICATE HOLDER	CANCELLATION
City of Greeley 1000 10th St Greeley, CO 80631-3808	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE

ACORD 25 (2009/09) 1 of 1 The ACORD name and logo are registered marks of ACORD
#S786373/M786364 DSM

EXHIBIT 4
DEBARMENT/SUSPENSION CERTIFICATION STATEMENT

The proposer certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in this transaction by any Federal, State, County, Municipal or any other department or agency thereof. The proposer certifies that it will provide immediate written notice to the City if at any time the proposer learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstance.

DUNS # (Optional) _____

Name of Organization_____

Address_____

Authorized Signature_____

Title_____

Date_____

City of Greeley Colorado

Stantec

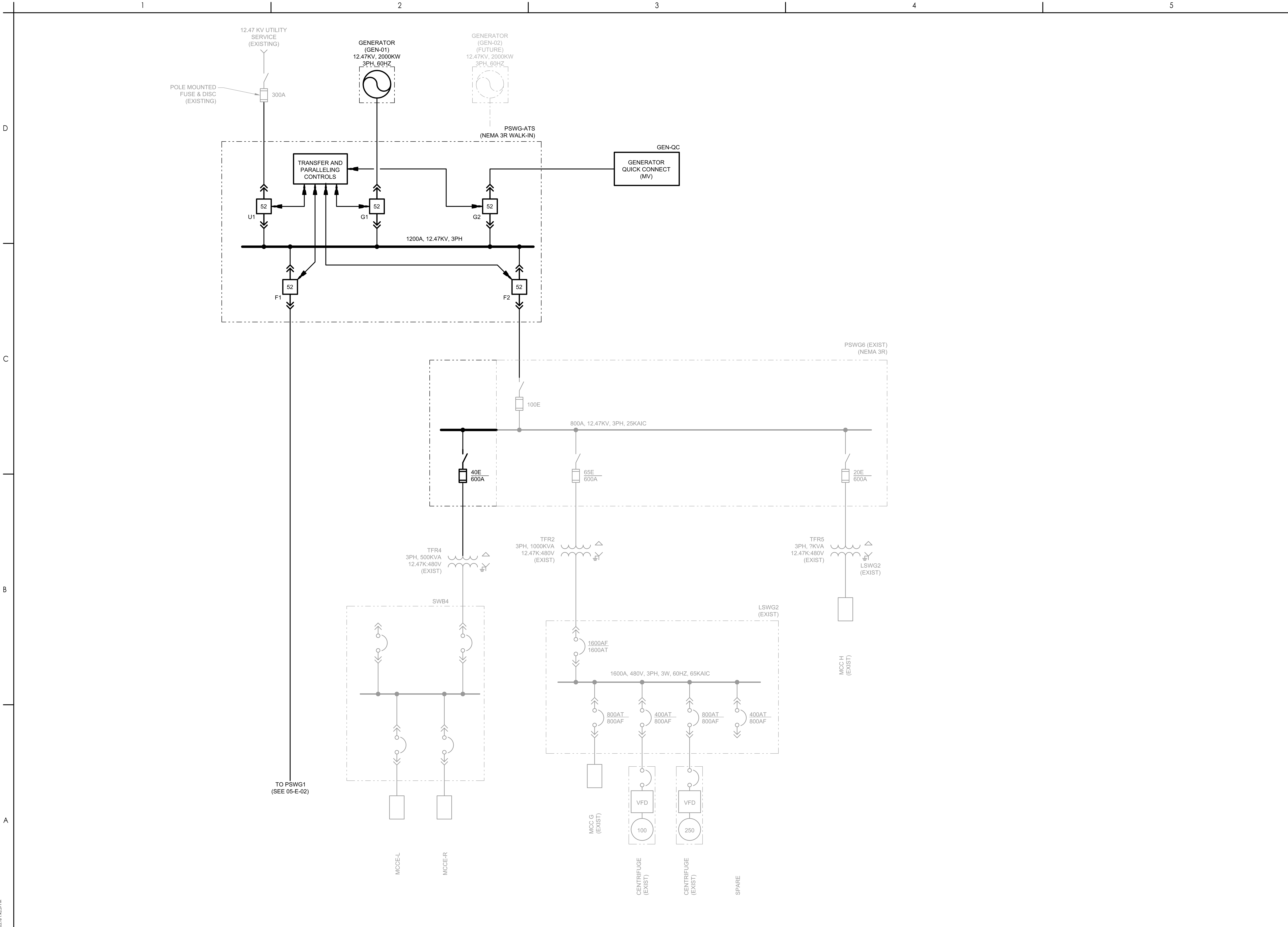
City of Greeley Wastewater Treatment & Reclamation Facility

Primary and Phosphorus Side Stream Treatment Upgrades Project

GENERATOR PROCUREMENT PACKAGE

Project Number: 181301285 2023.05.15

DESIGN DEVELOPMENT
NOT TO BE USED FOR CONSTRUCTION



Stantec
1560 Broadway Suite 1800
Denver, CO 80202
Tel: +1.303.291.2222
www.stantec.com

Consultant

Revision | By | Appd | YYYY.MM.DD

Issued	By	Appd	YYYY.MM.DD
D GENERATOR PROCUREMENT	NRB	SRT	2023.05.15
C PRE-PROCURE NO. 1 DRAFT	NRB	SRT	2023.03.20
B 60% DESIGN DEVELOPMENT	NRB	SRT	2022.12.16
A 30% PRELIMINARY DESIGN	NRB	SRT	2022.06.01

Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION

Not for permits, pricing or other official purposes. This document has not been completed or checked and is for general information or comment only.

City of Greeley Colorado

WTRF Primary and Phosphorus Side Stream Treatment Upgrades

300 East 8th Street
Greeley, Colorado 80631

Project No.: 181301285
File Name: 0128505E-01

Scale: NO SCALE

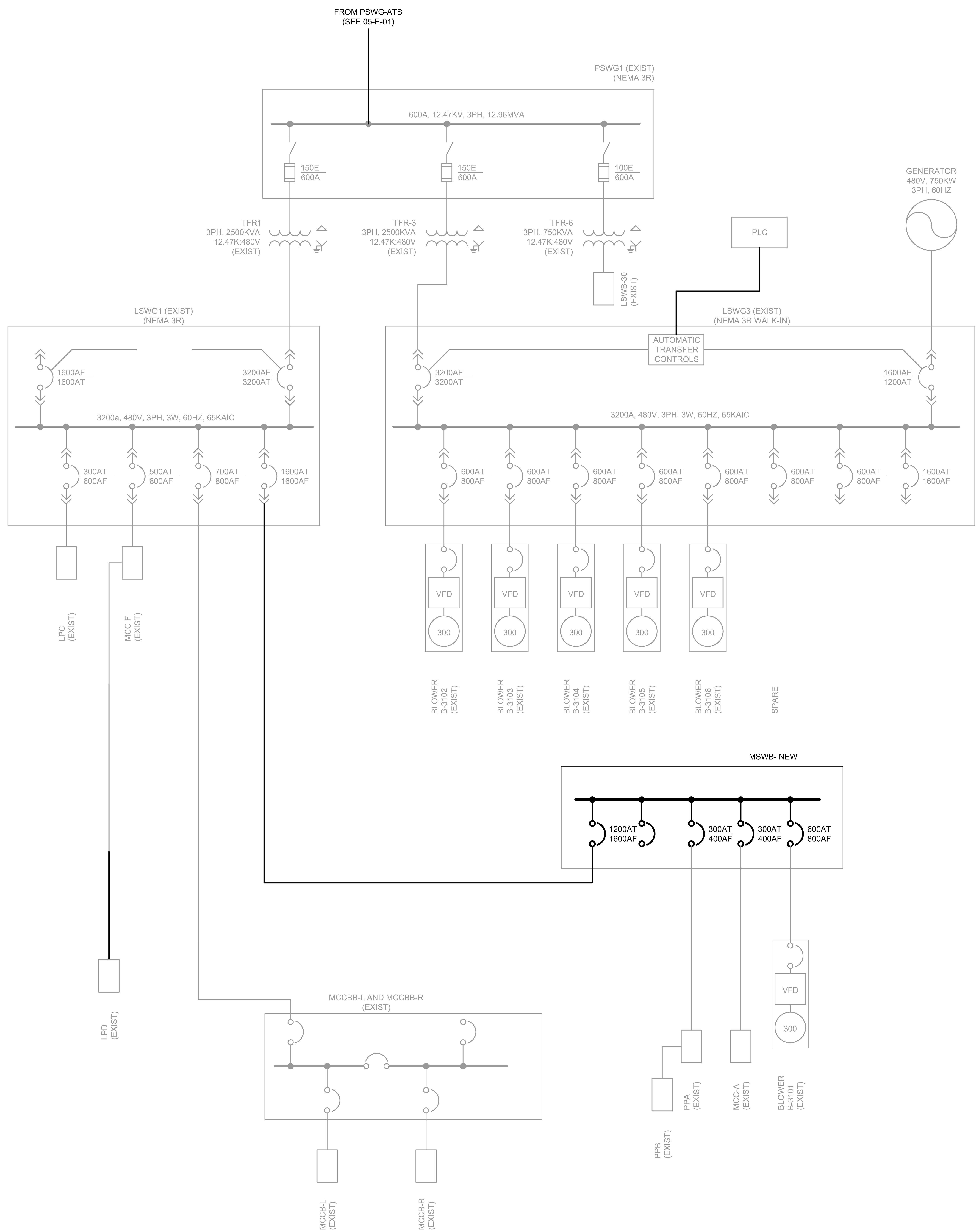
KES	KES		2022.12.16
Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title
SITE AND GROUNDS OVERALL SINGLE LINE DIAGRAM - I

Revision:

Drawing No.
05E-01

ORIGINAL SHEET - ANSI D



c:\pw_working\wtr\keismith\d0345132\0128505e-02
2023.03.16 1:44:09 PM

ORIGINAL SHEET - ANSI D

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Revision

		By	Appd	YYYY.MM.DD

Issued

		By	Appd	YYYY.MM.DD
D	GENERATOR PROCUREMENT	NRB	SRT	2023.05.15
C	PRE-PROCURE NO. 1 DRAFT	NRB	SRT	2023.03.20
B	60% DESIGN DEVELOPMENT	NRB	SRT	2022.12.16
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City of Greeley Colorado

WTRF Primary and Phosphorus Side Stream Treatment Upgrades

300 East 8th Street
Greeley, Colorado 80631

Project No.: 181301285

File Name: 0128505E-02

Scale: NO SCALE

KES	KES		2022.12.16
Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

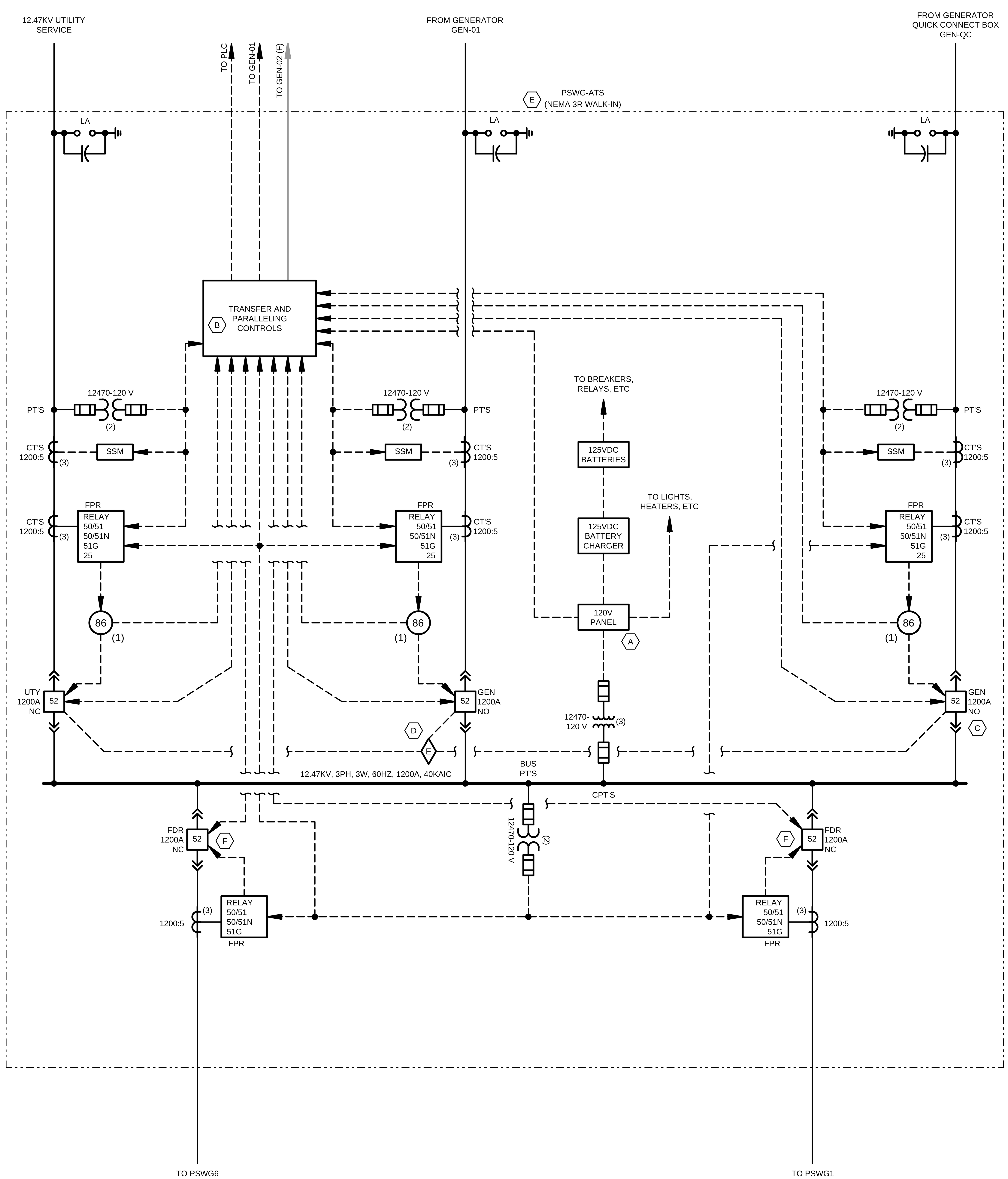
Title

SITE AND GROUNDS OVERALL SINGLE LINE DIAGRAM - II

Revision:

Drawing No.

05E-02



SHEET KEYNOTES

A. PROVIDE A PANELBOARD IN THE SWITCHGEAR ENCLOSURE FOR POWER DISTRIBUTION TO ACCESSORIES (LIGHTS, HEATERS, ETC.) AS NECESSARY.

B. PARALLELING CONTROLS SHALL ALLOW FOR SHORT TIME PARALLEL (LESS THAN 100MSEC) WITH UTILITY ON RETURN OF UTILITY POWER AND TO REMOVE LOAD FROM UTILITY FOR GENERATOR TESTING. PARALLELING OF MULTIPLE GENERATORS WILL BE REQUIRED IN THE FUTURE WHEN THE SECOND GENERATOR IS INSTALLED BUT IS NOT REQUIRED AT THIS TIME. CONTROLLER SHALL BE CAPABLE OF BEING REPROGRAMMED TO PARALLEL MULTIPLE GENERATORS IN THE FUTURE.

C. BREAKER IS INSTALLED FOR CONNECTION OF A TEMPORARY GENERATOR BUT IS NOT TO BE PARALLELED TO UTILITY IF IN USE. ALL CONTROL WIRING FOR FUTURE PARALLELING OF GENERATOR SHALL BE INSTALLED.

D. BREAKERS SHALL BE ELECTRICALLY INTERLOCKED SUCH THAT ONLY ONE (1) OF THE THREE (3) BREAKERS MAY BE CLOSED AT A TIME EXCEPT DURING THE SHORT RETRANSFER OPERATION. THIS SHALL BE CAPABLE OF BEING RECONFIGURED IN THE FUTURE WHEN THE SECOND GENERATOR IS ADDED.

E. CONTROL POWER FOR SWITCHGEAR TO BE PROVIDED BY 125VDC BATTERY SYSTEM PROVIDED AS PART OF THE SWITCHGEAR PACKAGE.

F. CONTROL OF FEEDER BREAKERS IS NOT REQUIRED AT THIS TIME BUT WILL BE REQUIRED WHEN THE SECOND GENERATOR IS ADDED. SWITCHGEAR SHALL BE BUILT WITH THE NECESSARY WIRING BUT THE PROGRAMMING IN THE TRANSFER CONTROLS WILL NOT BE ACTIVATED AT THIS TIME. THE PROGRAMMING SHALL BE EASILY MODIFIED IN THE FUTURE TO INCORPORATE IT.

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Revision

D	GENERATOR PROCUREMENT	NRB	SRT	2023.05.15
C	PRE-PROCUREMENT_1 DRAFT	NRB	SRT	2023.03.20
B	60% DESIGN DEVELOPMENT	NRB	SRT	2022.12.16
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Permit/Seal

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City of Greeley Colorado

WTRF Primary and Phosphorus Side Stream Treatment Upgrades

300 East 8th Street
Greeley, Colorado 80631

Project No.: 181301285

File Name: 0128505E-03

Scale: NO SCALE

KES	KES		2022.12.16
Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title

SITE AND GROUNDS MAIN SWITCHGEAR SINGLE LINE DIAGRAM

Revision:

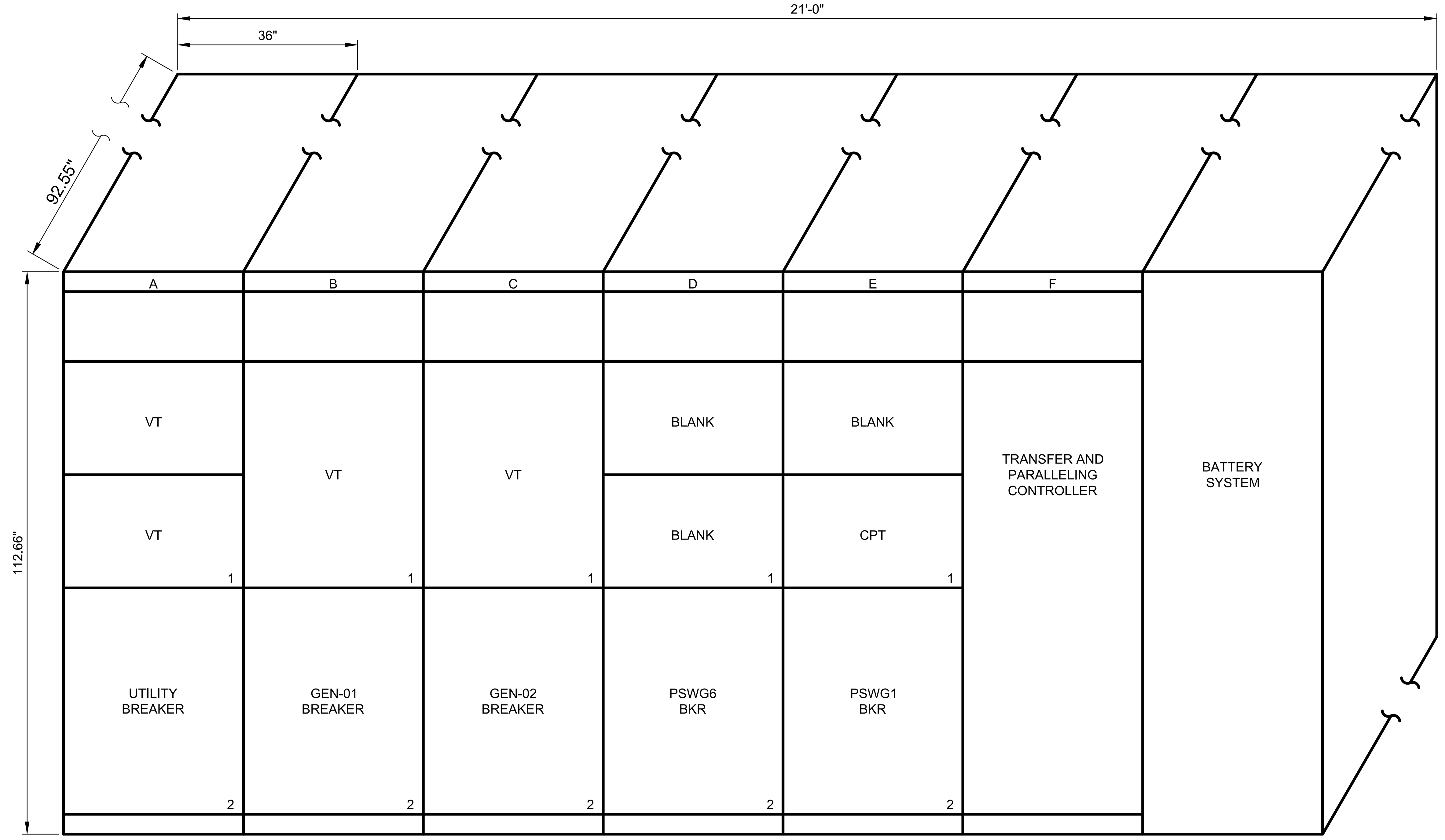
Drawing No.

05E-03

ORIGINAL SHEET - ANSI D

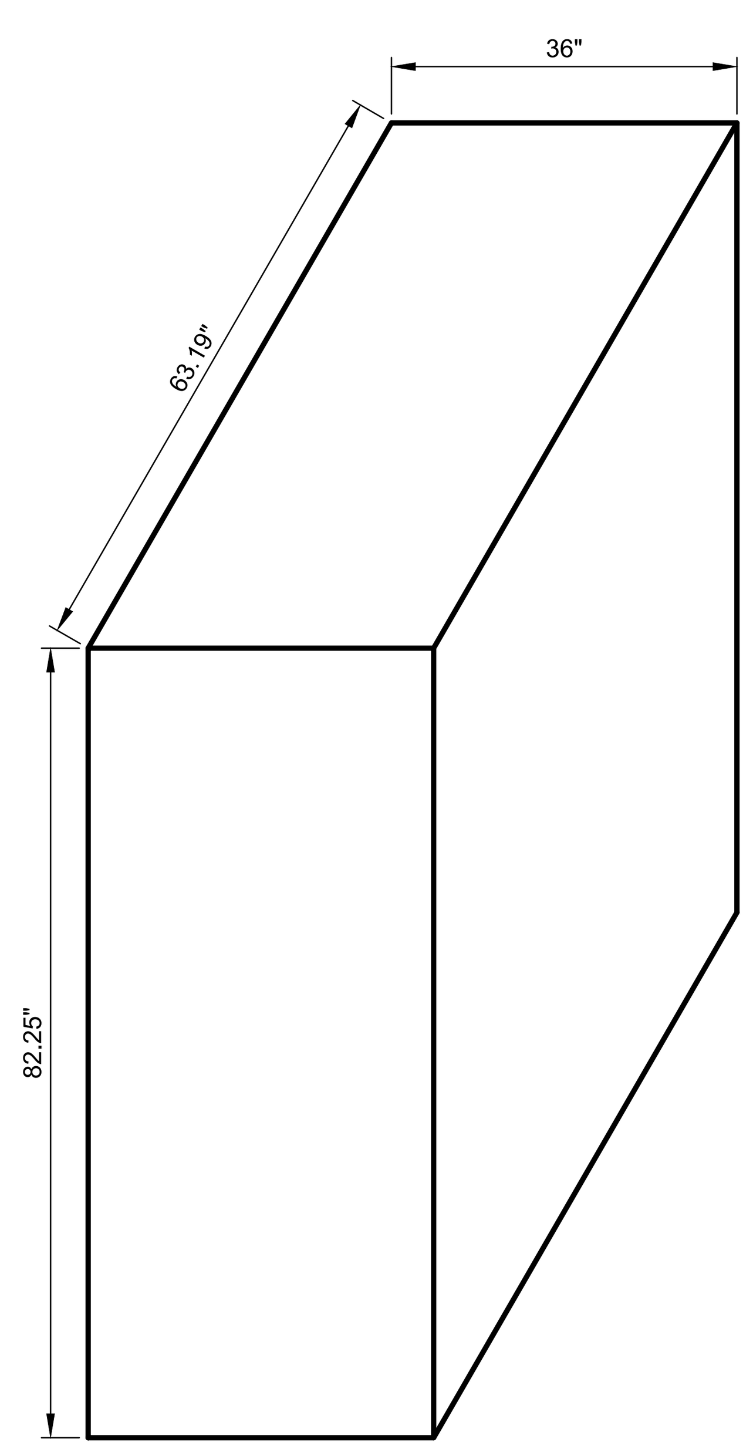
SHEET KEYNOTES

A. ENCLOSURE TO BE KEPT WEATHERPROOF DURING AND AFTER MODIFICATION.



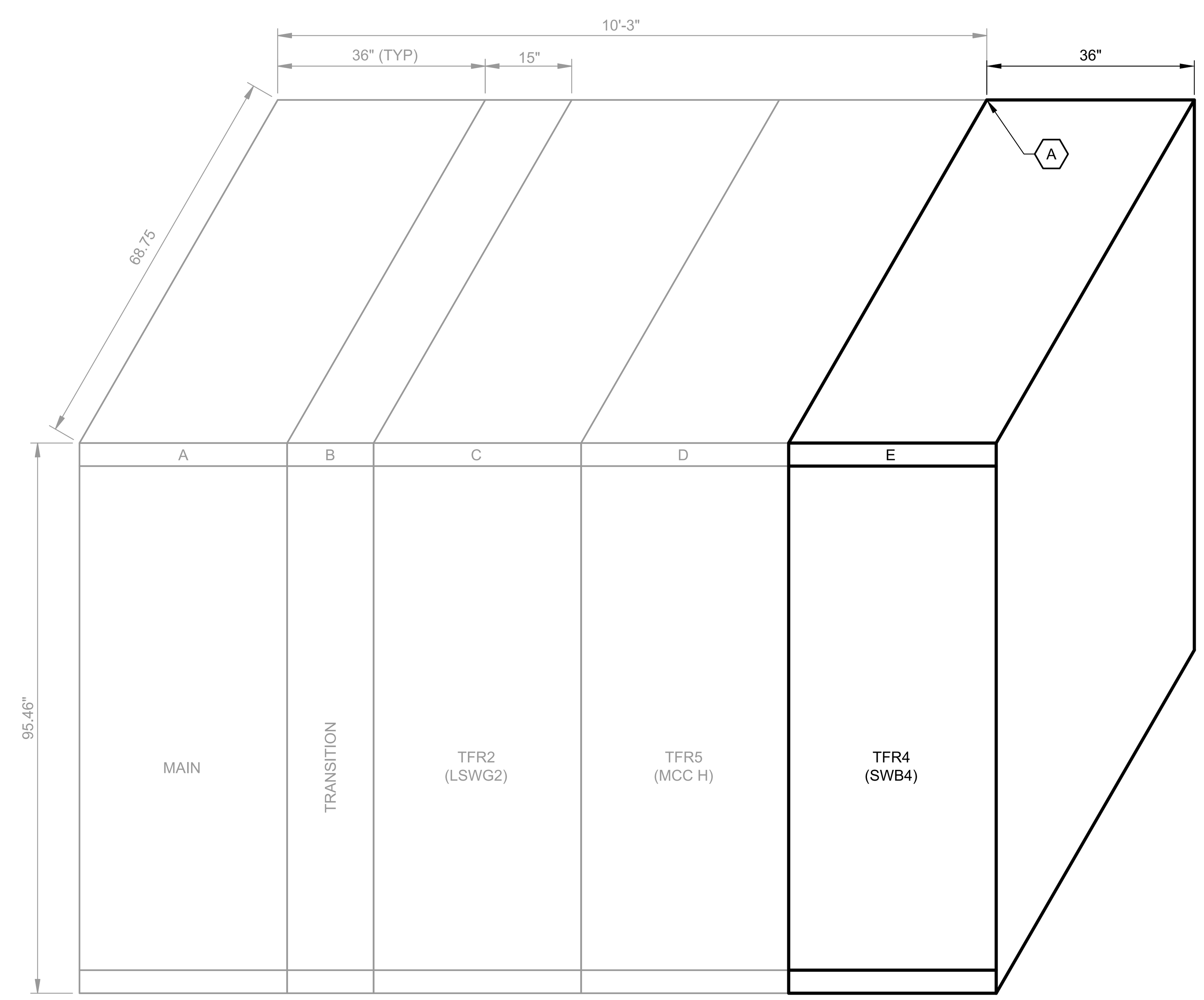
PSWG-ATS

DIMENSIONS SHOWN ARE FOR SWITCHGEAR ONLY.
FINAL DIMENSIONS SHALL BE BASED ON NEMA 3R WALK-IN ENCLOSURE



GEN-QC

DIMENSIONS ARE BE BASED ON APT GLQC SWITCHGEAR



PSWG6 (EXISTING)

EXISTING SWITCHGEAR IS EATON MODEL MVS IN A NEMA 3R ENCLOSURE

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Issued	By	Appd	YYYY.MM.DD
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City of Greeley Colorado

WTRF Primary and Phosphorus Side Stream Treatment Upgrades
300 East 8th Street
Greeley, Colorado 80631

Project No.: 181301285

Scale: NO SCALE

Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
KES	KES		2022.12.16

Title
SITE AND GROUNDS EQUIPMENT ELEVATIONS

Revision:

Drawing No.
05E-04

ORIGINAL SHEET - ANSI D

GENERATOR PROCUREMENT PACKAGE

City of Greeley Wastewater Treatment and Reclamation Facility

Prepared for:

City of Greeley

June 8, 2023

Revision	Description	Author		Quality Check		Approved By	
1.	DRAFT	NB, KS, JV		DR		ST	
2.	PROCURE	NB, KS, JV		DR		ST	

Prepared by _____
(signature)

Authors

Reviewed by _____
(signature)

Reviewer

Approved by _____
(signature)

Approver

SECTION 01 10 00 – GENERATOR SUMMARY OF WORK
(PRE-PROCUREMENT PACKAGE)

PART 1 -- SPECIFICATIONS

The Work to be performed under this contract is described in the specifications listed below.

Section	Title	Standby Generator
01 10 03	Summary of Work - Standby Power Generation	X
01 33 00	Submittal Procedures	X
01 33 17	Structural Design, Support and Anchorage	X
01 45 00	Quality Control	X
01 60 00	Products Materials Equipment and Substitutions	X
01 75 00	Equipment Testing and Plant startup	X
01 78 20	Operation and Maintenance Manuals	X
01 79 00	Owner Staff Training	X
26 00 00	Electric work, General	X
26 05 10	Electric Motors	X
26 11 10	Low Voltage Switchgear	X
26 13 00	Medium Voltage Switching Center	X
26 23 13	Medium Voltage Metal Clad Switchgear	X
26 24 13	Medium Voltage Temporary Generator Quick Connection Switchgear	X
26 32 13	Standby Power Generation	X
46 01 00	Equipment General Provisions	X

PART 2 -- DRAWINGS

2.1 The Work to be performed under this contract is described in the drawings listed below.

ELECTRICAL	
05E-01	SITE AND GROUNDS - OVERALL SINGLE LINE DIAGRAM - I
05E-02	SITE AND GROUNDS - OVERALL SINGLE LINE DIAGRAM - II
05E-03	SITE AND GROUNDS - MAIN SWITCHGEAR SINGLE LINE DIAGRAM
05E-04	SITE AND GROUNDS - EQUIPMENT ELEVATIONS

- END OF SECTION

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SECTION 01 10 03 - SUMMARY OF WORK

STANDBY POWER GENERATION

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The Work to be performed under this Contract involves furnishing an engine driven standby electrical generating system and other items and services as indicated. The Standby Generator will be incorporated into the construction of the refurbishment of the OWNER's (City of Greeley) Wastewater Treatment and Reclamation Facility (WTRF). The SELLER of the standby electrical generating system will be contracted to provide specific Goods and Special Services related to furnishing this equipment. The equipment will be installed under a separate Contract with a CONTRACTOR to be selected by the OWNER. The WORK shall be complete, and all Work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the VENDOR as though originally so indicated, at no increase in cost to the City of Greeley (OWNER).

B. The documents in this package refer to the SELLER, VENDOR, SUPPLIER and MANUFACTURER, often interchangeably. Whether or not the VENDOR is also the MANUFACTURER or SUPPLIER of the equipment, all contractual responsibilities associated with the equipment pre-purchase fall on the VENDOR/MANUFACTURER who prepares and submits a bid and related information as a Bidder in accordance with these Bidding Documents and is contracted with the OWNER. Lower-tier SUPPLIERS, MANUFACTURERS and VENDORS shall provide their equipment and services through the OWNER-contracted VENDOR, and Work shall be coordinated by the VENDOR.

C. Per Part 1.1.E.1, the OWNER, also referred to as the BUYER in some instances, will assign this Work to the CONTRACTOR for procurement and installation. Prior to this assignment, the VENDOR will also be responsible for activities such as shop drawings, submittals and coordination described as being the Contractor's responsibility and will work directly with the OWNER/ENGINEER to complete the Special Services described hereunder.

D. The scope of Work associated with the Goods and Special Services are summarized as follows:

1. City Owned/Contractor Installed Equipment

Through this approach, the Vendor will propose a recommended generator package. The recommended generator package may be supplied directly to the City or the City's assigned CONTRACTOR. The Vendor shall propose to develop submittals and shop drawings to meet the technical specifications and criteria within this RFP; develop a project schedule, fabricate all materials, complete factory testing of equipment, furnish factory acceptance reports, deliver all materials to the site, and complete field acceptance testing. For this delivery approach, the Owner's Contractor will accept all materials at the job site, verify against the stated Bill of Materials, complete all on-site installation, and manage the startup and testing process.

Upon successful startup and testing of equipment, the City will be responsible for Operations and Maintenance of generators. Vendor shall provide a two (2) year, and optional five (5) year warranty for the generator system.

2. Special Services

a. Developing and submitting shop drawings, samples, diagrams and schedules, installation and O&M manuals, etc. for review by OWNER and ENGINEER in accordance with the pre-procurement document requirements.

b. Coordinating and reviewing with the OWNER and ENGINEER the detailed design of the system.

c. Special Services are expected to be accomplished in advance of, and after the OWNER contracting with a contractor and may be provided after the Contract is assigned to the Contractor.

3. Goods

a. Furnish a complete standby electrical generating system in accordance with the Contract Documents.

b. Furnish 15kv switchgear in accordance with the Contract Documents.

c. Furnish a 15kv quick connection switchgear in accordance with the contract documents

d. Contract with Eaton corporation to furnish a new fused switch for the existing 15kv switchgear and a new automatic transfer controller for existing 480v switchgear.

e. Coordinate with the Contractor to assure the systems are constructed and installed correctly.

f. Provide services to test, start-up, and commission the systems.

g. Provide training to the OWNER's staff in the operation and maintenance of the systems.

h. The equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.

i. Submit complete Operation and Maintenance manuals.

j. Provide and perform corrective actions should the systems fail to meet performance requirements.

E. Contracting Conditions

1. The equipment is being pre-procured, and VENDOR will initially contract with the OWNER and provide the Special Services. The Contract will then be assigned to a Contractor who may be responsible for procurement and will be responsible for the installation and startup of the equipment.

The WORK hereunder will be constructed and installed under a Construction Manager at Risk (CMAR). The CMAR Contractor (CONTRACTOR) shall develop and work within a Guaranteed Maximum Price (GMP). Refer to OWNER-provided Division 0 specifications for additional information.

F. Project Summary

1. The project is located at the OWNER's Wastewater Treatment and Reclamation Facility (WTRF), located at 300 East 8th Street, Greeley, CO 80631. The Primary Treatment and Side Stream Phosphorus Removal Project (4P Project) is comprised of separate work packages that include the renovations and new Work in several areas around the plant. The WORK of this 4P Project comprises in-kind replacement and new process improvements to the influent pump station, headworks, grit basins, primary clarifiers, primary sludge pumping building, blower building, digester area, back-up generators and sidestream phosphorous management improvements.

1. The VENDOR shall provide an engine-driven standby electrical generating system, complete and operable, in accordance with the Contract Documents. The supplier of the generator set shall also be the MANUFACTURER of the engine for the generator system. The VENDOR will also be responsible for supplying the Medium Voltage Metal-Clad Switchgear and Medium Voltage Switching Center and a new automatic transfer controller for existing 480v switchgear and shall contract with Eaton to provide this equipment. The VENDOR shall also provide a Medium Voltage Generator Quick Connection Switchgear.

3. Procurement Bidding Documents includes 60% Designs and plans / sections of the proposed Work, including equipment and items provided by others. OWNER and ENGINEER reserve the right to modify the layout as required during design based on VENDOR’s equipment details, process requirements of the project, ancillary system needs, expected spatial requirements for equipment placement and maintenance (including removal), input from CONTRACTOR, and/or as determined by OWNER and ENGINEER to be in the best interest of the project.

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SECTION 013300 - SUBMITTAL PROCEDURES

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Wherever submittals are required by the Contract Documents, the VENDOR/SELLER/MANUFACTURER shall submit them to the ENGINEER/OWNER directly for review and approval while the CONTRACTOR has not yet been engaged. Once the CONTRACTOR is engaged by the OWNER, submittals will be issued to the CONTRACTOR, who will in turn review, comment, and submit the package to the OWNER/ENGINEER for review and approval.

B. Per Section 01 10 00 - Summary of Work VENDOR/SELLER/MANUFACTURER are required to submit items required under Special Services per the project specifications directly to the OWNER/ENGINEER prior to assignment of the contract to the CONTRACTOR. The VENDOR/SELLER/MANUFACTURER contracted with the OWNER has ultimate responsibility for coordinating and submitting submittals required by the contract.

C. Within 14 calendar days after the date of notification of award, MANUFACTURER shall provide:

1. Submittal Schedule

a. Submit a preliminary schedule of Shop Drawings, Samples, and proposed Substitutes ("or equal") submittals listed in the Bid.

b. Base the schedule of submittals on schedule, long-lead items, and size of submittal package.

c. Allow time for resubmittals as needed for OWNER / ENGINEER review.

D. MANUFACTURER submittals shall be posted for OWNER and ENGINEER review to a web-based construction management/filesharing platform. The platform is expected to be Procore, and will be hosted by the OWNER for MANUFACTURER's use.

1.2 SHOP DRAWINGS

A. Wherever called for in the Contract Documents or where required by the ENGINEER, furnish one electronic copy of each Shop Drawing submittal to the web-based project document management system (Procore) as furnished by the OWNER.

B. Shop Drawings may include detail design calculations, shop-prepared drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.

C. Whenever the MANUFACTURER is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in Colorado.

D. Transmittal Form

1. Shop Drawing submittals shall be accompanied by the OWNER's standard submittal transmittal form, a reproducible copy of which is available from the OWNER.

2. A submittal without the form, or where applicable items on the form have not been completed, will be returned for resubmittal.

3. The transmittal form shall include any deviations from the project Contract Documents.

E. Organization

1. Use a single submittal transmittal form for each technical specification Section or item or class of material or equipment for which a submittal is required.

2. A single submittal covering multiple Sections will not be accepted, unless the primary specification references other Sections for components: For example, if a pump Section references other Sections for the motor, shop-applied protective coating, anchor bolts, local control panel, and variable frequency drive, a single submittal would be accepted, whereas a single submittal covering vertical turbine pumps and horizontal split-case pumps would not be accepted.

3. On the transmittal form, index the components of the submittal and insert tabs in the submittal to match the components.

4. Relate the submittal components to specification paragraph and subparagraph, Drawing number, detail number, schedule title, room number, or building name, as applicable.

5. Unless otherwise indicated, match terminology and equipment names and numbers used in the submittals with those used in the Contract Documents.

F. Format

1. Unless specifically required in this specification, by ENGINEER, or elsewhere in the Contract documents, each submittal shall be made in an electronic format.

2. All submittals, unless a sample is included, shall be submitted electronically via the OWNER's web-based submittal system.

3. Number every page in a submittal in sequence.

4. Electronic files which contain more than 10 pages in PDF format shall contain internal book-marking from an index page to major sections of the document. PDF files shall be set to open "Bookmarks and Page" view. General information shall be added to each PDF file, including Title, Subject, Author, and Keywords.

   a. PDF files shall be fully searchable using Adobe Reader™ or Bluebeam® Revu® , unsecured, unencrypted and not password protected.

   b. The following actions within Adobe Acrobat or Bluebeam softward shall be allowed:

1) Printing.

2) Changing.

3) Content copying or extraction.

4) Extraction for Access.

5) Commenting.

6) Fitting for form fields.

7) Signing.

8) Creation of duplicate information.

5. The PDF files shall be set up to print legibly at either 8 ½-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch paper sizes. No other page sizes will be accepted.

6. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with complete pertinent data capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports.

7. Present a sufficient level of detail for assessment of compliance with the Contract Documents.

8. Numbering

   a. Assign to each submittal a unique number.

   b. Number the submittals sequentially, with the submittal numbers clearly noted on the transmittal.

   c. Assign original submittals a numeric submittal number followed by a letter of the alphabet in order to distinguish between the original submittal and each resubmittal: For example, if submittal "25-A" requires a resubmittal, the first resubmittal will bear the designation "25-B" and the second resubmittal will bear the designation "25-C," and so on.

G. Disorganized submittals that do not meet the requirements of the Contract Documents will be returned without review.

H. ENGINEER's Review

1. Except as otherwise indicated, the ENGINEER will return each submittal to the MANFACTURER with comments noted thereon, within 15 Working Days following receipt by the ENGINEER.

2. It is considered reasonable that the MANUFACTURER shall make a complete and acceptable submittal to the ENGINEER by the first resubmittal on an item.

3. Repetitive review:

a. The OWNER reserves the right to withhold monies due to the MANUFACTURER to cover additional costs of the ENGINEER's review beyond the first resubmittal.

4. The ENGINEER'S maximum review period for each submittal or resubmittal will be 15 Working Days; thus, for a submittal that requires 2 resubmittals before it is complete, the maximum review period could be 45 Working Days.

I. If a submittal is returned to the MANUFACTURER marked "NO EXCEPTIONS TAKEN," formal revision and resubmission will not be required.

J. If a submittal is returned marked "MAKE CORRECTIONS NOTED," the MANUFACTURER shall make the corrections on the submittal, but formal revision and resubmission will not be required.

K. Resubmittals

1. If a submittal is returned marked "AMEND-RESUBMIT," the MANUFACTURER shall revise the submittal and resubmit the required number of copies.

2. Resubmittal of portions of multi-page or multi-drawing submittals will not be accepted: For example, if a Shop Drawing submittal consisting of 10 drawings contains one drawing noted as "AMEND-RESUBMIT," the submittal as a whole is deemed "AMEND-RESUBMIT," and 10 drawings are required to be resubmitted.

3. Every change from a submittal to a resubmittal or from a resubmittal to a subsequent resubmittal shall be identified in a cover letter. The cover letter shall indicate a specific, line-item response to each comment from the previous submittal, along with an indication of which page(s) the revised information can be found.

L. Rejected Submittals

1. If a submittal is returned marked "REJECTED-RESUBMIT," it shall mean either that the proposed material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request not submitted in accordance with Section 01 60 00 – Products, Materials, Equipment, and Substitutions.

2. In the first 2 cases, the MANFACTURER shall prepare a new submittal and shall submit the required number of copies.

3. In the latter case, the MANUFACTURER shall submit the substitution request according to the requirements of Section 01 60 00 – Products, Materials, Equipment, and Substitutions.

4. The resubmittal of rejected portions of a previous submittal will not be accepted.

M. The fabrication of an item may commence only after the ENGINEER has reviewed the pertinent submittals and returned copies to the MANUFACTURER marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

N. Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

O. Review by MANUFACTURER (prior to CONTRACTOR being hired by OWNER)

1. Submittals shall be carefully reviewed by an authorized representative of the MANUFACTURER prior to submission to the ENGINEER.

2. Each submittal shall be dated and signed by the MANUFACTURER as being correct and in strict conformance with the Contract Documents.

3. In the case of Shop Drawings, each sheet shall be so dated and signed.

4. Any deviations from the Contract Documents shall be noted on the transmittal sheet.

5. The ENGINEER will only review submittals that have been so verified by the MANUFACTURER.

6. Non-verified submittals will be returned to the MANUFACTURER without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the MANUFACTURER.

P. Review by CONTRACTOR (once CONTRACTOR hired by OWNER)

1. Once the OWNER has hired a CONTRACTOR to install the OWNER-furnished equipment, the MANUFACTURER shall submit documents through the CONTRACTOR. The CONTRACTOR'S requirements for submittals will be as indicated in the bid documents that the CONTRACTOR will receive.

Q. Conformance

1. Corrections or comments made on the MANUFACTURER's Shop Drawings during review shall not relieve the MANUFACTURER from compliance with Contract Drawings and Specifications.

2. A lack of comments made on the MANUFACTURER's Shop Drawings during review shall not relieve the MANUFACTURER from compliance with Contract Drawings and Specifications.

3. Review is for conformance to the design concept and general compliance with the Contract Documents only.

4. The MANUFACTURER shall be responsible for confirming and correlating quantities and dimensions, fabrication processes and techniques, coordinating WORK with the trades, and satisfactory and safe performance of the WORK.

1.3 SAMPLES

A. Quantity

1. The MANUFACTURER shall submit the number of samples indicated by the Specifications, or as needed by ENGINEER or OWNER.

2. Where the quantity of each sample is not indicated, submit such quantity as necessary for proper examination and testing by the methods indicated. A minimum of 2 samples will be necessary.

B. Identification and Distribution

1. Individually and indelibly label or tag each sample, indicating the salient physical characteristics and the manufacturer's name.

2. Upon acceptance by the OWNER, one set of samples will be retained by the ENGINEER, and one set shall remain at the Site in the OWNER's field office until completion of the WORK.

C. Selection

1. Unless otherwise indicated, the OWNER will select colors and textures from the manufacturer's standard colors and standard materials, products, or equipment lines.

2. If certain samples represent non-standard colors, materials, products, or equipment lines that will require an increase in Contract Times or Price, the MANUFACTURER shall clearly state so on the transmittal page of the submittal.

D. The MANUFACTURER shall schedule sample submittals such that:

1. Sample submittals for color and texture selection are complete so the OWNER has 15 Working Days to assemble color panels and select color- and texture-dependent products and materials without delay to the construction schedule; and,

2. After the OWNER selects colors and textures, the MANUFACTURER has sufficient time to provide the products or materials without delay to the construction schedule.

3. The Contract Times will not be extended for the MANUFACTURER's failure to allow enough review and approval or selection time, failure to submit complete samples requiring color or texture selection, or failure to submit complete or approvable samples.

1.4 TECHNICAL MANUAL

A. See Specification 01 78 20 - Operation and Maintenance Manual

1.5 SPARE PARTS LIST

A. General

1. Furnish to the ENGINEER spare parts information for mechanical, electrical, and instrumentation equipment.

2. The spare parts list shall include those spare parts that each manufacturer recommends to be maintained by the OWNER in inventory.

B. Sources and Pricing

1. The spare parts list shall include a current list price of each spare part.

2. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts, to assist the OWNER in ordering.

C. Format

1. Cross-reference the spare parts lists to the equipment numbers designated in the Contract Documents.

2. The spare parts list shall be submitted electronically for review and then electronic and hard copy for final version.

3. The spare parts lists shall be bound in standard-size, 3-ring, loose-leaf, vinyl plastic, hard-cover binders suitable for bookshelf storage.

4. The binder ring size shall not exceed 2-1/2 inches.

1.6 AS-BUILT DRAWINGS (NOT REQUIRED)

1.7 INFORMATIONAL AND QUALITY CONTROL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. MANUFACTURER shall make informational and quality control submittals using a web based construction document management system.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Include the signature of an officer or other individual authorized to sign documents on behalf of that entity for certificates and certifications.

3. Test and Inspection Reports: Comply with requirements specified in Section 01 45 00 – Quality Control.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of engineers, architects, and owners, and other information specified.

C. Qualification data shall be submitted 30 Days prior to delivery of each item to the Site.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents. Submittals shall include ready mix delivery tickets.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

L. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, used for calculations. Include page numbers.

Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for delivery, storage, assembly, installation, start-up, adjustment, and finishing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

R. Installation instructions shall be submitted 30 Days prior to delivery of each item to the Site.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representatives' tests and inspections. Include the following, as applicable:

   1. Statement on condition of substrates and their acceptability for installation of product.

   2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

T. Confined Space Entry Training Certificates: Not required.

U. Fabrication and Installation Drawings: Submit drawings for ENGINEER or OWNER benefit for the limited purpose of assessing conformance with information given and design concept expressed in Contract Documents and for record drawing purposes.

   1. Data indicating inappropriate or unacceptable Work may be subject to action by ENGINEER or OWNER.

V. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, and term of the coverage.

W. The ENGINEER will record the date that a QC submittal was received and review it for compliance with submittal requirements, but the review procedures above for Shop Drawings and samples will not apply.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 33 17 – STRUCTURAL DESIGN, SUPPORT AND ANCHORAGE

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The SELLER/MANUFACTURER shall analyze and design equipment and structures supplied by them in accordance with this section, the 2021 International Building Code (IBC), American Society of Civil Engineers (ASCE) 7-16 and the Contract Documents.

B. The MANUFACTURER shall provide calculations and shop drawings for equipment and structures supplied by them in accordance with this section, the 2021 IBC, ASCE 7-16 and the Contract Documents.

C. The MANUFACTURER shall design and furnish the anchors for installation by the CONTRACTOR.

D. All equipment and structures supplied by the MANUFACTURER shall be anchored in place by methods that satisfy this section, the 2021 IBC, ASCE 7-16 and the Contract Documents. Friction shall not be used to resist sliding due to wind and earthquake loads.

E. Equipment and structures supplied by the MANUFACTURER shall be adequately designed for all applicable static, dynamic, operating, wind and earthquake loads according to this section, the 2021 IBC, ASCE 7-16 and the Contract Documents.

F. Design parameters used to determine wind and earthquake loads shall be as listed in this section.

G. Where a conflict exists between the requirements of the 2021 IBC, ASCE 7-16 and the Contract Documents, the more stringent requirement shall apply.

1.2 REFERENCES

A. 2021 IBC International Building Code

B. ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures

1.3 MANUFACTURER SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Calculations

1. Calculations shall be complete, accurate, and in accordance with the requirements of this section, 2021 IBC, ASCE 7-16 and the Contract Documents, and shall be signed and sealed by a Professional Engineer registered in the State of Colorado.

2. The calculations shall demonstrate a complete lateral and vertical load path, and shall clearly indicate all reactions imposed on the supporting foundation.

3. When computer generated calculations and analyses are included as part (or as the whole) of the calculations, the calculations shall include, but not be limited to, the following: derivations of all input parameters; clear indication of the applicable loads acting on the equipment and structures and reactions imposed on the supporting foundation.

C. Shop Drawings

1. Shop drawings shall include a table listing the reactions imposed on the supporting foundation for each individual nominal load (Dead, Live, Snow, Wind and Earthquake) at each anchor or baseplate.

2. The table shall include the following footnotes:

a. Reactions provided in table are based on nominal loads. Nominal loads refer to Dead (D), Live (L), Snow (S), Wind (W) and Earthquake (E) as determined according to ASCE 7-16. Wind (W) and Earthquake (E) loads are at the Strength Level. Load factors for LRFD Load Combinations have not been applied.

b. The overstrength factor is not included in the Earthquake (E) reactions. The overstrength factor is not required for anchor design of equipment and structures assigned to Seismic Design Category B per ACI 318-19.

c. The reactions include a concurrent vertical earthquake (E) force of $\pm 0.2S_{DS}D$.

d. Refer to the coordinate axes provided on this drawing for direction of X, Y and Z reactions. Z is the vertical axis. Positive Z values represent a compressive reaction. Values for Wind (W) and Earthquake (E) are reversible.

e. Equipment and structures anchorage is designed by the CONTRACTOR according to ACI 318-19 as a Deferred Submittal.

3. Example Reactions Table

	Dead (D) (kip)			Live (L) (kip)			Snow (S) (kip)			Wind (W) (kip)			Earthquake (E) (kip)		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
Anchor 1															
Anchor 2															
Anchor 3															
Anchor 4															

1.4 SEISMIC DESIGN CRITERIA

A. Design Parameters

1. Risk Category: III

2. Seismic Importance Factor, I_e: 1.25.

3. Mapped spectral response acceleration parameter at short period: S_S = 0.15.

4. Mapped spectral response acceleration parameter at 1-second period: S_1 = 0.05.

5. Site Class: D.

6. Design spectral response acceleration parameter at short period: S_{DS} = 0.16.

7. Design spectral response acceleration parameter at 1-second period: S_{D1} = 0.08.

8. Seismic Design Category: B.

9. Long-period transition period: T_L = 4.0 seconds.

10. Response modification coefficient, R: Refer to ASCE 7-16, Tables 15.4-1 and 15.4-2.

11. Overstrength factor, Ω_o: Refer to ASCE 7-16, Tables 15.4-1 and 15.4-2.

12. Component amplification factor, a_p: Refer to ASCE 7-16, Tables 13.5-1 and 13.6-1.

13. Component response modification factor, R_p: Refer to ASCE 7-16, Tables 13.5-1 and 13.6-1.

14. Component overstrength factor, Ω_o: Refer to ASCE 7-16, Tables 13.5-1 and 13.6-1.

15. Component importance factor, I_p:

    a. I_p = 1.00, unless noted otherwise herein.

    b. I_p = 1.50 if any of the following conditions apply:

        1) The component is required to function for life-safety purposes after an earthquake, including fire sprinkler systems and egress stairways.

        2) The component conveys, supports or otherwise contains toxic, highly toxic, or explosive substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released.

1.5 WIND DESIGN CRITERIA

A. Design Parameters

1. Risk Category: III.

2. Basic Design Wind Speed, V: 114 mph.

3. Allowable Stress Design Wind Speed, V_{asd}: 88 mph.

4. Exposure Category: C.

5. Topographic Factor, K_{zt}: 1.0.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 DEFINITION

A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to the performance of the WORK beyond furnishing of manufactured products. However, products supplied and incorporated into the WORK by VENDORS and CONTRACTORS may be subject to inspection and quality control in accordance with this Section and the requirements of other technical sections. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER and/or OWNER at the place of manufacture.

B. The presence of the ENGINEER and/or OWNER at the place of manufacturer, however, shall not relieve the MANUFACTURER of the responsibility for providing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is a duty of the MANUFACTURER, and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.3 SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing will be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will confirm for the OWNER that the quality of the workmanship is in full accord with the Contract Documents.

B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the testing or other quality assurance requirements originally indicated, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the ENGINEER and/or OWNER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER or OWNER to require the removal or correction and reconstruction of any such WORK in accordance with the General Conditions.

1.4 INSPECTION AND TESTING SERVICE

A. Inspection and testing laboratory service shall comply with the following:

1. Unless indicated otherwise by other technical sections, the OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

2. The OWNER or independent firm will perform inspections, tests, and other services as required by the ENGINEER under Paragraph 1.3C above.

3. Reports of testing, regardless of whether the testing was the OWNER'S or the MANUFACTURER's responsibility, will be submitted to the ENGINEER, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

4. The MANUFACTURER shall cooperate with the OWNER or independent firm and furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.

5. The MANUFACTURER shall notify OWNER 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.

6. Retesting required because of non-conformance to requirements shall be performed by the same independent firm on instructions by the ENGINEER. The MANUFACTURER shall bear all costs from such retesting.

7. For samples and tests required for MANUFACTURER's use, the MANUFACTURER shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the MANUFACTURER'S use shall be the MANUFACTURER'S responsibility.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Inspection: The OWNER and MANUFACTURER/CONTRACTOR shall inspect materials or equipment upon arrival on the job site and immediately prior to installation and reject damaged and defective items.

B. Measurements: The MANFACTURER/CONTRACTOR shall verify measurements and dimensions of the WORK as an integral step of starting each installation.

C. MANUFACTURER'S Instructions: Where installations include manufactured products, the CONTRACTOR shall comply with MANUFACTURER'S applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

END OF SECTION

SECTION 01 60 00 - PRODUCTS, MATERIALS, EQUIPMENT, AND SUBSTITUTIONS

(PRE-PROCUREMENT PACKAGE)

PART 1 - GENERAL

1.1 DEFINITIONS

A. The word "Products," as used in the Contract Documents, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from the MANUFACTURER'S stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form WORK. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying, and erection of the WORK.

1.2 QUALITY ASSURANCE

A. Source Limitations: To the greatest extent possible for each unit of WORK, the MANUFACTURER shall provide products, materials, and equipment of a singular generic kind from a single source.

B. Compatibility of Options: Where more than one choice is available as options for MANUFACTURER selection of a product, material, or equipment, the MANUFACTURER shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 PRODUCT DELIVERY AND STORAGE

A. The MANUFACTURER shall deliver the WORK to the WTRF site in Greeley, Colorado under their scope. All freight shall be insured to the WTRF site.

B. The CONTRACTOR shall offload and store the WORK in accordance with MANUFACTURER'S written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

1.4 TRANSPORTATION AND HANDLING

A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.

B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment [including those furnished by OWNER,] by methods to prevent soiling and damage.

C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.5 STORAGE AND PROTECTION

A. Products shall be stored in accordance with MANUFACTURER'S written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.

B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.

C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.

D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.

E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.6 MAINTENANCE OF PRODUCTS IN STORAGE

A. Stored products shall be periodically inspected by the CONTRACTOR on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.

B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.

C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continuously.

D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.

E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.

F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance by the OWNER in accordance with the Contract Documents.

1.7 PROPOSED SUBSTITUTIONS OR "OR-EQUAL" ITEM

A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular manufacturer, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other manufacturers may be accepted if sufficient information is submitted by the MANUFACTURER to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the MANUFACTURER.

2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER's decision shall be final.

3. The ENGINEER may require the MANUFACTURER to furnish additional data about the proposed substitution.

4. The OWNER may require the MANUFACTURER to furnish a special performance guarantee or other surety with respect to any substitution.

5. Acceptance by the ENGINEER of a substitution item proposed by the MANUFACTURER shall not relieve the MANUFACTURER of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.

6. The MANUFACTURER shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.

B. The procedure for review by the ENGINEER will include the following:

1. If the MANUFACTURER wishes to provide a substitution item, the MANUFACTURER shall communicate the proposed substitution to the ENGINEER and OWNER.

2. The MANUFACTURER shall confirm that the proposed substitution meets the requirements stated herein.

3. The ENGINEER will evaluate each proposed substitution within a reasonable period of time. Substitutions that impact the construction schedule shall be deemed rejected if not approved in time to be incorporated into the work without impacting the construction schedule.

4. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER'S acceptance of the proposed substitution.

C. The MANUFACTURER's substitution request shall consider the following:

1. Whether the evaluation and acceptance of the proposed substitution will impact the CONTRACTOR'S achievement of Substantial Completion on time.

2. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.

3. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.

4. Whether all variations of the proposed substitution from the items originally specified are identified.

5. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency that maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

6. Whether an itemized estimate is included of all costs that will result directly or indirectly from acceptance of such substitution, including cost of redesign and claims of other contractors affected by the resulting change.

7. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.

D. Without any increase in cost to the OWNER, the MANUFACTURER shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the MANUFACTURER'S purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the proposed substitution or proposed equipment or material.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 75 00 – EQUIPMENT TESTING AND START-UP

(PRE-PROCUREMENT PACKAGE)

PART 1 - GENERAL

1.1 THE SUMMARY

A. Start-up is prerequisite to satisfactory completion of the contract requirements and shall be completed within the Contract Times.

B. Conduct all test, check out, start-up, and related requirements indicated in the Contract Documents and provide documentation of same to the ENGINEER prior to requesting Substantial Completion from the ENGINEER. Where manufacturer onsite inspections are required before start-up, the manufacturer shall furnish a written statement that the installation and check out is complete and proper and that the item(s) are ready for start-up

C. Start-up of equipment and treatment processes is a highly complex operation requiring the combined expertise of the SELLERS, VENDORS, CONTRACTOR, Subcontractors, the ENGINEER, and the OWNER. The CONTRACTOR shall be responsible for coordinating all parties for a successful start-up: the ENGINEER and OWNER will be available for technical and operational advice prior to and during start-up.

D. General requirements for start-up activities are included in this Section. More specific requirements may also be included in other portions of the Contract Documents.

1.2 DEFINITIONS

A. Start-up is defined as testing, demonstrations, and other activities as required to achieve Substantial Completion. Start-up includes pre-commissioning and commissioning activities, manufacturer's services, certifications of readiness for testing, and troubleshooting, checkout, and shakedown activities.

B. Pre-commissioning is the systematic demonstration through testing and extended operation that major equipment and auxiliary systems, including related components, sub-systems, and systems operate properly and consistent with their intended function. Pre-commissioning involves balancing, adjustments, calibration, loop checks, and loop validation. Pre-commissioning shall simulate shutdown conditions, failure conditions, power fail and restart, bypass conditions, and failure resets. Pre-commissioning will not be considered complete until successful results and documentation of tests and manufacturer's certifications required by the Contract Documents are submitted and accepted by the ENGINEER. Pre-commissioning of all portions of the WORK shall be successfully completed prior to starting Commissioning.

C. Commissioning is the verification that the complete WORK functions on an extended basis in full conformance with the Contract requirements.

1.3 SUBMITTALS

A. Schedule: The schedule for start-up shall be part of the CONTRACTOR's overall construction schedule.

B. Start-up Plan: Not less than 60 Days prior to start-up, submit for review a detailed Start-up Plan. The CONTRACTOR shall revise the Plan as necessary based on review comments. The Plan shall include:

1. Schedules for manufacturers' equipment certifications

2. Schedules for submitting final Technical Manuals,

3. Schedule for training the OWNER's personnel,

4. Description of temporary facilities and schedule for installation and decommissioning them

5. List of OWNER and CONTRACTOR-furnished supplies

6. Detailed schedule of operations to achieve successful pre-commissioning and commissioning.

7. Checklists and data forms for each item of equipment

8. Address coordination with the OWNER's staff.

9. Designate a representative of the CONTRACTOR who has the authority to act in matters relating to start-up and has experience in testing water treatment plants. The Plan shall also designate the roles and responsibilities of any Subcontractors that may be involved in start-up activities.

10. Safety, start-up, and testing procedures and proposed inspection and certification forms and records.

11. Interconnection of new to existing facilities

    a. Date and time frame of proposed shutdown or interconnection, including sequence of events and activities to be conducted.

    b. A detailed description of sequences and activities for the planned shutdown and interconnection.

    c. Staff, equipment, and materials that will be at the Site before commencing the shutdown.

    d. Other provisions so that interconnection, testing, and start-up will be completed within the planned time.

12. Hydrostatic testing of water-holding structures and pipelines and other potable water equipment. Schedule and plan shall indicate source of water, testing and disinfection sequence, disinfection procedures, and the disposal of the water following disinfection.

C. System Outage Requests: Request for shutdown of existing systems as necessary to test or start up new facilities.

D. Records and Documentation

1. Where required by the specifications, submit equipment installation certifications under those Sections.

2. Records of start-up as indicated below.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 MALFUNCTIONS

A. During the extended operational demonstrations, all components, sub-systems, systems, and equipment must properly run continuously 24 hours per day at rates indicated by the ENGINEER throughout the test period. Unless indicated otherwise, if any item fails or malfunctions during the test, the item shall be repaired and the test restarted at time zero with no credit given for the operating time before the failure or malfunction. Malfunctions satisfying all 3 of the following conditions will allow the demonstration period to resume at the elapsed time when the malfunction started:

1. Malfunction did not cause any interruption of the continuous operation of any other components, sub-systems, systems, and equipment.

2. Malfunction was corrected without causing or requiring any components, sub-systems, systems, and equipment to cease operations.

3. Malfunction was corrected within one hour of the time the malfunction was detected (the one hour period includes the time required to locate the cause of the malfunction, beginning upon CONTRACTOR's notification from the ENGINEER that a malfunction has occurred and ending when the item is corrected and the system is successfully placed back into operation).

B. The CONTRACTOR shall arrange for manufacturer's representatives to visit the Site as often as necessary to correct malfunctions.

3.2 PREREQUISITES

A. Pre-commissioning and commissioning activities shall be scheduled in the overall project schedule. The 7 Day demonstrations and the 8 Day demonstration shall start prior to midday on a Monday, Tuesday, or Wednesday. Testing periods shall not include holidays, based on the OWNER's calendar.

B. The following shall be completed before pre-commissioning begins.

1. All Technical Manual information required by the Contract Documents has been submitted.

2. Safety equipment, emergency shower and eyewash units, fire extinguishers, gas detectors, protective guards and shields, emergency repair kits, safety chains, handrails, gratings, safety signs, and valve and piping identification required by the Contract Documents are provided. Devices and equipment shall be fully functional, adjusted, and tested.

3. Manufacturer's certifications of proper installation have been accepted.

4. Leakage tests, electrical tests, and adjustments have been completed.

5. The ENGINEER and OWNER has approved the Start-up Plan.

6. Temporary facilities are functional, adjusted, and ready for use.

7. Individual instrumentation loops (analog, status, alarm, and control) have been verified functionally.

8. Pressure switches, flow switches, timing relays, level switches, vibration switches, temperature switches, RTD monitors, pressure regulating valves, and other control devices to the settings determined by the ENGINEER or the equipment manufacturer have been adjusted for accuracy.

9. Individual interlocks between the field-mounted control devices and the motor control circuits, control circuits of variable-speed controllers, and packaged system controls have been verified.

3.3 GENERAL

A. Supplies

1. The CONTRACTOR shall furnish:

a. Fuel

b. Oil and grease

c. Other necessary materials not listed for the OWNER to furnish

2. The OWNER will furnish:

a. 2W Water

b. Electrical Power

c. Chemicals, including anti-foam and magnesium chloride

B. Start-up Records: The CONTRACTOR shall maintain the following during testing and start-up and submit originals to ENGINEER:

1. Lubrication and service records for each mechanical and electrical equipment item

2. Hours of daily operation for each mechanical and electrical equipment item

3. Equipment alignment and vibration measurement records

4. Logs of electrical measurements and tests

5. Instrumentation calibration and testing logs

6. Testing and validation of SCADA inputs, outputs, logic functions, status indications, and alarms

7. Factory and field equipment settings

8. Log of problems encountered and remedial action taken

9. Other records, logs, and checklists as required by the Contract Documents

3.4 PRE-COMMISSIONING

A. Pre-Commissioning testing shall include all specified installation and functional testing required by the individual component, device, and equipment specification sections and this section.

B. Furnish the ENGINEER and OWNER at least 15 Days written notice confirming the start of pre-commissioning. The ENGINEER and OWNER's staff will observe pre-commissioning.

C. Installation Testing: The CONTRACTOR shall perform component, device, and equipment installation tests including:

1. Electrical devices and sub-systems: As specified in Section 26 01 26 – Electrical Tests and the individual equipment Sections, the CONTRACTOR shall:

a. Perform insulation resistance tests on wiring except 120-volt lighting, wiring, and control wiring inside electrical panels.

b. Perform continuity tests on grounding systems.

c. Check motors for actual full load amperage draw. Compare to nameplate value.

2. Instrumentation devices and sub-systems: As specified in the individual equipment Sections and Section 40 91 00 Process Control and Instrumentation Systems, the CONTRACTOR shall:

a. Bench or field calibrate instruments and make required adjustments and control point settings.

b. Leak test pneumatic controls and instrument air piping.

c. Energize transmitting and control signal systems, verify proper operation, ranges, and settings.

d. Perform inactive network testing.

e. Perform site/campus fiber network testing.

f. Perform loop testing.

D. Pre-Commissioning Testing: The CONTRACTOR shall:

1. Perform checkout and functional testing as specified in the individual equipment Sections.

2. Functionally test mechanical and electrical equipment, and instrumentation and controls systems for proper operation after installation testing tasks have been completed.

3. Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration. Perform initial checks in the presence of and with the assistance of the manufacturer's representative.

4. Demonstrate that equipment is effectively communicating with each other.

5. Conduct continuous 8-hour test under full load conditions for each pump and for each sludge removal mechanism. Replace parts which operate improperly.

E. Instrumentation and Cotnrols Functional Testing: The CONTRACTOR shall:

1. Demonstrate proper operation of each instrument loop function including alarms, local and remote controls, instrumentation, and other equipment functions. Generate signals with test equipment to simulate operating conditions in each control mode.

F. CERTIFICATE OF PROPER INSTALLATION

1. At completion of Functional Testing, the CONTRACTOR shall furnish comprehensive certified test record documentation, prepared and signed by manufacturer's authorized representative, by the electrical and/or instrumentation subcontractor certifying the following for all components, devices, equipment, sub-systems, systems, facilities, controls, and processes:

a. Has been properly installed, adjusted, aligned, and lubricated.

b. Is free of any stresses imposed by connecting piping or anchor bolts.

c. Is suitable for satisfactory full-time operation under full load conditions.

d. Operates within the allowable limits for vibration.

e. Motor control logic that resides in motor control centers, control panels, and circuit boards furnished by the electrical and/or instrumentation subcontractor has been fully configured and tested and is properly operating.

f. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.

g. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning. Note: this is limited to local controls only (i.e. – communicating with the PLC but independent of the PLC programming).

h. A Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by the equipment manufacturer's representative.

i. Other sign-off sheets will be furnished by the ENGINEER prior to initiation of Functional Testing.

j. The certified test records shall include documentation of all pre-commissioning and commissioning activities and tests, studies, compliance certificates, and other records required by the specifications.

3.5 COMMISSIONING

A. Upon approval of the ENGINEER's commissioning testing and pre-start-up activities, the CONTRACTOR shall prepare the site for and perform facility start-up testing that includes the following:

1. The CONTRACTOR shall be responsible for installing any temporary piping, valves, pumps, and any other appurtenances (including electrical) that will be required for the start-up and performance testing of the facility. The detailed plan will be developed during Construction. All temporary facilities shall be removed completely at the end of the project.

2. Process area start-ups: where possible and beneficial to reduce complexity and risk of complete facility testing, start-up individual process areas comprised of multiple interdependent systems. Process area test flows will be limited by upstream and downstream process constraints (i.e., tank and basin volumes) and/or localized recirculation capabilities.

3. System testing with water – no treatment: test entire facility with recirculating water supply at the design flow for the largest single process or system train to ensure proper complete facility (devices, components, equipment, and controls) hydraulic performance.

4. Perform to the extent possible control testing and control loop tuning during system testing with water, control testing, interlock and permissive testing, etc.

5. The PROGRAMMER will be performing similar tests during this time period, with cooperation by the CONTRACTOR.

6. The PROGRAMMER, with support from the CONTRACTOR shall demonstrate the manual and automatic modes of operation to verify proper control sequences, software interlocks, proper operation of software logic and controllers, etc. System testing shall include the use of water or other process media, as applicable, to simulate the actual conditions of operation.

7. Systems testing activities shall follow the detailed procedures and checklists in the Testing and Start-up Plan. Completion of systems shall be documented by a report.

8. The CONTRACTOR shall demonstrate utility, chemical feed, safety equipment, and other support systems before whole process systems.

B. Upon completion of start-up testing, the CONTRACTOR shall perform entire facility start-up resulting in treatment of raw water delivered from the raw water conveyance system. The PROGRAMMER will complete remaining control loop tuning and interlock permissive testing during this phase of start-up.

C. The CONTRACTOR shall conduct remaining equipment, sub-system, and system performance tests as specified that could not be performed during the commissioning phase due to inter system and/or treatment process dependencies.

3.6 PERFORMANCE TESTING

A. After approved completion of start-up and operator training, the CONTRACTOR shall conduct performance test of the entire new facility. Demonstrate satisfactory operation of equipment and systems in actual operation to meet contract specified performance requirements. The CONTRACTOR shall work with the OWNER to start up the plant and allow the OWNER to operate it without malfunction for a continuous 7 Day, 24 hour/day period, or a timeframe agreed to by the OWNER. The ENGINEER will determine the operational parameters.

B. The CONTRACTOR shall conduct performance test for 8 working days that may be non-continuous. The test shall conclude when all components, devices, equipment, sub-systems, systems, facilities, controls, and processes are demonstrated to be able to properly operate, without shutdown or loss of service, for the entire continuous test period.

1. The test shall be initiated only on Tuesday, Wednesday or Thursday, unless written permission to initiate the test on other days is provided by the OWNER.

C. OWNER will provide operations personnel for duration of test.

D. Furnish the ENGINEER and OWNER at least 10 Days written notice confirming the start of performance testing.

E. The CONTRACTOR shall immediately correct defects in material, workmanship, or equipment which became evident during performance testing. Where failure occurs with any single item, the test shall be stopped, repairs implemented, and the test shall then resume as determined by the OWNER.

1. Where defect or failure occurs with a component which is immediately replaced with an installed standby unit, the test may continue uninterrupted if repair of the failed unit is accomplished within 24 hours. If repair is not accomplished within 24 hours, the Performance Test will be halted and the unit will be repaired. The OWNER will then determine if the test period shall be resumed or restarted from the beginning without credit for previous successful test days.

2. Where defect or failure occurs with a component which not immediately replaced with an installed standby unit, the test may continue uninterrupted if repair of the failed unit is accomplished within 8 hours. If repair is not accomplished within 8 hours, the Performance Test will be halted and the unit will be repaired. The OWNER will then determine if the test period shall be resumed or restarted from the beginning without credit for previous successful test days.

F. The CONTRACTOR shall repeat performance test when malfunctions or deficiencies cause shutdown or partial operation of the facility or results in performance that is less than specified.

G. After individual equipment items and sub-systems have been tested and certified as required by the Technical Specifications, tests of systems comprised of single or multiple equipment items with appurtenant equipment and instruments and controls shall be conducted. Items of equipment shall be tested as part of a system to the maximum extent possible.

H. Subject to the malfunction criteria above, each system shall be demonstrated for a continuous, 7 Day, 24 hour/day period. If any system malfunctions, the item or equipment shall be repaired and the test restarted at time zero with no credit given for the elapsed time before the malfunction.

I. Defects that appear shall be promptly corrected. Time lost for wiring corrections, control point settings, or other reasons that interrupt the test may, at the judgment of the OWNER, be cause for extending the demonstration an equal amount of time.

J. Commissioning shall not begin until leakage tests, instrumentation tests and adjustments, electrical tests and adjustments, equipment field tests, disinfection, and system tests have been completed to the satisfaction of the OWNER.

K. The OWNER will furnish certified treatment plant operators during the start-up period to comply with CDPHE requirements.

L. During Performance Testing, the CONTRACTOR shall:

1. Lubricate and maintain equipment in accordance with the manufacturers' recommendations.

2. Clean or replace strainers, screens, and filter elements.

END OF SECTION

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SECTION 01 78 20 – OPERATION AND MAINTENANCE MANUALS

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 GENERAL

A. Operation and maintenance (O&M) Manuals shall be provided in accordance with Section 01 33 00 –Submittal Procedures, and as required in the technical specifications of the Contract Documents. O&M information shall be provided for each maintainable piece of equipment, equipment assembly or subassembly, and material provided or modified under this Contract.

1. All operations and maintenance manuals must be written in English.

2. Each O&M manual shall include a list of the P&ID tags that are covered by the manual. A single manual submittal may cover multiple items as long as they share common product-specific options, wiring, service and features. If the options, wiring, service or features differ between equipment from the same manufacturer, the options or features shall be clearly marked in the O&M manual with the associated P&ID tag.

3. O&M manual shall reflect the MANUFACTURER's recommendations and requirements.

4. O&M information shall contain the names, addresses, and telephone numbers of the manufacturer, the nearest authorized representative of the manufacturer, and the nearest supplier of the manufacturer's equipment and parts.

5. O&M instructions must be submitted and accepted at least 30 days before on-Site training may start.

B. It is expected that the OWNER will have hired the CONTRACTOR by the time installation and O&M manuals are ready for submission for OWNER/ENGINEER review and approval. The language in this specification assumes the O&M manuals will be submitted through the CONTRACTOR; however, if the OWNER has not yet engaged a CONTRACTOR and these documents are ready, the MANUFACTURER shall submit the documents directly to the OWNER/ENGINEER for review through the web-based document management system (Procore).

C. MANUFACTURER shall provide preliminary O&M Manuals to the CONTRACTOR for submission to the OWNER after the equipment submittal has been reviewed and accepted by the ENGINEER and before the equipment has arrived at the Site.

D. MANUFACTURER shall provide final O&M Manuals after the preliminary manual has been reviewed and comments provided by the ENGINEER and no less than 30 calendar days prior to conducting on-Site training for the equipment.

E. ENGINEER'S review shall be in accordance with Section 01 33 00 –Submittal Procedures.

1.2 MANUFACTURER SUBMITTALS

A. O&M manuals, information, and data shall be transmitted in accordance with Section 01 33 00 – Submittal Procedures accompanied by a transmittal form. The transmittal form shall be used as a checklist to ensure the manual is complete. Only complete sets of O&M instructions will be reviewed for acceptance. O&M manuals shall be reviewed and approved in accordance with Section 01 33 00 – Submittal Procedures. Submissions found requiring corrections or to be incomplete shall be returned to the MANUFACTURER for correction and re-submission. All submitted and approved O&M manuals shall be retained by the ENGINEER.

1. All O&M Manuals shall be submitted in electronic Adobe / Bluebeam PDF format for Windows in accordance with the OWNER's web-based document management system (Procore). Electronic files shall also conform to the following requirements:

a. File formats shall be in Adobe PDF file format latest version. Alternate electronic formats may be acceptable, as determined by the ENGINEER.

b. Each PDF document or alternate format shall be searchable. Scanned documents are not acceptable.

c. Pages within the PDF must be formatted to standard letter (8 ½ x 11) portrait for text and/or ledger (11 x 17) landscape for drawings.

d. Include a copy of the PDF O&M Manual contained in one PDF file containing the entire O&M manual in one file. All chapters, sections and drawings must be bookmarked. Bookmarks shall include a logical description of the chapter or section or the title and number of a drawing.

e. Font color shall be black. Font sizes for text based documents shall be no less than 10 pt. and no greater than 14 pt. for general text and no less than 12 pt. and no greater than 18 pt. for headers.

f. File names shall be in English, clearly convey the information contained within the file, and must not exceed 100 characters in length. Only standard abbreviations may be used in file names.

g. File names shall contain no spaces, shall not exceed 50 characters, shall have only alphanumeric characters, and shall not contain symbols such as: ` ! @ # $ % ^ & *( ) - = + < > ? / \ | . , ~ ‘ “ ; { [}].

h. All information provided electronically shall be consistent with information provided in paper format. Do not add content to an electronic submittal that is not also in the paper submittal.

i. Files shall not be password protected.

j. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the P&ID tag, as it appears in the Contract Documents.

k. If manufacturers' standard brochures and manuals are used to describe O&M procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 GENERAL

A. Each manual shall include at a minimum separate chapters or sections describing operating instructions, preventative maintenance, corrective maintenance, troubleshooting, drawings, wiring diagrams, copies of field test results, warranty information, spare parts, training information and any other information required to operate and maintain a piece of equipment, equipment assembly, subassembly, or material, organized as follows.

B. Chapter 1 - Summary: The MANUFACTURER shall supply an Equipment Summary Form for each item of mechanical, electrical, and instrumentation equipment in the WORK. The Equipment Summary Form shall indicate the equipment name, specification section, equipment tag number, and process area in which the equipment is installed.

C. Chapter 2 - Operating Instructions and Procedures: Required operating instructions including specific manufacturer instructions, procedures, and illustrations shall be provided. This shall include, but not be limited to, subsections organized in the following sequence:

1. P&ID and any other equipment tag numbers.

2. Nameplate data of equipment installed.

3. Manufacturer's operation instructions including

a. installation,

b. adjustment,

c. calibration,

d. start-up,

e. break-in,

f. normal operating instructions and sequences,

g. load changes,

h. troubleshooting,

i. testing to determine performance efficiency

j. disassembly and re-assembly,

k. re-alignment, and

l. shut down.

m. Provide a control sequence and diagrams for each of these operations. These will explain function, normal operating characteristics, limiting conditions and operation and control of systems and specific equipment.

4. Emergency Operations: Provide emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.

5. Performance curves, engineering data, and test results.

6. Summer, winter, and special operating instructions.

7. Sequence of operations and as-installed control diagrams by controls manufacturer with composite wiring diagrams.

8. Operating instructions for microprocessors or other programmable devices.

9. Routine procedures for troubleshooting, and testing to determine performance efficiency.

10. Servicing and lubrication schedule and list of required fuel, air, oil, plant air, and HVAC filter replacement schedules including commercial number of each.

11. Safety Precautions: List personnel hazards for equipment and list safety precautions for all operating conditions.

12. Operator Re-start: Provide requirements to set up and prepare each system for use.

13. Operator Services Requirement: Provide instructions for services to be performed by the operator such as lubrication, adjustments, and inspection.

14. Tabulation of proper settings for pressure relief valves, low and high pressure switches, and other protection devices.

15. List of all electrical relay settings including alarm and contact settings

16. Environmental Conditions: Provide a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

D. Chapter 3 - Preventative Maintenance: The following information shall be provided for preventive and scheduled maintenance to minimize corrective maintenance and repair:

1. Lubrication Data: Provide lubrication data, other than instructions for lubrication and provide the following information:

   a. A table showing recommended lubricants for specific temperature ranges and applications.

   b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants (e.g. SAE grade), and capacities.

   c. A lubrication schedule showing service interval frequency.

2. Preventive Maintenance Plan and Schedule: Provide manufacturer's schedule for routine preventive maintenance, inspections, tests, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventive maintenance man-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft, and including activities such as removal and re-installation.

E. Chapter 4 - Corrective Maintenance: Manufacturer's recommendations shall be provided on procedures and instructions for correcting problems and making repairs.

1. Troubleshooting Guides and Diagnostic Techniques: Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or requires replacement.

2. Wiring Diagrams and Control Diagrams: Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job-specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type identically to actual installation numbering.

3. Maintenance and Repair Procedures: Provide instructions and list tools required to restore product or equipment to proper condition or operating standards.

4. Removal and Replacement Instructions: Provide step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings, and adjustments required. Instructions shall include a combination of tests and illustrations.

5. Spare Parts and Supply Lists: Provide lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. List spare parts and supplies that have a long lead time to obtain.

a. Include manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.

b. Cross-sectional or exploded view drawings shall accompany the parts list. Part numbers shall appear on the drawings with arrows to the corresponding part.

6. Corrective Maintenance Man-hours: Provide manufacturer's projection of corrective maintenance man-hours including craft requirements by type of craft. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.

F. Chapter 5 – Parts List

1. Parts List: Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Addresses and telephone numbers of the nearest supplier and parts warehouses shall be included.

2. Drawings: Cross-sectional or exploded view drawings shall accompany the parts list. Part numbers shall appear on the drawings with arrows to the corresponding part. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.

G. Appendices: The following information shall be provided; include information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment.

1. Personnel Training Requirements: Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly.

2. Testing Equipment and Special Tool Information: Provide information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components as required in Section 01 79 00 – Owner Staff Training and the Technical Specifications.

3. Programming and Software: Copies of all MANUFACTURER-furnished programming and software, including vendor-supplied controllers.

4. Warranty provisions, affidavits, and certificates required by the Contract Documents.

H. Field Changes: Following the acceptable installation and operation of an equipment item, the item's instructions and procedures shall be modified and supplemented by the CONTRACTOR to reflect any field changes or information requiring field data.

- END OF SECTION -

SECTION 01 79 00 - OWNER STAFF TRAINING

(PRE-PROCUREMENT PACKAGE)

PART 1 - GENERAL

1.1 THE SUMMARY

A. The VENDOR shall furnish all labor, materials, equipment, and incidentals necessary to train OWNER's personnel on the equipment, products, and systems furnished under this Contract. OWNER training is a prerequisite to satisfactory completion of the Contract requirements and shall be completed within the Contract Time.

B. The minimum onsite training requirements for various plant components are described in various sections of the specifications.

C. All training shall be videotaped for reference by OWNER staff that aren't able to attend the onsite training.

D. Except where otherwise indicated, all costs for training shall be the responsibility of the VENDOR.

1.2 SUBMITTALS

A. Training Schedule: Schedule for training the OWNER's personnel shall be submitted with the detailed Testing and Startup Plan required by Section 017500 – Equipment Testing and Plant Startup and shall be coordinated with the CONTRACTOR.

B. Resumes of instructors.

C. The training lesson plan and materials shall be submitted to the OWNER/ENGINEER for review not less than 3 weeks prior to the provision of training

D. Approved operation and maintenance manuals shall be available at least 30 days prior to the scheduled date for the individual training session.

E. Training classes shall be scheduled a minimum of four (4) weeks in advance of the date of the first class to allow OWNER staffing arrangements to take place. The CONTRACTOR shall schedule training classes to be coordinated with the availability of the OWNER staff designated to attend the meeting.

F. Training classes shall be organized in conjunction with the Startup Systems, as defined in Section 017500 – Testing and Plant Startup. Each training class shall consist of a classroom portion and a field tour portion. Each training class shall include:

1. Equipment and process safety overview.

2. Overview of the system, conducted by the VENDOR/CONTRACTOR.

3. Training on each item of equipment within the startup system, conducted by the Equipment Manufacturer's representative.

4. Training on the mechanical piping system within the startup system, conducted by the VENDOR/CONTRACTOR'S mechanical superintendent.

5. Training on the power distribution system within the startup system, conducted by the VENDOR/CONTRACTOR'S electrical superintendent.

6. Training on the instrumentation and control systems within the startup system, conducted by the VENDOR'S/CONTRACTOR's I&C System Supplier.

7. Training on the control system within the startup system, conducted by the VENDOR/CONTRACTOR.

G. Class Agenda: A class agenda shall be prepared by the CONTRACTOR and submitted to the OWNER/ENGINEER with the training schedule. The agenda shall include a listing of subjects to be discussed, time estimated for each subject, a list of documentation to be used and provided to support training, the proposed route of the field tours, and the instructor(s) name and qualifications. Agendas shall include an allocation of time for all components of the training session, including time for OWNER staff to ask questions and discuss the subject matter. The OWNER may request that particular subjects are emphasized and the agenda shall be adjusted to accommodate these requests. Copies of the agenda shall be distributed to each student at the beginning of each training class.

H. Within ten (10) days after the completion of each training session, the CONTRACTOR shall submit the following:

1. A sign-in sheet of all personnel that attended the training session.

2. A copy of the training materials utilized during the lesson with all notes, diagrams, and comments.

3. A flash drive containing the above information and a video of the training.

1.3 INSTRUCTOR QUALIFICATIONS

A. Instructors shall be completely knowledgeable in the products and systems for which they are providing training, and shall be experienced in conducting classes. Sales representatives are not considered qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction on the actual equipment and processes installed on the project.

B. Instructor shall have at least two years of experience in providing training certified by the Manufacturer.

C. If, in the opinion of the OWNER, the instructor did not provide the scheduled training, such training shall be rescheduled and repeated with a suitable instructor at the CONTRACTOR's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Where specified, the VENDOR/CONTRACTOR shall conduct training sessions for the OWNER's personnel to instruct the staff on the proper operation, care, and maintenance of the equipment and systems installed under this Contract.

2.2 LOCATION

A. Training sessions shall take place at a location agreed to by the OWNER, except for field training on the actual equipment which shall occur at the Project Site.

2.3 FORMAT AND CONTENT

A. Each training session shall be comprised of time spent both in the classroom and at the specific location of the subject equipment or system. As a minimum, the training session shall cover the following subjects for each item of equipment or system:

1. Familiarization

a. Review catalog, parts lists, drawings, etc., which have been previously provided for the OWNER's files and operation and maintenance manuals.

b. Inspection on how the equipment has been installed. Demonstrate the operation of the unit and describe how all parts of the equipment meet the requirement of the Specifications.

c. Answer questions.

2. Safety

a. Using the material previously provided, review the safety features of the equipment.

b. Discuss proper precautions when working around equipment.

3. Operation

a. Using material previously provided, review reference literature.

b. Explain all modes of operation (including emergency).

c. Check out OWNER's personnel on the proper use of the equipment.

4. Preventive Maintenance

a. Using material previously provided, review preventive maintenance (PM) lists, including:

1) Reference material.

2) Daily, weekly, monthly, quarterly, semiannual, and annual PM activities.

b. Demonstrate how to perform Preventive Maintenance procedures.

c. Demonstrate to the OWNER's personnel what to look for as indicators of potential equipment problems.

5. Corrective Maintenance

a. Identify possible problems.

b. Demonstrate how to perform repairs. Point out special problems.

c. Open up equipment and demonstrate O & M procedures, where practical.

6. Parts

a. Demonstrate the use of previously provided parts list and order parts.

b. Check over spare parts on hand. Make recommendations regarding additional parts that should be available.

7. Local Representatives

a. Identify local vendors where to order parts: name, address, telephone.

b. Service problems:

1) Identify local or regional contacts.

2) Identify emergency contacts.

8. Operation and Maintenance Manuals

a. Review any other material submitted.

b. Update material, as required based on questions during the training. Provide supplemental material needed by OWNER as identified during the training sessions.

PART 3 - EXECUTION

3.1 GENERAL

A. The objective of the training included under this Section shall be to convey the knowledge needed by the OWNER operations, maintenance, and engineering staff to safely operate, maintain, and repair the equipment and systems furnished under this CONTRACT.

B. OWNER personnel who will participate in this training have existing full-time work assignments and this training is an additional assigned work task. OWNER's staff work schedules, regularly shift as the plant is operated on an around-the-clock basis. Scheduling shall take OWNER staff availability in mind, and multiple sessions may need to be scheduled in order to accommodate all OWNER staff.

C. Training shall be tailored to suit the skills and job classifications of the personnel attending the classes, e.g., plant manager, plant operator, maintenance technical, electrician, etc.

D. Minimum onsite training requirements for plant components are described in various sections of the Specifications. For the purpose of the times given in individual Specification sections, a workday is defined as an eight (8) hour day at the site, excluding travel time.

E. Training shall be scheduled as a separate trip from equipment inspection, startup, and field adjustment. Training shall not be done until the Manufacturer certifies that the equipment is operable as specified.

F. Specific Training Objectives: The training shall include a review of the equipment and drives, including internal parts, as prepared at the factory. The training shall include safety, removal, inspection, cleaning, operation and maintenance of the equipment such as startup, normal operation and shutdown procedures, step-by-step troubleshooting procedures with all necessary test equipment, and emergency or abnormal operation procedures. Training shall include preventive maintenance and long-term maintenance procedures, special tools necessary, and a discussion of recommended spare parts.

3.2 TRAINING CLASSES

A. Number of Classes on Each Subject: A minimum of two (2) classes on identical subject matter shall be conducted, unless otherwise indicated. The purpose of having two (2) classes on each subject is to accommodate the attendance of as many OWNER personnel working different shifts as possible.

B. A maximum of one (1) class per day shall be held on consecutive days unless otherwise approved by the OWNER. Multiple classes may be scheduled if the class duration is shorter than four (4) hours. Times shall be scheduled at the discretion of the OWNER.

C. Class Length: Each class shall be subdivided into two (2) to six (6) hour modules, or as appropriate for the subject matter being discussed.

D. Number of Students: It is estimated that five (5) to ten (10) persons will attend each training class. The OWNER will determine the actual number of students. Provide training materials for all attendees.

E. Cancellation of Classes: If a class must be canceled because the equipment is not ready for operation, etc. the VENDOR/CONTRACTOR shall notify the OWNER at least one (1) week in advance. The VENDOR/CONTRACTOR shall coordinate with the OWNER to reschedule the training.

3.3 TRAINING AIDS

A. Training Aids: Each instructor is encouraged to use audio-visual devices, P&IDs, models, charts, etc. to increase the transfer of knowledge. The CONTRACTOR shall provide all such equipment (televisions, videocassette recorder/player, projectors, screens, easels, models, charts, etc.) for each class. It shall be the responsibility of the CONTRACTOR to confirm in advance that the training room set-up will be appropriate for the types of audio-visual equipment to be employed.

B. Classroom Documentation: If training is being completed on equipment, systems, or products for which an Operations and Maintenance Manual is required, the draft Operations and Maintenance Manual shall have been returned by the ENGINEER with a status of "No Exceptions Taken" or "Make Corrections Noted" before the training class is scheduled. The approved draft Operations and Maintenance Manual shall be used during classroom instruction. Supplemental documentation handouts shall be provided by the organization conducting the training as required to support instruction.

3.4 DOCUMENTATION OF TRAINING

A. The CONTRACTOR shall videotape the entire detailed training course in proper operation and maintenance and provide the video in a digital format. The video shall be organized by each segment of the training session and be presented in a table of contents style with selectable segments of the session. The video shall become the exclusive property of the OWNER. The OWNER reserves the right to video record, photograph, audio record, and otherwise document any or all training classes provided under this WORK.

B. The following services shall be provided for each item of equipment or system as required in individual specification sections. Additional services shall be provided, where specifically required in individual specification sections.

1. As a minimum, classroom equipment training for operations personnel will include:

a. Identify and discuss safety items and procedures.

b. Using slides and drawings, discuss the equipment's specific location in the plant and an operational overview.

c. Purpose and plant function of the equipment.

d. A working knowledge of the operating theory of the equipment.

e. Start-up, shutdown, normal operation, and emergency operating procedures, including a discussion on system integration and electrical interlocks, if any.

f. Routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.

g. Operator detection, without test instruments, of specific equipment trouble symptoms.

h. Required equipment exercise procedures and intervals.

i. Routine disassembly and assembly of equipment if applicable (as judged by the OWNER on a case-by-case basis) for purposes such as operator inspection of equipment.

2. As a minimum, hands-on equipment training for operations personnel will include:

a. Identify and review safety items and perform safety procedures.

b. Identify location of equipment and review the purpose.

c. Identifying piping and flow options.

d. Identifying valves and their purpose.

e. Identifying instrumentation:

f. Location of primary element.

g. Location of instrument readout.

h. Discuss purpose, basic operation, calibration, maintenance, troubleshooting, repair, and information interpretation.

i. Discuss, demonstrate, and perform standard operating procedures and round checks.

j. Discuss and perform preventative maintenance activities.

k. Discuss and perform start-up and shutdown procedures.

l. Perform the required equipment exercise procedures.

m. Perform routine disassembly and assembly of equipment if applicable.

3. Classroom equipment training for the maintenance and repair personnel will include:

a. Safety procedures.

b. Theory of operation.

c. Description and function of equipment.

d. Start-up and shutdown procedures.

e. Normal and major repair procedures.

f. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.

g. Routine and long-term calibration procedures.

h. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.

i. Hands-on equipment training for maintenance and repair personnel shall include:

1) Locate and identify equipment components.

2) Review the equipment function and theory of operation.

3) Review normal repair procedures.

4) Perform start-up and shutdown procedures.

5) Review and perform the safety procedures.

6) Perform OWNER-approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.

END OF SECTION

SECTION 26 00 00 – ELECTRICAL WORK, GENERAL

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide the electrical WORK, complete and operable, as indicated in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all Sections in Division 26, except as otherwise indicated.

C. The WORK of this Section is required for operation of electrically-driven equipment provided under Specifications in other Divisions.

D. The MANUFACTURER's attention is directed to the requirement for proper coordination of the WORK of this Section with the WORK of equipment Specifications, the WORK of instrumentation Sections, and the WORK of Section 26 05 10 – Electric Motors.

E. Equipment supports and foundations shall be in conformance with the requirements of Section 46 01 00 – Equipment General Provisions.

1.2 REFERENCE STANDARDS

NEC (NFPA 70)	National Electrical Code: 2020 Edition
NETA	International Electrical Testing Association
NEMA 250	Enclosure for Electrical Equipment (1000 Volts Maximum)

A. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL) or an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction.

B. Installation of electrical equipment and materials shall comply with OSHA Safety and Health Standards (29 CFR 1910 and 29 CFR 1926, as applicable), state building standards, and applicable local codes and regulations.

C. Where the requirements of the specifications conflict with UL, NEMA, NFPA, or other applicable standards, the more stringent requirements shall govern.

1.3 REFERENCE SPECIFICATIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

C. Section 26 00 00 – Electrical Work, General

D. Section 46 01 00 – Equipment General Provisions

1.4 SIGNAGE AND MARKINGS

A. Identification

1. Provide danger, caution, and warning signs and equipment identification markings in accordance with applicable federal, state, OSHA, and NEC requirements.

B. Warning Signs

1. 600 Volts Nominal, or Less

a. Mark entrances to rooms and other guarded locations that contain live parts with conspicuous signs prohibiting unqualified persons from entering.

2. Greater than 600 Volts

a. Buildings, rooms, or enclosures containing exposed live parts or exposed conductors operating at greater than 600 volts nominal shall be lockable.

b. Provide permanent and conspicuous warning signs reading as follows: DANGER – HIGH VOLTAGE – KEEP OUT.

3. Outside Branch Circuits and Feeders over 600 Volts

a. Post warning signs in plain view where unauthorized persons might come in contact with live parts: WARNING – HIGH VOLTAGE – KEEP OUT.

C. Isolating Switches

1. Provide isolating switches not interlocked with an approved circuit-interrupting device with a sign warning against opening them under load.

1.5 MANUFACTURER's SUBMITTALS

A. General

1. Furnish submittals in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

2. Custom-prepare Shop Drawings.

3. Drawings or data indicating "optional" or "as required" equipment will not be accepted.

4. Cross out options not proposed or delete from the Shop Drawings.

B. Shop Drawings: Include the following:

1. Complete material lists stating the manufacturer and brand name of each item or class of material.

2. Shop Drawings for grounding WORK not specifically indicated

3. front, side, rear elevations, and top views with dimensional data

4. location of conduit entrances and access plates

5. component data

6. connection diagrams, terminal numbers, internal wiring diagrams, conductor size, and cable numbers

7. method of anchoring, seismic requirements, weight

8. types of materials and finish

9. nameplates

10. temperature limitations, as applicable

11. voltage requirement, phase, and current, as applicable

12. front and rear access requirements

13. test reports

14. grounding requirements

C. Catalog Cuts

1. Submit catalog cuts or photocopies of applicable pages of bulletins or brochures for mass-produced, non-custom manufactured material.

2. Stamp the catalog data sheets in order to indicate the Project name, applicable Specifications Section and Paragraph, model number, and options.

D. Materials and Equipment Schedules

1. Within 30 Days of the commencement date in the Notice to Proceed, deliver to the ENGINEER a complete list of materials, equipment, apparatus, and fixtures that are proposed for use.

2. Include in the list the type, size, name of manufacturers, catalog number, and such other information as required to identify the item.

E. Technical Manuals

1. Submit complete information in accordance with the requirements of Section 01 33 00 –Submittal Procedures.

1.6 AREA DESIGNATIONS

A. General

1. Designations for electrical WORK specifically indicated in other Sections shall comply with the requirements of those Sections unless indicated otherwise.

2. Designations for other electrical WORK not included in the above Paragraphs shall be as follows:

AREA	NEMA ENCLOSURE CLASSIFICATION						
	1	3R	7	4X	9	12	Notes
10 - Influent Pump Station				X			
11 - Headworks			X				
12 – Grit Basins				X			
20 – Primary Clarifiers				X			
25 – Primary Building							
Electrical Room						X	Gasketed
Pump Room				X			
31 – Blower Building							
Electrical Room						X	Gasketed
Blower Room				X			
60 – Digester Building				X			
63 - Phosphorous				X			

3. Designations for electrical WORK not included in the above Paragraphs shall be NEMA 4X.

4. Installations in hazardous locations shall conform strictly to the requirements of the indicated Class, Group, and Division.

B. Material Requirements

1. Construct NEMA 4X enclosures of Type 316 stainless steel.

2. Do not coat NEMA 4X enclosures.

3. Construct NEMA 7 enclosures of cast aluminum.

4. Do not coat NEMA 7 and 9 enclosures.

5. Construct NEMA 1, 3R, and 12 enclosures of steel, and prime and coat with ANSI 61 light grey paint.

1.7 EQUIPMENT WARRANTY

A. The electrical equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.

1.8 TESTS

A. The MANUFACTURER shall be responsible for factory and field tests indicated in Division 26, as required by the ENGINEER, and as required by other authorities having jurisdiction.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Provide equipment and materials that are new and are the products of experienced and reputable manufacturers in the industry.

B. Provide equipment and materials listed by UL and bearing the UL label, where UL requirements apply.

C. Provide similar items in the WORK as products of the same manufacturer.

D. Provide equipment and materials of industrial grade standard of construction.

E. Where a NEMA enclosure type is indicated in a non-hazardous location, use that type of enclosure despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.

F. On devices indicated to display dates, display the year as 4 digits.

G. Temperature Ratings of Equipment Terminations

1. Provide terminations and lugs rated for use with 75-degree C conductors.

2.2 ELECTRICAL IDENTIFICATION

A. Nameplates

1. Fabricate nameplates from white-letter, black-face laminated plastic engraving stock, such as **Formica Type ES-1** or equal.

2. Securely fasten each nameplate, using fasteners constructed of brass, cadmium-plated steel, or stainless steel, and screwed into inserts or tapped holes as required.

3. Provide engraved characters of the block style, with no characters smaller than 1/8 inch top to bottom.

PART 3 -- EXECUTION

3.1 GENERAL

A. Incidentals

1. Provide materials and incidentals required for a complete and operable system, even if not required explicitly by the Contract Documents.

2. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

B. EQUIPMENT ANCHORING

C. MANUFACTURER is responsible for providing design forces/loads as indicated in Section 01 33 17 – Structural Design, Support, and Anchorage and submitting per Section 01 33 00 – Submittal Procedures. The CONTRACTOR shall design, furnish and install all anchors.

D. MANUFACTURER's Recommendations

1. Anchoring methods and leveling criteria in the printed recommendations of the equipment MANUFACTURER'S are a part of the WORK of this Contract.

2. Submit such recommendations and design loads in Shop Drawings as indicated.

3.2 EQUIPMENT IDENTIFICATION

A. Provide nameplates for panelboards, control and instrumentation panels, starters, switches, and pushbutton stations.

B. Identify control devices within enclosures as indicated and similar to the subparagraph above.

C. Use equipment names and tag numbers, where indicated, on nameplates.

D. Terminal Blocks

1. Label termination points on terminal blocks by identifiers on the blocks.

2. Provide identifiers that have been preprinted by the terminal manufacturer or custom-printed.

3. Hand-lettered markers will not be accepted.

END OF SECTION

SECTION 26 05 10 - ELECTRIC MOTORS

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. General: The MANUFACTURER shall provide electric motors, accessories, and appurtenances complete and operable, in conformance to the Contract Documents.

B. The provisions of this Section apply to low voltage 3 phase, AC squirrel cage induction motors throughout the Contract Documents, except as indicated otherwise.

C. The MANUFACTURER is responsible for selecting suitable electric motors for the equipment. The choice of motor manufacturer shall be subject to review by the ENGINEER. Such review will consider future availability of replacement parts and compatibility with driven equipment

1.2 REFERENCE SPECIFICATIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 33 17 – Structural Design, Support and Anchorage

C. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

D. Section 26 00 00 – Electrical Work, General

E. Section 46 01 00 – Equipment General Provisions

1.3 MANUFACTURER SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Complete motor data shall be submitted with the driven machinery Shop Drawings. Motor data shall include:

1. Machine name and specification number of driven machine

2. Motor manufacturer

3. Motor type or model and dimension drawing. Include motor weight.

4. Nominal horsepower

5. NEMA design

6. Enclosure

7. Frame size

8. Winding insulation class and temperature rise class

9. Voltage, phase, and frequency ratings

10. Service factor

11. Full load current at rated horsepower for application voltage

12. Full load speed

13. Guaranteed minimum full load efficiency. Also nominal efficiencies at 1/2 and 3/4 load.

14. Type of thermal protection or overtemperature protection, where included

15. Wiring diagram for devices such as motor leak detection, temperature, or zero speed switches, as applicable

16. Bearing data. Include recommendation for lubricants of relubricatable type bearings.

17. If utilized with a variable frequency controller, verify motor is inverter duty type. Include minimum speed at which motor may be operated for the driven machinery. Provide shaft grounding details and information. Provide insulated bearing details and information.

18. Power factor at 1/2, 3/4 and full load.

19. Recommended size for power factor correction capacitors to improve power factor to 0.95 percent lagging when operated at full load.

C. If water cooling is required for motor thrust bearings, the Shop Drawing submittals shall indicate this requirement.

1.4 EQUIPMENT WARRANTY

A. The electrical equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Electric motors driving identical machines shall be identical.

B. Maximum motor loading shall be equal to nameplate horsepower rating or less, exclusive of service factor and be verifiable from the submittal data of the driven machinery.

C. Motor Capacity

1. The MANUFACTURER shall size motors for the larger of the following criteria:

a. Size motors to continuously carry the maximum load that develops across the full range of driven equipment operation.

b. Size motors for the minimum size indicated

2. In every case, motor size shall be derated from nameplate values as follows:

a. Ambient Temperature

1) For ambient temperatures up to but not exceeding 40 degrees C, no derating is required.

2) For ambient temperatures exceeding 40 degrees but less than 50 degrees C, derate nameplate HP ratings to 85 percent.

b. Site Altitude: The City of Greeley is located at 4,576 ft above mean sea level. Derating factors shall be as indicated below:

Altitude	Derating Factor
3,300 to 5,000 ft	97 percent

3. Increased circuit breaker, magnetic starter, and conductor and conduit capacities required for motors larger than the indicated sizes shall be provided as part of the WORK.

D. Exempt Motors: Motors for valve operators, submersible pumps, or motors which are an integral part of standard manufactured equipment, i.e., non-NEMA mounting, common shaft with driven element, or part of domestic or commercial use apparatus may be excepted from these requirements to the extent that such variation reflects a necessary condition of motor service or a requirement of the driven equipment.

2.2 DESIGN REQUIREMENTS

A. General: Electric motors shall comply with NEMA MG-1 - Motor and Generator. Motors used with adjustable frequency drives shall comply with NEMA MG-1, Part 31, and shall be clearly identified as “Inverter Duty.”

B. NEMA Design: Electric motors shall be NEMA Design B unless otherwise indicated. In no case shall starting torque or breakdown torque be less than the value in NEMA MG 1. Motors shall be suitable for the indicated starting method.

C. Motor Voltage Ratings: Low voltage motors shall have voltage ratings in accordance with the following, unless otherwise indicated:

1. Motors below 1/2 HP shall be rated 115 volts, single phase, 60 Hz. Dual voltage motors rated 115/230 volts, 115/208 volts, or 120-240 volts are acceptable, provided leads are brought out to the conduit box.

2. Motors 1/2 HP and larger shall be rated 460 volts, 3 phase, 60 Hz. Dual voltage motors rated 230/460 volts or 208/230/460 volts are acceptable, provided every lead is brought out to the conduit box.

D. Insulation: Three phase motors shall be provided with Class F insulation, rated to operate at a maximum ambient temperature of 40 degrees C and at the altitudes where the motors will be installed and operated, without exceeding Class B temperature rise limits stated in NEMA MG 1-12.44. Single phase motors shall have Class F insulation with temperature rise not to exceed the insulation class. Motors to be operated from adjustable frequency drives shall be provided with insulation systems to withstand 1600 volt spikes, with dV/dT as defined in NEMA MG 1-31. The adjustable frequency drive manufacturer shall coordinate with the motor manufacturer to determine when additional dV/dT protection is required. Where required, it shall be furnished and installed as per the manufacturer's written instructions.

E. Motors 50 HP or smaller located in non-hazardous areas shall be totally enclosed, fan cooled (TEFC) with a Service Factor of 1.15 for non-VFD applications and service factor of 1.15 (sine)/1.0 (inverter) for VFD applications.

F. Motors 50 HP and greater located in non-hazardous areas shall be TEFC, with a service factor of 1.15 for non-VFD applications and service factor of 1.15 (sine)/1.0 (inverter) for VFD applications..

G. Motors for use in hazardous locations shall have enclosures suitable for the classification indicated. Such motors shall be U.L. listed and be stamped as such.

H. Motors larger than 50 HP installed outdoors or where indicated shall be provided with 120 volt AC space heaters, wired to a terminal strip in a low voltage motor junction box. If provided by the manufacturer when not specified, the manufacturer shall not require that they be connected or the CONTRACTOR shall connect them at no extra cost to the OWNER, in order to keep the warranty in force.

I. NEMA Premium Efficiency Motors

1. Motors with a nameplate rating of 1 HP and larger shall be NEMA premium efficient units. Motors shall be stamped with the efficiency on the nameplate with the caption "NEMA Nominal Efficiency" or "NEMA Nom. Eff." Such motors shall have efficiencies determined by the test as set forth in ANSI/IEEE 112 - Standard Test Procedure for Polyphase Induction Motors and Generators, Method B.

2. Efficiency: Nominal efficiency and minimum efficiency shall be defined in accordance with the following tables. Both efficiencies shall be included in the Shop Drawing submittal.

OPEN DRIP-PROOF (ODP)						
FULL-LOAD EFFICIENCIES OF NEMA PREMIUM EFFICIENCY MOTORS RATED 600 VOLTS OR LESS						
	2 POLE		**4 POLE**		**6 POLE**	
HP	**Nom. Effic.**	**Min. Effic.**	**Nom. Effic.**	**Min. Effic.**	**Nom. Effic.**	**Min. Effic.**
1	77.0	74.0	85.5	82.5	82.5	80.0
1.5	84.0	81.5	86.5	84.0	86.5	84.0
2	85.5	82.5	86.5	84.0	87.5	85.5
3	85.5	82.5	89.5	87.5	88.5	86.5
5	86.5	84.0	89.5	87.5	89.5	87.5
7.5	88.5	86.5	91.0	89.5	90.2	88.5
10	89.5	87.5	91.7	90.2	91.7	90.2
15	90.2	88.5	93.0	91.7	91.7	90.2
20	91.0	89.5	93.0	91.7	92.4	91.0
25	91.7	90.2	93.6	92.4	93.0	91.7
30	91.7	90.2	94.1	93.0	93.6	92.4
40	92.4	91.0	94.1	93.0	94.1	93.0
50	93.0	91.7	94.5	93.6	94.1	93.0
60	93.6	92.4	95.0	94.1	94.5	93.6
75	93.6	92.4	95.0	94.1	94.5	93.6
100	93.6	92.4	95.4	94.5	95.0	94.1
125	94.1	93.0	95.4	94.5	95.0	94.1
150	94.1	93.0	95.8	95.0	95.4	94.5
200	95.0	94.1	95.8	95.0	95.4	94.5
250	95.0	94.1	95.8	95.0	95.8	95.0
300	95.4	94.5	95.8	95.0	95.8	95.0
350	95.4	94.5	95.8	95.0	95.8	95.0
400	95.8	95.0	95.8	95.0	--	--
450	96.2	95.4	96.2	95.4	--	--
500	96.2	95.4	96.2	95.4	--	--

Source: NEMA MG1 - 2011, Table 12-12

TOTALLY ENCLOSED - FAN COOLED (TEFC)						
FULL-LOAD EFFICIENCIES OF NEMA PREMIUM EFFICIENCY MOTORS RATED 600 VOLTS OR LESS						
	2 POLE		**4 POLE**		**6 POLE**	
HP	**Nom. Effic.**	**Min. Effic.**	**Nom. Effic.**	**Min. Effic.**	**Nom. Effic.**	**Min. Effic.**
1	77.0	74.0	85.5	82.5	82.5	80.0
1.5	84.0	81.5	86.5	84.0	87.5	85.5
2	85.5	82.5	86.5	84.0	88.5	86.5
3	86.5	84.0	89.5	87.5	89.5	87.5
5	88.5	86.5	89.5	87.5	89.5	87.5
7.5	89.5	87.5	91.7	90.2	91.0	89.5
10	90.2	88.5	91.7	90.2	91.0	89.5
15	91.0	89.5	92.4	91.0	91.7	90.2
20	91.0	89.5	93.0	91.7	91.7	90.2
25	91.7	90.2	93.6	92.4	93.0	91.7
30	91.7	90.2	93.6	92.4	93.0	91.7
40	92.4	91.0	94.1	93.0	94.1	93.0
50	93.0	91.7	94.5	93.6	94.1	93.0
60	93.6	92.4	95.0	94.1	94.5	93.6
75	93.6	92.4	95.4	94.5	94.5	93.6
100	94.1	93.0	95.4	94.5	95.0	94.1
125	95.0	94.1	95.4	94.5	95.0	94.1
150	95.0	94.1	95.8	95.0	95.8	95.0
200	95.4	94.5	96.2	95.4	95.8	95.0
250	95.8	95.0	96.2	95.4	95.8	95.0
300	95.8	95.0	96.2	95.4	95.8	95.0
350	95.8	95.0	96.2	95.4	95.8	95.0
400	95.8	95.0	96.2	95.4	--	--
450	95.8	95.0	96.2	95.4	--	--
500	95.8	95.0	96.2	95.4	--	--

Source: NEMA MG1 - 2011, Table 12-12

J. Two speed motors shall be of the 2 winding type.

2.3 ACCESSORY REQUIREMENTS

A. General: Horizontal motors 3 HP and larger and every vertical motor shall have split-type cast metal conduit boxes. Motors shall be provided with oversized conduit boxes. Where conduit sizes indicated do not match the motor terminal box, the MANUFACTURER shall provide means to accommodate the motor requirements. Motor boxes other than open drip-proof shall be gasketed.

B. Lifting Devices: Motors weighing 265 lb (120 Kg) or more shall have suitable lifting eyes for installation and removal.

C. Special Requirements: The MANUFACTURER shall refer to individual equipment specifications for special requirements such as motor winding thermal protection or multi-speed windings.

D. Grounding Lugs: Provide motor grounding lug suitable to terminate ground wire, sized as indicated.

E. Nameplate: Motors shall be fitted with permanent stainless steel nameplates indelibly stamped or engraved with NEMA Standard motor data, in conformance with NEMA MG-1-10.40. Inverter duty motors shall be clearly identified as such.

F. Where motors are indicated by elementary schematics or specifications to have zero speed switches, the switches shall be factory mounted integral to the motors. Switches shall close the contacts when the motor is at zero speed.

G. Inverter duty motors shall be provided with shaft grounding rings. Rings shall be factory installed, and shall be manufactured by **Aegis**, or equal. The motor warranty shall include coverage against VFD-induced bearing damage or failure.

2.4 MOTOR THERMAL PROTECTION

A. Single Phase Motors: Single phase 120, 208, or 230 volt motors shall have integral thermal overload protection or shall be inherently current limited.

B. Thermostats: Where indicated or specified, winding thermostats shall be snap action, bi-metallic, temperature-actuated switch. Thermostats shall be provided with one normally closed contact. The thermostat switch point shall be precalibrated by the manufacturer. All inverter duty motors shall be provided with winding thermostats, unless RTDs are specified. All explosion-proof motors shall be provided with winding thermostats.

2.5 MOTOR BEARINGS

A. General: Bearings shall conform to Section 46 01 00 - Equipment General Provisions, except as indicated herein.

B. Motors greater than 2 HP shall have bearings designed for 17,500 hours (belted) or 100,000 hours (coupled) L-10 life.

C. Fractional Horsepower: Motors with fractional horsepower through 2 HP shall be provided with lubricated-for-life ball bearings.

D. Horizontal Motors Over 2 HP: Motors larger than 2 HP shall be provided with relubricatable ball bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

E. Vertical Motors Over 2 HP: Vertical motors larger than 2 HP shall be provided with relubricatable ball, spherical, roller, or plate type thrust bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

F. Water Cooled Motors: If water cooling is required for the thrust bearings, cooling water lines shall be provided complete with shut-off valve, strainer, solenoid valve, flow indicator, thermometer, throttling valve, and, (where subject to freezing), insulation with heat tracing.

G. Inverter Duty Motors: Provide an insulated bearing to prevent circulating bearing currents.

2.6 MANUFACTURERS, OR EQUAL

A. **U.S. Motors/Nidec**

B. **Baldor**

C. **WEG**

PART 3 -- EXECUTION

3.1 INSTALLATION

Motor installation shall be performed by the CONTRACTOR in accordance with the motor manufacturer's written recommendations and the written requirements of the manufacturer of the driven equipment. Shaft grounding devices shall be connected to the grounding system in accordance with the manufacturer's recommendations.

3.2 FACTORY TESTING

A. Motors rated 100 HP and larger shall be factory tested in conformance with IEEE 112, IEEE 43 - Recommended Practice for Testing Resistance of Rotating Machinery, and NEMA MG-2. Except where specific testing or witnessed shop tests are required by the specifications for driven equipment, factory test reports may be copies of routine test reports of electrically duplicate motors. Test report shall indicate test procedure and instrumentation used to measure and record data. Test report shall be certified by the motor manufacturer's test personnel and be submitted to the ENGINEER.

END OF SECTION

SECTION 26 11 10 - LOW-VOLTAGE SWITCHGEAR

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The MANUFACTURER shall remove and replace the existing automatic transfer controls in the existing low voltage switchgear, as indicated and in accordance with the Contract Documents.

B. The requirements of Section 26 00 00 – Electrical Work, General, apply to the WORK of this Section.

C. The requirements of Section 01 11 00 – Summary of Work (Standby Power Generation) apply to this Section.

D. The existing switchgear is **Magnum DS Metal-Enclosed LV Switchgear by Eaton**. The General Order number is LDN0006530. All work on the switchgear shall be done by or under the supervision of **Eaton Corporation**. in order to maintain the UL listing of the equipment.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Reference Codes

1. The indicated WORK shall conform to or exceed the applicable requirements of the National Electrical Code (NEC), provided that where a local code or ordinance is in conflict with the NEC, the provisions of the local code or ordinance shall take precedence.

2. Additional requirements are indicated in Section 26 00 00 – Electrical Work, General.

B. Commercial Standards

1. ANSI/NFPA 70 National Electrical Code

2. UL 1558 Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

3. IEEE C37.17 Trip Systems for Low-Voltage AC and General Purpose DC Circuit Breakers

4. IEEE C37.20.1 Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

C. Reference Specifications

1. Section 01 11 00 – Summary of Work (Standby Power Generation)

2. Section 01 33 00 – Submittal Procedures

3. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

4. Section 26 00 00 – Electrical Work, General

5. Section 46 01 00 – Equipment General Provisions

1.3 MANUFACTURER SUBMITTALS

A. Submittals shall conform to the requirements of Section 26 00 00 – Electrical Work, General, Section 01 33 00 –Submittal Procedures.

B. Provide the following Shop Drawings

1. Updated drawings and necessary information for insertion into the existing Operations and Maintenance manual.

C. Certifications

1. Certified factory design test report for new ATS controller

1.4 QUALITY ASSURANCE

A. The switchgear modifications shall be designed for continuous duty service.

PART 2 -- PRODUCTS

2.1 AUTOMATIC TRANSFER CONTROL

B. An automatic transfer control system shall be incorporated into the existing switchgear, as follows:

1. In normal operation the utility circuit breaker shall be closed and the generator circuit breaker shall be open.

2. Primary Feeder Failure

a. Failure of the primary feeder shall be detected by a 3-phase voltage sensor.

b. Activation of these relays shall cause the utility circuit breaker to open after an adjustable time delay and a generator start command shall be issued.

c. Once power is available on the generator feeders, the generator circuit breaker shall close, allowing resumption of plant operation from the generator.

d. The controller shall be provided with an external signal indicating whether the power sensed on the normal feeders is utility power or generator power being fed upstream of the switchgear.

e. The controller shall hold the generator breaker closed until it receives indication that utility power has been restored at the upstream switchgear.

3. Upon utility power being restored at the upstream switchgear, the plant PLC will send a signal when to begin the retransfer sequence and the generator breaker shall open, and after an adjustable time delay the utility breaker shall close.

4. If any breaker tripping has occurred, the lockout relay shall prevent closure of the circuit breaker until the fault has been cleared and the lockout has been reset. No breaker shall be allowed to close into a fault.

PART 3 -- EXEXUTION

3.1 INSTALLATION

A. Install the new components in the existing switchgear in accordance with the manufacturer's instructions.

3.2 FACTORY TESTING

A. The MANUFACTURER shall test the new control equipment per their standard testing procedures before shipping them to the field.

3.3 FIELD TESTING

A. The MANUFACTURER shall test the new controls after they are installed to ensure they operate as indicated above.

END OF SECTION

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SECTION 26 13 00 – MEDIUM VOLTAGE SWITCHING CENTER

(PRE-PROCUREMENT PACKGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The MANUFACTURER shall provide a new switch section on the existing switching center, complete and operable, in accordance with the Contract Documents.

B. The new switch shall be provided by the SUPPLIER of the Standby Generation system.

C. The requirements of Section 26 00 00 - Electrical Work, General, apply to the WORK of this Section.

D. The requirements of Section 01 11 00 – Summary of Work (Standby Power Generation) apply to this Section.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Codes

1. NSI/NFPA 70 National Electric Code

B. Commercial Standards

1. NEMA SG5 Power Switchgear Assemblies

2. NEMA SG6 Power Switching Equipment

3. ANSI/IEEE C37.20 (R82) Switchgear Assemblies Including Metal Enclosed Bus

C. Reference Specifications

1. Section 01 11 00 – Summary of Work (Standby Power Generation)

2. Section 01 33 00 – Submittal Procedures

3. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

4. Section 01 33 17 – Structural Design, Support and Anchorage

5. Section 01 75 00 – Equipment Testing and Plant Start-up

6. Section 01 78 20 – Operations and Maintenance Manuals

7. Section 26 00 00 – Electrical Work, General

8. Section 46 01 00 – Equipment General Provisions

1.3 MANUFACTURER SUBMITTALS

A. Submittals shall conform to the requirements of Section 26 00 00 - Electrical Work, General, Section 01 33 00 – Submittal Procedures, and the following additional requirements:

1. Engineering data to include voltage, current, and short-circuit ratings.

2. Outline dimensions to include available space for conduits, stress cone type cable terminations, and cable supports.

1.4 QUALITY ASSURANCE

A. General: All materials shall be tested and inspected in accordance with Section 26 00 00 - Electrical Work and the following requirements.

B. Factory Tests

1. Design test reports conducted on one medium voltage load break switch assembly having essentially duplicate ratings as indicated shall be submitted. The design testing program shall conform to ANSI/IEEE C37.20 and shall include at least the following tests:

a. Basic impulse level.

b. Momentary withstand.

c. Short time withstand.

d. Fault closing.

e. Load interruption at various loads and power factors including magnetizing current of the transformer.

2. A Certificate of Qualification shall be submitted to verify that the submitted Design Test Reports are completely applicable to all equipment furnished hereunder. Production Tests shall be conducted on each medium voltage load break switch assembly, and test reports shall be submitted. The production tests program shall conform to ANSI/IEEE C37.20 and NEMA SG-6, and shall include but not be limited to the following tests:

a. Visual and Mechanical Inspection

b. Dielectric test at power frequency for one minute

c. Contact resistance measurement for all the three phases.

d. A check of safety interlocks.

C. The switching center shall be designed for continuous duty service in the environmental conditions in Section 26 00 00 - Electrical Work.

D. Switchgear shall be qualified for use in seismic areas as defined in Section 01 33 17 - Structural Design, Support and Anchorage

1.5 MAINTENANCE AND GUARANTEE

A. The MANUFACTURER shall guarantee that the furnished equipment shall meet the requirements of the Contract Documents.

B. The 15 kV switchgear center shall carry a manufacturer's label stating switchgear ratings and catalog or shipping number as well as the name of the manufacturer. The manufacturer shall be responsible for activation and acceptance of switching center.

1.6 WARRANTY

A. The equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.

PART 2 -- PRODUCTS

2.1 GENERAL

A. The switching center shall be an integrated assembly of switches, bus, and fuses which are coordinated electrically and mechanically for high voltage circuit switching and protection. The switching center shall be provided in compliance with this Specification and with all applicable NEMA and ANSI standards. All major components shall be provided by **Eaton**.

B. The construction shall be the same as the existing and shall be designed to connect to the existing switching center.

C. The bus bar shall be the same as the existing and shall be designed to connect to the existing switching center bus bar.

2.2 SERVICE

A. The switching center shall be suitable for operation at 12.47 nominal kV, 3 phase, 60 Hz directly grounded system and the whole switching center line up shall have the minimum interrupting capacity of 25,000 amp RMS symmetrical at nominal system voltage or as shown.

2.3 ENCLOSURE

A. The switching center enclosure shall be an outdoor, weather-proof NEMA 3R non-walk-in type enclosure and shall have the same characteristics and paint color as the existing switching center.

B. The additional section shall maintain the weather integrity of the existing switchgear.

C. The floor-standing switching center shall be shipped fully assembled and tested.

2.4 DESIGN AND CONSTRUCTION FEATURES

A. The switching center configuration shall be as indicated and shall have 1 feeder switch added to the existing switchgear.

B. Outgoing switch section shall have ample space for 15 kV, 133 percent shielded, jacketed single conductor stress-cone terminations, lightning arresters, matching existing ones). All terminals and lugs shall be of the solderless type suitable for copper cables of size shown.

C. The switch shall be the same type as the existing switches in the existing switching center and shall be fused and manually operated.

D. Power fuses shall be provided for fault protection. The fuses shall be same type as the fuses in the existing switching center.

2.5 NAMEPLATES

A. Nameplates shall be black and white 1/8-inch thick lamicoid, with lettering engraved through the black surface exposing the white lamination beneath. Letter height shall be 1/8-inch minimum unless otherwise indicated. Nameplate shall be fastened using 2 matching screws: adhesive tape is not acceptable.

2.6 SURFACE PREPARATION, PAINTING AND CLEANLINESS

A. Cleanliness of the equipment shall be such that it is smooth and free of all foreign matter such as scales, sand, blisters, weld splatters, metal chips and shavings, oil, grease, organic matter, and rust.

B. All metal enclosures shall be chemically cleaned and treated in a process which provides a phosphate coating, then be primed and finished with corrosion resistant enamel paint.

1. Exterior surfaces shall be painted to match the existing switching center and in accordance with the manufacturer's standard practice for the environmental conditions. In addition, the undersurfaces shall be covered with a corrosion resistant protective coating.

2. The MANUFACTURER shall furnish 2 one-pint aerosol spray cans of paint, matching each color used, for field "touch-up" after installation of the equipment.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. The MANUFACTURER shall provide written instructions for the CONTRACTOR to follow when installing the new switchgear section.

B. The CONTRACTOR shall install the switching center in accordance with the manufacturer's installation instructions and as indicated. The CONTRACTOR shall provide the floor channels and shall secure the switching center to the channels by bolting or tack welding at the front and the rear. Prior to energizing, all equipment shall be cleaned, inspected for loose connections, checked out for electrical and mechanical operations and phase-sequence, and all circuits made free of any shorts or ground connections following field testing.

3.2 START-UP ASSISTANCE AND TRAINING

A. The manufacturer's representative shall furnish on-site start-up assistance and shall inspect the installation prior to start-up to verify that the equipment is installed in accordance with the manufacturer's requirements.

B. In addition, the manufacturer's representative shall provide on-Site training for the operation and maintenance of all equipment included in this Section.

C. The following times shall be included, as a minimum, for the above tasks. A Day is defined as 8 hours on-Site, exclusive of meals and travel. Each task shall be considered a separate trip to the site. Dates and times for the trips shall be coordinated with the OWNER.

1. Inspection of the installation: 1 Day

2. Start-up assistance: 1 Day

3. Operation and Maintenance Training: One Day

D. The manufacturer shall be responsible for activation and acceptance of switchgear

END OF SECTION

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SECTION 26 24 13 – MEDIUM VOLTAGE GENERATOR QUICK CONNECTION SWITCHGEAR

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish medium voltage generator quick connection switchgear.

B. The requirements of Section 01 11 00 – Summary of Work (Standby Power Generation) and Section 26 00 00 – Electrical Work, General, apply to the WORK of this Section.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Reference Standards:

1. C37.55, Medium-Voltage Metal-Clad Assemblies

2. NFPA 70, National Electric Code

B. Reference Specifications

1. Section 01 11 00 – Summary of Work (Standby Power Generation)

2. Section 01 33 00 – Submittal Procedures

3. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

4. Section 01 33 17 – Structural Design, Support and Anchorage

5. Section 26 00 00 – Electrical Work, General

6. Section 46 01 00 – Equipment General Provisions

1.3 MANUFACTURER SUBMITTALS

A. Furnish submittals in accordance with Section 26 00 00 – Electrical Work, General and Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:

1. Electrical and mechanical drawings for each type of unit, showing electrical ratings, dimensions, mounting provisions, connection details, and layout diagrams.

C. Product Data:

1. Manufacturer's technical information, including catalog information.

2. Manufacturer's technical specifications with assembly and component ratings.

D. Certifications: Certification that station devices comply with standards referenced in this section.

E. Test results: All test results shall be submitted to OWNER/ENGINEER.

1.4 QUALITY ASSURANCE

A. The equipment furnished under this section shall be the product of a manufacturer who has produced switchgear up to 15kV for a period of at least 15 consecutive years.

B. Switching gear shall be qualified for use in seismic areas as defined in Section 01 33 17 - Structural Design, Support and Anchorage.

1.5 FACTORY TESTS

A. Switchgear shall be subjected to the manufacturer's standard tests which shall include as a minimum:

1. Visual and Mechanical Inspection:

a. Inspect bolted electrical connections using calibrated torque-wrench method.

b. Confirm correct operation and sequencing of mechanical interlock systems.

c. Inspect insulators for evidence of physical damage or contaminated surfaces.

d. Verify correct barrier installation and operation.

e. Exercise active components.

2. Electrical Tests:

a. Power frequency dielectric withstand voltage test

b. Current-injection tests on the entire current circuit in each section of switchgear.

3. System Function Tests:

a. Simulate the Power System conditions as required.

b. Verify operation sequence.

1.6 WARRANTY

A. The equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.

PART 2 -- PRODUCTS

2.1 GENERAL

A. System Rating:

1. 15kV, 3 phase, 60 Hz, 1200A, 95KV BIL and housed in a NEMA 3R enclosure.

B. Phase and Ground Busbar

1. Material: Silver-plated Copper

2. Equipment Ground Bus: bonded to box.

3. Isolated Ground Bus: insulated from box.

C. Temporary generator connectors shall be Camlok style and shall be provided loose with the switchgear (1 per phase and 1 ground connector)

D. Permanent Connection shall be factory installed broad range set-screw mechanical type, located behind a physical barrier

E. Phase Rotation Monitoring Device:

1. Phase monitoring relay to be **Siemens 3U4512-1AR20** or equal and shall be factory installed

2.2 ENCLOSURE

A. Enclosure shall be NEMA 3R Rain-Tight Enclosure. NEMA 3R integrity shall be maintained while temporary cabling is connected during use

B. Front door shall be pad-lockable and shall include a hinged access plate at the bottom for entry of temporary cabling that prevents unauthorized tampering while in use.

C. Front and Side shall be accessible for maintenance. Top, Side, and Bottom shall be accessible for permanent cabling

D. Enclosure shall be painted ANSI 61 grey.

2.3 Manufacturer, or equal:

A. Trystar

B. ASCO

PART 3 -- EXECUTION

3.1 GENERAL

A. CONTRACTOR SHALL install quick connection switchgear in accordance with equipment manufacturer's written recommendations and instructions and the Contract Documents.

3.2 FIELD TESTING

1. CONTRACTOR shall provide a portable generator for 1 day minimum to test operation of Quick Connection Switchgear and upstream switchgear connections.

2. Portable generator rating shall be 1000kw minimum.

END OF SECTION

SECTION 26 32 13 - STANDBY POWER GENERATION

(PRE-PROCUREMENT PACKAGE)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The MANUFACTURER shall provide an engine-driven standby electrical generating system, complete and operable, in accordance with the Contract Documents.

1. The generator SUPPLIER will also be responsible for supplying the following items and services:

a. Medium Voltage Metal-Clad Switchgear - Specification 26 13 13

b. Medium Voltage Switching Center – Specification 26 13 00

1) The Generator Supplier shall contract with Eaton to provide this equipment.

c. Low Voltage Switchgear - Specification 26 11 10

1) The Generator Supplier shall contract with Eaton to provide this equipment.

d. Medium Voltage Generator Quick Connection Switchgear – Specification 26 24 13

B. The CONTRACTOR shall be responsible for coordination of interface with other equipment and for any special construction necessary to complete the WORK of this Section in an acceptable manner.

C. The SUPPLIER of the generator set shall also be the manufacturer of the engine for the generator system; however, the CONTRACTOR shall be responsible to the OWNER for the WORK of this Section.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Materials shall conform with applicable requirements of the National Electrical Code (NEC), and any other State or Municipal codes which apply. Generator system shall meet applicable standards and codes, including IEEE, NEMA, ANSI, OSHA, and UL.

B. Reference Specifications

1. Section 01 11 00 – Summary of Work (Standby Power Generation)

2. Section 01 33 00 – Submittal Procedures

3. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

4. Section 01 33 17 – Structural Design, Support and Anchorage

5. Section 01 75 00 – Equipment Testing and Plant Start-up

6. Section 01 78 20 – Operations and Maintenance Manuals

7. Section 26 00 00 – Electrical Work, General

8. Section 26 13 13 - Medium Voltage Metal-Clad Switchgear

9. Section 46 01 00 – Equipment General Provisions

1.3 MANUFACTURER SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00- Submittal Procedures.

B. Shop Drawings

1. Detailed, dimensioned Shop Drawings and data demonstrating adherence to the requirements of these specifications shall be submitted and approved before fabrication, shipment, or other WORK under this Section begins. Include the manufacturer's certification that engine atmospheric emissions will comply with the limitations.

2. Certified custom drawings and custom wiring diagrams of each component in the system and a master wiring diagram showing the entire system on one sheet. This diagram shall include all AC and DC power control connections between the generator, engine, fuel tank system, batteries, and circuit breakers and shall be a custom drawing for this specific installation. A master drawing of the engine/generator set shall also be provided, showing general dimensions, bill of materials, location and size of all connections for fuel, cooling, exhaust, direct current connections, conduit locations, and connections for control and power wiring. Include wire and terminal numbers for all diagrams. Furnish KW output curves, fuel consumption curves, and certified air emission data sheets.

3. Outline drawings and connection diagrams shall be complete enough to enable the installation to be designed completely, and connection diagrams shall give both internal and external connections. Include foundation loading and clearances.

4. Ten copies of complete and detailed instructions for the operation, lubrication, and maintenance of equipment in the system. The manuals shall be furnished after final approval of Shop and working drawings but prior to shipment of equipment. Manuals shall be complete with wiring diagrams, lubrication schedules and recommended lubricants, drawings, cuts, parts lists, and other necessary data. All parts shall be numbered or otherwise clearly identified to facilitate ordering of replacements. Descriptions of all operational control devices and their functions shall also be included.

C. O&M Manual: Submit in accordance with Section 01 78 20 – Operations and Maintenance Manuals.

1.4 QUALITY ASSURANCE

A. The engine/generator shall be the product of a manufacturer who has been regularly engaged in the design and production of similar engine/generator sets for a minimum of 10 years.

B. The SUPPLIER shall maintain a local parts and 24-hour service facility within the State of Colorado. The SUPPLIER shall have factory trained and authorized service representatives to furnish necessary installation, test, and start-up supervision as well as operation and maintenance training necessary for final approval and acceptance.

C. Generator equipment shall be qualified for use in seismic areas as defined in Section 01 33 17 - Structural Design, Support and Anchorage.

1.5 WARRANTY

A. The equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.

PART 2 -- PRODUCTS

2.1 SYSTEM COMPONENTS

A. Provide one new diesel engine-powered electric generator set, in an outdoor, weatherproof, sound attenuated enclosure. The engine generator shall have a nominal standby rating of 2000 KW, 2500 KVA, 0.8 power factor 12,470 volts, three phase, four wire, low-resistance grounded neutral, 60 Hertz. The equipment package shall include in general, and as applicable, engine and generator on a common vibration isolating base, with auxiliaries, accessories, and controls, including intake filters, discharge silencer, turbocharger, heat exchangers, foundation bolts, isolators, piping, flexible couplings, supports, complete exhaust piping, ring, and silencer, insulation, control panels, lubrication system, water jacket heaters, cooling system, fuel tank, batteries and battery rack, battery charger, grounding resistor, spare parts, and all materials necessary to permit installation, testing and placing the system in successful operation.

B. Provide one 6,500 gallon fuel storage tank with double wall steel construction, integral with the base of the generator-set and generator-set enclosure. Tank size shall be sized as noted or as required to provide 48hrs of fuel with the generator running at full load.

C. The generator-set, enclosure, base-mounted fuel tank, and accessories shall be assembled and shipped to the Site as a complete, coordinated package, ready for installation. The engine generator base, cooling system, etc, shall be factory painted before installation in the enclosure.

1. The SUPPLIER of the generator set shall also include instructions for field assembly of the entire genset, fuel tank and enclosure by the CONTRACTOR.

2.2 SYSTEM OPERATION

A. The system shall operate as follows:

1. Automatic Control

a. A maintained remote contact closure from the automatic transfer switchgear shall cause the generator-set to start and run.

b. When the remote start-up contact opens, the engine shall continue to operate for an adjustable cool-down time (typically 5 to 30 minutes).

2. Local Control: The generator-set shall be capable of manual initiation or stopping from the locally mounted generator control panel. The local generator control panel shall be provided as part of this Contract.

3. Emergency Stop Control: An emergency stop pushbutton shall be provided at the generator control panel that shall cause the unit to stop without any delay.

2.3 ENGINE

A. The SUPPLIER shall provide a complete engine-powered standby electrical generating system of the type and capacity indicated.

B. The diesel engine shall be mounted on a common base with the generator and the direct connected radiator and shall be rated for standby service, continuously for the duration of the electric power interruption, with engine jacket water cooled by means of a direct mounted water-to-air radiator under SAE conditions at 85 degrees F, 4700 feet above sea level. The generator rating shall be 2000 KW.

C. The diesel engine shall be four-cycle, turbocharged, aftercooled, 1800 rpm, with individual fuel pumps and injection valve for each cylinder. The generator-set shall be **Caterpillar, Cummins, MTU, Kohler,** or equal**.**

D. The engine shall have a dry type air cleaner with service indicator, fuel oil filter, full pressure positive pump lubrication with full-flow oil filters, thermostatic regulated oil cooling system, and crankcase drain with valving to be able to drain the crankcase oil without reaching under the engine.

E. The engine shall also be equipped with two 120 volt, thermostatically controlled jacket water heaters. Power shall be derived from a suitably-rated dry-type transformer with primary circuit breaker and panelboard, also provided as part of the generating system, and including facilities to provide power to the battery charger, fuel oil transfer pumps if required, and other generator-related facilities.

F. The diesel engine shall perform as indicated when operating on a commercial grade of non-premium distilled petroleum fuel oil such as No. 2 domestic burner oil and diesel fuel.

G. The engine shall be equipped with an electric 24 volt dc starting system of sufficient capacity to crank at a speed which will start the engine under conditions indicated. Include a charging alternator. The starting pinion shall disengage automatically when the engine starts. The starting system shall include relays for fully automatic operation from a remote signal.

H. The engine shall be provided with a speed control, **Woodward Type 2301,** or equal and electronic governor, **Woodward Type EG-3P,** or equal.

I. The engine shall minimize discharge of gaseous pollutants and shall comply with the discharge limitations of the Colorado Air Pollution Control Division from the Colorado Department of Health and Environment . The CONTRACTOR shall furnish a certification from the manufacturer that the proposed generator set will comply with the limitations.

J. Specific limitations applicable under all loads are:

Pollutant	Maximum Emission Rate (tons/year)
Nitrogen oxides	1.0
Carbon monoxide	1.0
Non-methane hydrocarbons	1.0

2.4 BATTERIES AND BATTERY CHARGER

A. Provide a lead-acid storage battery with sufficient capacity for three 30 second cranking cycles, allowing 10 seconds between cycles. Submit calculations verifying adequate capacity. The battery shall be on a plastic rack as close as practical to the starter motor. The CONTRACTOR shall provide vented, nonmetallic protective covers or red and black plastic or rubber boots covering all terminals to protect against an accidental short circuit as might be caused by laying a metallic object on the battery. Metallic racks and covers are not acceptable.

B. A unit-mounted battery charger for 120 V, single phase, 60 Hz input shall be provided. The battery charger shall be voltage regulated, with separate float and equalize charge voltage adjustment having a 10 amp rating. The battery charger shall include alarm relays to sense high and low dc voltage, zero current, and ac power failure, with individual output contacts wired to terminal strips for tie into remote alarms. Also, provide an ac “on” indicating pilot LED light and dc voltmeter and ammeter and annunciator. The battery charger shall be **LaMarche Model A46,** or equal.

2.5 EXHAUST SYSTEM

A. The engine shall be provided with an exhaust system consisting of flexible connection, exhaust silencer, steel piping, fittings, stainless steel hardware and supports, brackets, and rain collar.

B. The flexible connection shall be of the stainless steel bellows type with flanged ends. Flexible elements shall be stainless steel suitable for exhaust temperatures recommended by the engine manufacturer. The flexible connection shall be suitable for vibration isolation and for relieving stress caused by thermal expansion.

C. The exhaust silencer shall be a critical grade manufactured by **Maxim,** or equal.

D. The silencer shall be mounted and supported horizontally on the roof of the generator enclosure.

E. Exhaust piping shall be pitched upward from the engine and be provided with sufficient drains to eliminate condensation and rain water. Exhaust piping shall be welded steel pipe. Elbows shall be welding type, standard wall. Flanges shall be welding slip-on type, 125 pound, either forged or plate steel. Exhaust piping shall be supported independently of the silencer. The silencer and exhaust piping shall be insulated with a minimum of 2-1/2 inches of calcium silicate with a stainless steel jacket and shall be supported as required. The weight of the exhaust and silencer shall not be supported by the engine.

2.6 COOLING SYSTEM

A. The engine shall be equipped with a cooling system having sufficient capacity to effectively cool the engine when delivering full rated horsepower at the conditions stated above. A radiator and engine-driven fan of a type and capacity recommended by the engine manufacturer shall be included.

B. The radiator shall be sized in accordance with the engine manufacturer's recommendation for use with 50 percent aqueous ethylene glycol. Airflow shall be controlled by a power inlet damper and a gravity discharge damper, both provided as part of the walk-in outdoor enclosure. Design ambient air temperature shall be 100 degrees F at 4,675 feet above sea level.

C. The engine shall have an engine-driven, gear driven centrifugal type water circulating pump for circulating water through the cooling system.

2.7 GENERATOR

A. The generator shall be nominally rated 2000 KW at .8 PF, 12,470 V 3 phase, 60 Hz, 4 wire wye and shall be a brushless design with solid state permanent magnet generator (PMG) exciter. Other excitation methods are not acceptable. The voltage regulator shall be solid state, generator mounted. Provide radio-interference suppression meeting commercial standards.

B. If a line to neutral short circuit occurs, the generator shall be capable of supporting 300 percent rated current for 10 seconds without externally mounted devices.

C. Voltage Regulation Tolerance: Plus or minus 1 percent of any present value over the 3 phase load range. Instantaneous voltage dip or rise, when measured with an oscilloscope, shall not exceed 25 percent upon full load application or rejection, and shall return to preset value within 0.5 seconds.

D. Waveform: Deviation factor of output voltage shall not exceed 5 percent and the value of any individual harmonic shall not exceed 2 percent of the fundamental when operating with an unbalanced load.

E. Temperature Rise: Temperature rise of any component shall not exceed the rise permitted by NEMA standards. The voltage regulator shall be adjustable minus 25 percent to plus 10 percent.

F. Bearing: Double sealed ball bearing, lubricated for life.

2.8 VIBRATION ISOLATORS

A. The engine and generator shall be mounted on a common system base and shall be provided with vibration isolators of number and size as recommended by the engine supplier to support the engine, generator, radiator, and base. The isolation mountings shall consist of steel or cast iron top and bottom housings incorporating steel springs or "donut" style isolators, located between the genset and the base, and shall be provided with built-in leveling bolts and built-in resilient chocks to control isolation and withstand lateral forces in all directions.

B. The vibration isolators shall be **Korfund Dynamics Corporation Series L**, or equal.

2.9 LUBRICATION AND COOLING FLUIDS

A. The supplier shall furnish the engine fully charged with lubricating oil and grease as specified by the manufacturer for continuous service. The cooling system shall be furnished with a full charge of 50 percent ethylene glycol.

2.10 GENERATOR SYSTEM CONTROL PANEL

A. The engine shall provided with an integrally mounted instrument and control panel, vibration isolated, NEMA 12 compliant, dead front, constructed of 14-gauge steel and containing at least the following equipment:

B.

Coolant temperature gauge
Oil pressure gauge
Four position selector switches marked for “auto,” “manual,” “stop,” and “stop/reset.”
Automatic starting controls (2 wire start/stop)
Coolant level pre-alarm
Coolant temperature pre-alarms (low and high)
Fuel pressure pre-alarm
Low dc voltage alarm to indicate loss of charge on battery
Electrical contacts and “push to test” pilot lights for shutting down the engine on low oil pressure, high oil temperature, overcrank, high coolant temperature, and overspeed condition
Individual electrical contacts for remote indication of any pre-alarm or alarm condition
Running Time Meter (Non Resettable)
Emergency stop switch
Voltmeter and switch, ammeter and switch, frequency meter

C. Wiring

1. Signal wiring shall be segregated from power wiring and be arranged neatly to facilitate tracing of circuits.

2. Plastic wiring wraps shall be used to bundle wires, except within wiring ducts. The bundles shall be securely fastened to the steel structure at suitable intervals not exceeding 12 inches in length. No open space hanging of wires will be permitted. Flexible stranded copper wiring shall be used throughout. No solid conductor wire shall be permitted.

3. Terminal blocks shall be provided for interconnections between remote devices and local control panel wiring. The terminal blocks shall be factory assembled on a mounting channel, and the channel shall be bolted to the inside of the panel. The terminals shall have a continuous marking strip using the nomenclature on the schematic diagrams. No more than 2 wires shall be terminated at any one terminal. Wire terminals shall have sleeve wire markers properly marked to match the schematic diagrams.

2.11 GENERATOR ENCLOSURE AND FUEL TANK

A. Generator Enclosure

1. A weatherproof, sound attenuated, enclosure shall be provided to house the engine/generator and accessories. The following standards and codes shall be met at a minimum:

   a. NEPA 70 (National Electric Code)

   b. NFPA 30

   c. NFPA 37

   d. NFPA 110

   e. UL 142

   f. API 620

B. The enclosure shall be constructed with an aluminum diamond plate finished floor for mounting on a concrete pad. The enclosure shall conform to the following design criteria and be constructed as manufactured by **Pritchard-Brown (Div. of Enviro Industries),** or equal**.**

Rigidity wind test equal to	150 MPH
Roof load equal to	50 lbs. per sq. ft.
Floor load equal to	200 lbs. per sq. ft.
Rain test equal to	4-inches per hour
Enclosure certified to meet	BOCA base building and mechanical codes

C. Test data on similar construction by the manufacturer shall be available to the ENGINEER upon request.

D. Enclosure shall consist of a roof, steel floor, fuel tank base, 2 side walls and 2 end walls, of stressed skin, semi-monocoque construction, sized as required to meet dimensional, sound attenuation, and code requirements for the actual generator provided.

E. The system shall include a cooling and combustion air inlet silencer section, an equipment enclosure section, and a cooling air discharge silencer section. It shall be designed to reduce source noise by an estimated average 25 dB(A) as measured at a

distance of 7 meters from the enclosure. The enclosure shall also be bird- and rodent-proof with all openings screened.

F. Roof and walls shall be of one-piece semi-monocoque construction. Framing members shall be aluminum or aluminized steel. Skin material shall be minimum thickness 0.040-inch, prepainted earth bronze color, aluminum (roof shall be mill finish) or minimum thickness 18-gauge aluminized steel. Other materials of construction may be acceptable; however, the MANUFACTURER shall furnish data verifying that the proposed system is equivalent or better than that indicated. Alternative skin colors shall be submitted to the ENGINEER for selection. Skin panels shall be hard-riveted to framing members on 3-inch centers maximum. Pop rivets and bolts are not acceptable fasteners to attach exterior skin to framing. Roof assembly shall be cambered to aid in rain runoff.

G. Insulation in walls and roof shall be semi-rigid, thermo acoustic, thickness as required to meet the noise criteria. Lining shall be perforated mill finish aluminum. Self-adhesive foam and loose or batt-type insulating materials will not be accepted.

H. Lifting provisions shall be provided at the enclosure base, with capacity suitable for rigging the generator. Similar lifting provisions shall be provided for the fuel tank. Quality assurance procedures of the manufacturer shall include regular testing of the lift devices.

I. A minimum of 4 single personnel access doors shall be provided. A hinged access door for the load bank controls shall also be provided. Doors shall consist of an extruded frame with skin material matching enclosure. Doors shall be fully gasketed to form a weathertight perimeter seal and be pad-lockable. Hinges shall be stainless steel, and lock mechanisms shall be 3 point, with panic hardware to allow opening from inside even when padlocked. The door threshold, if needed, shall be aluminum. Stairs and handrails shall be aluminum and shall be manufactured to meet field-installed conditions.

J. Air handling shall be as follows: Air shall enter the enclosure through a removable hood. Motor-operated dampers shall be provided, wired to be spring operated to open upon engine start-up. Radiator discharge shall be through a gravity-operated damper and into a hood. The system shall not exceed 0.5-inch wg total external static pressure to ensure adequate airflow for cooling and combustion.

K. A bolt-in-place removable end wall panel shall be provided for maintenance and/or equipment installation. Bolts, nuts, and washers shall be stainless steel.

L. Enclosure manufacturer shall provide all necessary hardware to externally mount the exhaust silencer and maintain the weatherproof integrity of the system. A bird screen shall be installed on exhaust outlet.

M. Fuel Tank

1. An integral UL listed underframe tank with floor and rupture basin shall be provided, consisting of the following: a 7,000 gallon rupture basin utilizing minimum 7-gauge steel channel perimeter walls and bottom, a UL listed above-ground rectangular fuel storage tank of minimum 12-gauge steel, 6,500 gallon capacity, and a floor system consisting of fabricated or structural steel cross members on centers averaging 16-inches. The crossmembers shall be overlaid with O.S.B. board or plywood topped with 14-gauge steel diamond plate. This wood/steel combination shall be used for acoustic isolation of the generator set from the base. The tank shall have venting and emergency venting per UL 12 and NFPA 30; lockable fill, low-level, and high-

level alarm contacts; and a dc electric fuel level transmitter. The rupture basin shall include a float contact to indicate tank rupture. The cross members shall incorporate 3/8-inch thick steel tapping plates for gen-set mounting. The entire enclosure/fuel tank package shall be UL listed for use with a diesel engine generator system and shall meet the previously indicated codes and standards.

2. Pipe and Fittings

   a. Pipe and fitting materials shall be new and the best of their respective classes. Pipe shall be clearly marked with the manufacturer's standard trademark or identification mark. Pipe and fittings, unless otherwise indicated, shall meet the requirements of these specifications.

   b. Piping carrying fuel oil shall be copper type "L" with wrought copper fittings silver soldered. Flexible connections shall be provided between fuel lines and the engine.

3. Hangers, Supports, and Miscellaneous Metalwork: The SUPPLIER shall provide all necessary hangers, supports, concrete inserts, anchors, and guides for the standby generator equipment.

4. Valves: The SUPPLIER shall provide ball valves for installation at all required points and on at least each fuel supply line. Ball valves shall be stainless steel, rated 125 pounds working pressure and in every respect be suitable for the purpose intended.

2.12 SPARE PARTS

A. Four sets of the following spare parts shall be furnished:

1. Air filters

2. Oil filters

3. Fuel filters

2.13 FUEL POLISHING SYSTEM

A. The generator system shall include a fuel polishing system mounted within the system enclosure.

B. The system shall be designed for use with one diesel storage tank system up to 6,500 gallons

C. The system shall be a complete factory-assembled, automatic particulate filtration, water separation and removal system to maintain the purity of No. 2 fuel oil held in extended storage. The system shall circulate the oil from the storage tank, through the system, removing water and particulate matter, then returning the clean dry fuel back to the storage tank.

D. The System shall exceed diesel engine manufacturer's cleanliness target of ISO 18/16/13.

E. The system shall have a touch screen HMI and PLC controller that schedules system operation with alarms and sensors that automatically indicate filter conditions, presents of water in trap, and fluid leak. System includes Modbus networking kit.

F. Industrial electric control panel shall be Underwriters Laboratory 508A and CE Listed

G. System alarms shall be:

1. High water in trap

2. High vacuum (service primary filter)

3. High pressure (service final filters)

4. Fluid in system sump

5. No fluid flow

H. Manufacturer, or equal

1. Critical Power

2. ASNE

3. WASP

PART 3 -- EXECUTION

3.1 FACTORY TESTING

A. The generator system shall be witness tested at the factory before shipment to the Site. The manufacturer's standard testing procedure shall be followed, and in the event the system does not satisfy the test criteria or the requirements of this Section, it shall be repaired, modified, or replaced until it conforms.

B. Furnish the OWNER and ENGINEER 4 weeks prior notice of the testing date and a copy of the manufacturer's test procedure. The OWNER and the ENGINEER will witness the factory testing and sign the test data as witnesses. The ENGINEER will not review nor approve the test procedure.

C. Witnessed test results shall be submitted to the ENGINEER for the project file, not for review.

3.2 START-UP ASSISTANCE AND TRAINING

A. The manufacturer's representative shall furnish on-Site start-up assistance and shall inspect the installation prior to start-up to verify that equipment is installed in accordance with the manufacturer's requirements.

B. Upon completion of start-up and after acceptance by the OWNER, the CONTRACTOR shall completely fill the fuel tank.

C. In addition, the manufacturer's representative shall provide on-Site training for operation and maintenance of all equipment included in this Section.

D. The following times shall be included, as a minimum, for the above tasks. A Day is defined as 8 hours on-Site, exclusive of meals and travel. Each task shall be considered a separate trip to the site. Dates and times for the trips shall be coordinated with the OWNER.

1. Inspection of the installation: 3 Days

2. Start-up assistance: 3 Days

3. Operation and Maintenance Training: At minimum provide 3 days with one training per day for: (1) day shift operations, (2) night shift operations, and (3) maintenance. The night shift training session will start no earlier than 4 PM. Proposed training schedule shall be submitted to OWNER for review and approval in advance of scheduling OWNER staff and travel.

- END OF SECTION -

SECTION 46 01 00 - EQUIPMENT GENERAL PROVISIONS

(PRE-PROCUREMENT)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The equipment package MANUFACTURERS shall provide equipment and appurtenant WORK, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to equipment throughout the Contract except where otherwise indicated.

C. All component and support systems of the equipment shall be designed and manufactured to withstand all forces such as internal or external, static, wind, dynamic and seismic loads (wind and seismic in accordance with Section 01 33 17 – Structural Design, Support and Anchorage) in order for the equipment to last throughout its expected life without premature failure. If the project is located in a seismically active zone as specified in Section 01 33 17 – Structural Design, Support and Anchorage, the manufacturer shall submit a certification signed and stamped by a registered engineer stating that the equipment was designed and manufactured to withstand all the loads specified in this paragraph. Submit a copy of that analysis for review by the ENGINEER.

D. Equipment Arrangement: Unless specifically indicated otherwise, the arrangement of equipment indicated is based upon information available from manufacturers at the time of design and is not intended to show exact dimensions particular to a specific manufacturer. Some aspects of the Drawings are diagrammatic, and some features of the illustrated equipment arrangement may require revision by the CONTRACTOR to meet the actual equipment requirements proposed by the CONTRACTOR. Structural supports, foundations, piping and valve connections, and electrical and instrumentation connections indicated may have to be altered by the CONTRACTOR to accommodate the equipment provided. No additional payment will be made to the CONTRACTOR for such revisions and alterations. Substantiating calculations and drawings shall be submitted prior to beginning the fabrication of equipment.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:

1. American Society for Testing and Materials (ASTM).

2. American National Standards Institute (ANSI).

3. American Society of Mechanical Engineers (ASME).

4. American Water Works Association (AWWA).

5. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

6. American Welding Society (AWS).

7. National Fire Protection Association (NFPA).
8. Federal Specifications (FS).
9. National Electrical Manufacturers Association (NEMA).
10. Manufacturer's published recommendations and specifications.
11. Occupational Safety and Health Administration (OSHA).
12. Hydraulic Institute (HI)

B. The following standards are referenced in this Section:

ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ASME B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy and other Special Alloys
ASME B46.1	Surface Texture
ANSI S12.6	Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors
ASME B1.20.1	General Purpose Pipe Threads (Inch)
ASME B31.1	Power Piping
ASME B31.3	Process Piping
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)
AWWA D100	Welded Steel Tanks for Water Storage
ASTM A 48	Gray Iron Castings
ASTM A 108	Steel Bars, Carbon, Cold-Finished, Standard Quality

1.3 WARRANTY

A. MANUFACTURER's Warranty shall include equipment, parts, instruments, controls and ancillary equipment included within their equipment package. Warranty to be no less than two (2) years from the date of substantial completion unless indicated otherwise in the Contract Documents.

B. CONTRACTOR's warranty shall include labor and installation. Warranty to be no less than two (2) years from date of substantial completion.

1.4 VENDOR SUBMITTALS

A. MANUFACTURER shall provide submittals directly to OWNER in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Furnish complete drawings and technical information for equipment, piping, valves, and controls. Where indicated or required by the ENGINEER, Shop Drawings shall include clear, concise calculations showing equipment anchorage forces and the capacities of the anchorage elements proposed by the MANUFACTURER.

C. Spare Parts List: The MANUFACTURER submit as part of Shop Drawings a list of suggested spare parts for each piece of equipment. MANUFACTURER shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment.

1.5 QUALITY ASSURANCE

A. Costs: Responsibility shall be the MANUFACTURERS for performing and paying the costs of inspection, startup, testing, adjustment, and instruction services performed by factory representatives. The OWNER will pay for costs of power, water and process-required chemicals (ex., anti-foam and magnesium chloride). If available, the OWNER'S operating personnel will provide assistance in the field testing.

B. Inspection: The CONTRACTOR shall inform the local authorities, such as building and plumbing inspectors, fire marshal, OSHA inspectors, and others, to witness required tests for piping, plumbing, fire protection systems, pressure vessels, safety systems, cranes, and related items to obtain required permits and certificates, and shall pay inspection fees.

C. Quality and Tolerances: Tolerances and clearances shall be as shown on the Shop Drawings and shall be closely adhered to.

1. Machine work shall be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts. Members without machined or milled ends and which are to be framed to other steel parts of the structure may have a variation in the detailed length of not greater than 1/16-inch for members 30-feet or less in length, and not greater than 1/8-inch for members over 30-feet in length.

2. Castings shall be homogeneous and free from non-metallic inclusions and defects. Surfaces of castings which are not machined shall be cleaned to remove foundry irregularities. Casting defects not exceeding 12.5 percent of the total thickness and where defects will not affect the strength and serviceability of the casting may be repaired by approved welding procedures. The ENGINEER shall be notified of larger defects. No repair welding of such defects shall be carried out without the ENGINEER'S written approval. If the removal of metal for repair reduces the stress resisting cross-section of the casting by more than 25 percent or to such an extent that the computed stress in the remaining metal exceeds the allowable stress by more than 25 percent, then the casting may be rejected. Costs of casting new material shall be the MANUFACTURER'S responsibility as part of the WORK.

3. Materials shall meet the physical and mechanical properties in accordance with the reference standards.

D. Machine Finish: The type of finish shall be the most suitable for the application as

recommended by the equipment manufacturer in micro-inches in accordance with ANSI B46.1. In the absence of manufacturer's recommendations, the following surface finishes shall be used:

1. Surface roughness not greater than 63 micro-inches shall be required for surfaces in sliding contact.

2. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.

3. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.

4. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Noise Level: Not used

B. High Noise Level Location: Not Used

C. Personal Hearing Protection: Not Used

Drive Trains and Service Factors: Service factors shall be applied in the selection or design of mechanical power transmission components. Components of drive train assemblies between the prime mover and the driven equipment shall be designed and rated to deliver the maximum peak or starting torque (whichever is the greatest), speed, and horsepower. Applicable service factors shall be considered, such as mechanical (type of prime mover), load class, start frequency, ventilation, ambient temperature, and fan factors. Drive train components include couplings, shafts, gears and gear drives, drive chains, sprockets, and V-belt drives. Unless otherwise indicated, the following load classifications shall apply in determining service factors:

Type of Equipment	Service Factor	Load Classification
Blowers		
centrifugal or vane	1.0	Uniform
lobe	1.25	Moderate Shock
Centrifugal Fans	1.0	Uniform
Pumps		
centrifugal or rotary	1.0	Uniform
reciprocating	1.8	Moderate Shock
progressing cavity	1.0	Uniform
Clarifiers	1.0	Uniform
Grit Washing Equipment	1.25	Moderate Shock

Mechanical Bar Screens	1.0	Uniform
Cranes or Hoists	1.25	Moderate Shock

D. Mechanical Service Factors

	Mechanical Service Factors	
	Electric Motor	**Internal Combustion Engine**
Uniform	1.25	1.50
Moderate Shock	1.50	1.75
Heavy Shock	2.00	2.25

E. For thermal rating adjustments such as start frequency, ambient temperature, and hourly duty cycle factor, ventilation factor, and fan factor, refer to gear manufacturer sizing information.

F. For service factors of electric motors, see Section 26 05 10 - Electric Motors.

G. Where load classifications are not indicated, the equipment manufacturer's recommendations for service factors shall be utilized.

H. Welding: Unless otherwise indicated, welding shall conform to the following:

1. Latest revision of AWWA D100.

2. Latest revision of AWWA C206.

3. Composite fabricated steel assemblies that are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds to prevent corrosion of hard-to-coat metallic surfaces.

4. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.

5. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. Sharp corners of material that are to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

I. Protective Coating: Equipment shall be painted or coated in accordance with Section 09 96 00 - Protective Coating, unless otherwise indicated. Non-ferrous metal and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.

J. Potable Water Contact: Materials immersed in or exposed to potable water shall be made of materials or coated compliant with NSF Standard 61. Bronze alloy materials in contact with potable water shall be constructed of zero-lead materials or materials whose lead content do not exceed the weighted average criteria as required by the Lead Reduction Act. Equipment manufacturer shall submit to the ENGINEER a certification of compliance with the requirement of NSF Standard 61 and the Lead Reduction Act.

K. Protection of Equipment: Machined and coated surfaces shall be protected by rust inhibitor material prior to shipment. Equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. Equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry. Equipment with anti-friction bearings or sleeve bearings shall be protected from being damaged due to jarring motion during shipment. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers should be avoided to prevent accumulation of condensate in gears and bearings. In addition, motor space heaters shall be energized and shafts shall be rotated per manufacturer's recommendation. Equipment delivered to the Site with rust or corroded parts shall be rejected. If equipment develops defects during storage, it shall be disassembled, cleaned, recoated, or otherwise corrected to restore it to original condition.

L. Identification of Equipment Items

1. At the time of shipping, each item of equipment shall have a legible identifying mark corresponding to the equipment number in the Contract Documents for the particular item.

2. After installation, each item of equipment shall be given permanent identification.

   a. Pumps, compressors, and blowers of 150 horsepower or less shall receive acrylic plastic nametags.

   b. Pumps, compressors, and blowers larger than 150 horsepower shall receive stainless steel plate nametags.

M. Vibration Isolators: Air compressors, blowers, engines, inline fans shall be provided with restrained spring-type vibration isolators or pads per manufacturer's written recommendations. Vibration isolations shall be provided with seismic restraint.

N. Equipment Maximum Allowable Vibration Level: Unless otherwise indicated, maximum allowable vibration level shall be in accordance with the acceptance criteria recommended by the reference Standard for that particular type of equipment

O. Shop Fabrication: Shop fabrication shall be performed in accordance with the Contract Documents and the Shop Drawings.

P. Controls: Equipment and system controls shall be in accordance with Division 40 - Instrumentation.

2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS

A. Equipment Supports: Equipment components and supports, anchors, and seismic

restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be the greatest of the following design criteria:

1. Design Criteria noted in Section 01 33 17 – Structural Design, Support and Anchorage.

B. Submit design calculations for equipment supports, anchors, and seismic restrainers signed and sealed by an engineer registered in the State wherein the project is to be built. Calculations shall account for forces and distribution of forces on supporting structures resulting from normal operation, normal operation plus seismic loadings, and normal operation plus wind loadings in accordance with Section 01 33 17 – Structural Design, Support and Anchorage.

1. Wall-mounted equipment weighing more than 250 pounds or which is within 18-inches above the floor shall be provided with fabricated steel supports. Pedestals shall be of welded steel. If the supported equipment is a panel or cabinet or is enclosed with removable sides, the pedestal shall match the supported equipment in appearance and dimensions.

2. Seismic requirements: Freestanding and wall-hung equipment shall be anchored in place by methods that satisfy Section 01 33 17 – Structural Design, Support and Anchorage. Calculations shall be performed and signed and stamped for equipment weighing more that 400 pounds. Calculations shall analyze lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. Calculations shall include the distribution of forces imposed on the supporting structure and anchors, verifying that each anchor can develop the required resistance forces.

3. Wind requirements: Exterior freestanding equipment shall be anchored in place by methods that satisfy Section 01 33 17 – Structural Design, Support and Anchorage. Calculations shall be performed and signed and stamped, analyzing lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. Calculations shall include the distribution of forces imposed on the supporting structure and anchors, verifying that each anchor can develop the required resistance forces.

4. Anchors: Anchor bolts shall be in accordance with Section 05 50 00 - Miscellaneous Metalwork. CONTRACTOR shall determine the size, type, capacity, location, and other placement requirements of anchorage elements. Anchoring methods and leveling criteria in the manufacturer's literature shall be followed. CONTRACTOR shall submit methods and criteria with the Shop Drawings. MANUFACTURER shall submit design loads in accordance with Section 01 33 17 – Structural Design Support and Anchorage for the CONTRACTOR'S use in designing the anchor bolts

5. Equipment Foundations: Unless otherwise indicated, mechanical equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on minimum 3.5-inch high concrete bases. Unless otherwise indicated on the Drawings, pumps, blowers, compressors and engine driven equipment shall be provided with a concrete foundation with a total weight equal to at least five times the weight of the equipment. Concrete foundations shall be isolated from the building floor in order to prevent transfer of vibration from the equipment to the building structure. The CONTRACTOR through the equipment MANUFACTURER shall verify the size and weight of

equipment foundation to ensure compatibility with equipment.

6. Equipment Grout: Mechanical equipment installed on top of concrete foundations or bases shall be provided with non-shrink concrete or epoxy grout.

2.3 COUPLINGS

A. Mechanical couplings shall be provided between the driver and the driven equipment. Flexible couplings shall be provided between the driver and the driven equipment to accommodate slight angular misalignment, parallel misalignment, end float, and to cushion shock loads. Unless otherwise indicated or recommended by the equipment manufacturer, coupling type shall be furnished with the respective equipment as follows:

Equipment Type	Coupling Type
Horizontal and end suction pumps	Gear or flexible spring
Vertical turbine pumps	3 piece spacer for solid shaft or double nut for hollow shaft
Vertical non-clog pumps, close coupled	Flexible disc pack
Screw pumps	Flexible spring, gear coupling, fluid coupling
Vertical non-clog pumps with extended shaft	Flexible disc pack or Universal joint with carbon fiber composite shaft and steady bearing support(s)
Belt conveyors	Gear coupling for fractional to 7.5 horsepower, Silicone filled fluid coupling for 10 hp and larger
Sludge collector	Gear coupling or jaw clutch
Engine driven pumps	Universal joint type or elastomeric flexible type
Single stage centrifugal blowers	Flexible disc pack
Air compressors	Gear or flexible disc pack

B. Each coupling size shall be determined based on the rated horsepower of the motor, speed of the shaft, and the load classification service factor. The MANUFACTURER shall select or recommend the size and type of coupling required to suit each specific application.

C. Differential Settlement: Where differential settlement between the driver and the driven equipment may occur, 2 sets of universal type couplings shall be provided.

D. Taper-Lock or equal bushings may be used to provide for easy installation and removal of shafts of various diameters.

2.4 SHAFTING

A. General: Equipment manufacturer shall be responsible for designing and manufacturing

shafting to carry all loads applied to the shaft. Shafting shall be continuous between bearings and shall be sized to transmit the power required. Keyways shall be accurately cut in line. Shafting shall not be turned down at the ends to accommodate bearings or sprockets whose bore is less than the diameter of the shaft. Shafts shall rotate in the end bearings and shall be turned and polished, straight, and true.

B. Design Criteria: Shafts shall be designed to carry the steady state and transient loads suitable for unlimited number of load applications.

C. Materials: Shafting materials shall be compatible with the type of service and load transmitted. Environmental elements such as corrosive gases, moisture, and fluids shall be taken into consideration. Materials shall be as indicated unless furnished as part of an equipment assembly.

1. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.

2. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.

3. Other grades of carbon steel alloys shall be suitable for service and load.

4. Corrosion-resistant shafting shall be stainless steel or Monel, whichever is most suitable for the intended service.

D. Differential Settlement: Where differential settlement between the driver and the driven equipment may occur, a shaft of sufficient length with 2 sets of universal type couplings shall be provided.

2.5 GEARS AND GEAR DRIVES

A. Unless otherwise indicated, gears shall be of the spur, helical, or spiral-bevel type, designed and manufactured in accordance with AGMA Standards, with a service factor suitable for load class, mechanical service and thermal rating adjustment, a minimum L-10 bearing life of 60,000 hours, and a minimum efficiency of 94 percent. Peak torque, starting torque, and shaft overhung load shall be checked when selecting the gear reducer. Worm gears shall not be used unless specifically approved by the ENGINEER.

B. Gear speed reducers or increasers shall be of the enclosed type, oil- or grease- lubricated and fully sealed, with a breather to allow air to escape but keep dust and dirt out. The casing shall be of cast iron, ductile iron, or heavy-duty steel construction with lifting lugs and an inspection cover for each gear train. An oil level sight glass and an oil flow indicator shall be provided, located for easy reading.

C. Gears and gear drives that are part of an equipment assembly shall be shipped fully assembled for field installation.

D. Material selections shall be selected by the manufacturer, provided the above AGMA values are met. Input and output shafts shall be adequately designed for the service and load requirements. Gears shall be computer-matched for minimum tolerance variation. The output shaft shall have 2 positive seals to prevent oil leakage.

E. Oil level and drain locations shall be easily accessible. Oil coolers or heat exchangers with required appurtenances shall be provided when necessary.

F. Where gear drive input or output shafts from one manufacturer connect to couplings or sprockets from a different manufacturer, the MANUFACTURER shall have the gear drive manufacturer furnish a matching key taped to the shaft for shipment.

2.6 DRIVE CHAINS

A. Power drive chains shall be commercial type roller chains meeting ASME Standards.

B. A chain take-up or tightener shall be provided in every chain drive arrangement to provide easy adjustment.

C. A minimum of one connecting or coupler link shall be provided in each length of roller chain.

D. Chain and attachments shall be of the manufacturer's best standard material and be suitable for the process fluid.

2.7 SPROCKETS

A. General: Sprockets shall be used in conjunction with chain drives and chain-type material handling equipment.

B. Materials: Unless otherwise indicated, materials shall be as follows:

1. Sprockets with 25 teeth or less, normally used as a driver, shall be made of medium carbon steel in the 0.40 to 0.45 percent carbon range.
2. Type A and B sprockets with 26 teeth or more, normally used as driven sprockets, shall be made of minimum 0.20 percent carbon steel.
3. Large diameter sprockets with Type C hub shall be made of cast iron conforming to ASTM A 48, Class 30.

C. Sprockets shall be accurately machined to ASME Standards. Sprockets shall have deep hardness penetration in tooth sections.

D. Finish bored sprockets shall be furnished complete with keyseat and set screws.

E. To facilitate installation and disassembly, sprockets shall be of the split type or shall be furnished with Taper-Lock bushings as required.

F. Idler sprockets shall be provided with brass or Babbitt bushings, complete with oil hole and axial or circumferential grooving with stainless steel tubing and grease fitting extended to an accessible location. Steel collars with set screws may be provided in both sides of the hub.

2.8 V-BELT DRIVES

A. V-belts and sheaves shall be of the best commercial grade and shall conform to ASME, MPTA, and RMA Standards.

B. Unless otherwise indicated, sheaves shall be machined from the finest quality gray cast iron.

C. Sheaves shall be statically balanced. In some applications where vibration is a problem, sheaves shall be dynamically balanced. Sheaves operating at belt speeds exceeding 6,500 fpm may be required to be of special materials and construction.

D. To facilitate installation and disassembly, sheaves shall be provided complete with Taper-Lock or QD bushings as required.

E. Finish bored sheaves shall be complete with keyseat and set screws.

F. Sliding motor bases shall be provided to adjust the tension of V-belts.

2.9 DRIVE GUARDS

A. Power transmission trains, prime movers, machines, shaft extensions, and moving machine parts shall be guarded to conform to the OSHA Safety and Health Standards (29CFR1910). The guards shall be constructed of minimum 10-gauge expanded, flattened steel with smooth edges and corners, galvanized after fabrication, and securely fastened. Where required for lubrication or maintenance, guards shall have hinged and latched access doors.

2.10 BEARINGS

A. General: Bearings shall conform to the standards of the American Bearing Manufacturers Association, Inc. (ABMA).

B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and lubrication shall be considered in bearing selection.

C. Re-lubricatable type bearings shall be equipped with hydraulic grease fitting in an accessible location and shall have sufficient grease capacity in the bearing chamber.

D. Lubricated-for-life bearings shall be factory-lubricated with the manufacturer's recommended grease to insure maximum bearing life and best performance.

E. Anti-Friction Type Bearing Life: Except where otherwise indicated, bearings shall have a minimum L-10 life expectancy of 5 years or 20,000 hours, whichever occurs first. Where so indicated, bearings shall have a minimum rated L-10 life expectancy corresponding to the type of service, as follows:

Type of Service	**Design Life, years**	**L-10 Design Life, hours**
	(whichever comes first)	
8-hour shift	10	20,000
16-hour shift	10	40,000
Continuous	10	60,000

F. Bearing housings shall be of cast iron or steel and bearing mounting arrangement shall

be as indicated or as recommended in the published standards of the manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.

G. Sleeve Type Bearings: Sleeve-type bearings shall have a cast iron or ductile iron housing and Babbitt or bronze liner. Bearing housing shall be bolted and doweled to the lower casing half. These housings shall be provided with cast iron caps bolted in place and the bearing end caps shall be bored to receive the bearing shells. Sleeve bearings shall be designed on the basis of the maximum allowable load permitted by the bearing manufacturer. If the sleeve bearing is connected to an equipment shaft with a coupling, the coupling transmitted thrust will be assumed to be the maximum motor or equipment thrust. Lubricant, lubrication system, and cooling system shall be as recommended by the bearing manufacturer. In accordance with the Lead Reduction Act, sleeve bearings containing lead material exposed to drinking water shall not be acceptable.

H. Plate Thrust Bearings: Thrust bearings shall be the Kingsbury Type, designed and manufactured to maintain the shaft in the fixed axial position without undue heating or the necessity of adjustment or attention. Bearings shall be oil lubricated to suit the manufacturer's standard method of lubrication for the specific bearing. If bearing cooling is required, manufacturer shall provide heat exchangers, including necessary instrumentation and controls, piping, filters, and valves.

2.11 PIPING CONNECTIONS

A. Pipe Hangers, Supports, and Guides: Pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment. Supports and hangers shall be in accordance with Section 40 05 07 Pipe Supports.

B. Flanges and Pipe Threads: Flanges on equipment and appurtenances shall conform to ASME B16.1, Class 125, or B16.5, Class 150, unless otherwise indicated. Pipe threads shall be in accordance with ASME B1.20.1 and Section 40 05 00 - Piping, General.

2.12 GASKETS AND PACKINGS

A. Gaskets and packings shall be in accordance with the requirements of the specifications. Gaskets and packings in contact with drinking water shall be NSF 61 approved. Elastomeric materials in contact with water with chloramines, or water with ozone residual shall be made of Teflon or Viton-A, or equal.

B. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be Garlock No. 432, John Crane Everseal, or equal.

C. Packing around rotating shafts (other than valve stems) shall be "O" rings, stuffing boxes, or mechanical seals, as recommended by the manufacturer and approved by the ENGINEER, in accordance with Section 43 20 00 - Pumps, General.

2.13 NAMEPLATES

A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.14 TOOLS AND SPARE PARTS

A. Tools: The MANUFACTURER shall furnish one complete set of special wrenches and other special tools necessary for the assembly, adjustment, and dismantling of the equipment. Tools shall be of best quality hardened steel forgings with bright finish. Wrench heads shall have work faces dressed to fit nuts. Tools shall be suitable for professional work and manufactured by Snap On, Crescent, Stanley, or equal. The set of tools shall be neatly mounted in a labeled toolbox of suitable design provided with a hinged cover.

B. Spare parts shall be furnished as indicated in the individual equipment sections. Spare parts shall be suitably packaged in a metal box and labeled with equipment numbers by means of stainless steel or solid plastic nametags attached to the box.

2.15 EQUIPMENT LUBRICANTS

A. The MANUFACTURER shall provide lubricants for equipment during shipping, storage, and prior to testing, in accordance with the manufacturer's recommendations. Lubricants that could come in contact with potable water shall be food grade lubricants.

PART 3 -- EXECUTION

3.1 SERVICES OF MANUFACTURER

A. Installation Supervision, Inspection, Startup, and Field Adjustment: An authorized, experienced, and competent service representative of the manufacturer shall visit the Site to perform the following:

1. Supervision of the installation of the equipment

2. Inspection, checking, and adjusting the equipment and approving its installation

3. Startup and field testing for proper operation, efficiency, and capacity

4. Performing field adjustments during the test period to ensure that the equipment installation and operation comply with requirements

5. Certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation.

6. Unless otherwise indicated, factory representative shall be present at the job site for the following number of days:

    a. Half a day per equipment for smaller than 500 horsepower.

    b. One day per equipment for 500 horsepower and larger.

B. Owner Staff Training

1. OWNER staff training shall be in accordance with Section 01 79 00 – Owner Staff Training.

2. Unless otherwise indicated, a minimum of one day of training shall be provided for

each type of equipment.

3.2 INSTALLATION

A. General: Equipment shall be installed in accordance with the manufacturer's written recommendations.

B. Alignment: Equipment shall be field tested to verify proper alignment.

3.3 PACKAGED EQUIPMENT

A. If the packaged system has any additional features (as safety interlocks, etc.) other than required by the Contract Documents, the MANUFACTURER shall coordinate such features with the ENGINEER and provide material and labor necessary for a complete installation as required by the manufacturer.

3.4 FIELD ASSEMBLY

A. Studs, cap screws, bolt and nuts used in field assembly shall be coated with Never Seize compound or equal.

3.5 WELDING

A. Welds shall be cleaned of weld-slag, splatter, etc. to provide a smooth surface.

3.6 FIELD TESTS

A. Where indicated by the individual equipment sections, equipment shall be field tested after installation to demonstrate satisfactory operation without excessive noise, vibration, or overheating of bearings or motor.

B. The following field testing shall be conducted:

1. Start equipment, check, and operate the equipment over its entire operating range. Vibration level shall be within the amplitude limits as indicated or as recommended by the reference applicable standards.

2. Obtain concurrent readings of motor voltage, amperage, capacity, vibration, and bearing temperatures.

3. Operate equipment indicated in Section 01 75 00 – Equipment Testing and Plant Startup.

C. The ENGINEER shall witness field-testing. The CONTRACTOR shall notify the ENGINEER of the test schedule 3 Days in advance.

D. In the event that any equipment fails to meet the test requirements, the equipment shall be modified and retested until it satisfies the requirement.

END OF SECTION