



Purchasing Division

Invitation for Bid

IFB-4285-16-DH

Installation for Water Treatment Plant Filter Upgrade

Responses Due:

September 13, 2016 prior to 3:30pm

Accepting Electronic Responses Only

Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)

<https://www.rockymountainbidsystem.com/default.asp>

(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. 800-835-4603)

Purchasing Representative:

Duane Hoff Jr., Senior Buyer

duaneh@gjcity.org

970-244-1545

This document has been developed specifically to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction/Mesa County solicitations. All vendors are urged to thoroughly review this solicitation prior to responding. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

Invitation for Bids

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1. Instructions to Bidders

- 1.1. **Purpose:** The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the installation of an upgraded water filter system for the City of Grand Junction Water Treatment Plant. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

Note: This project shall be constructed in accordance with the current Davis Bacon Wage Rate Determination (Refer to Appendix B – Exhibit 00800B of the Project Manual). The contract is subject to General Decision Number CO160012 dated 06/03/2016 CO12.

IFB Questions:

Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org

- 1.2. **Mandatory Site Visit Meeting:** Prospective bidders are required to attend a mandatory Site Visit meeting on August 24, 2016 at 10:00am. Meeting location shall be in the Grand Junction Water Treatment Plant, 244 26 ¼ Road, Grand Junction, CO 81503. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).
- 1.3. **The Owner:** The Owner is the City of Grand Junction and/or Mesa County, Colorado and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.
- 1.4. **Prequalification Requirement: CITY ONLY** Contractors submitting bids over \$50,000 must be pre-qualified in accordance with the City's "*Rules and Procedures for Pre-qualification of Contractors*". All bids received by the specified time will be opened, but the City will reject bids over \$50,000 from contractors who have not been prequalified. Application forms for prequalification are available at the Administration Office of the Department of Public Works, City Hall, 250 North Fifth Street, Room 245. Call 970-256-4126 or 970-244-1555 for additional information. Contractors who are currently prequalified with the Colorado Department of Transportation (CDOT) will meet the requirements for prequalification by the City, unless the City has information or basis to the contrary. Due to the time required to process applications, all applications must be submitted no later than two weeks prior to the Response Due Date. Application link: <http://www.gjcity.org/PreQualification.aspx>
- 1.5. **Submission:** Each bid shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (<https://www.rockymountainbidsystem.com/default.asp>). This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.) Please view our "**Electronic Vendor Registration Guide**" at <http://www.gjcity.org/BidOpenings.aspx> for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website

or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**)

- 1.6. **Modification and Withdrawal of Bids Before Opening.** Bids may be modified or withdrawn by an appropriate document stating such, duly executed and submitted to the place where Bids are to be submitted at any time prior to Bid Opening.
- 1.7. **Printed Form for Price Bid:** All Price Bids must be made upon the Price Bid Schedule attached, and should give the amounts both in words and in figures, and must be signed and acknowledged by the bidder.

The Offeror shall specify a unit price in figures for each pay item for which a quantity is given and shall provide the products (in numbers) of the respective unit prices and quantities in the Extended Amount column. The total Bid price shall be equal to the sum of all extended amount prices. When an item in the Price Bid Schedule provides a choice to be made by the Offeror, Offeror's choice shall be indicated in accordance with the specifications for that particular item and thereafter no further choice shall be permitted.

Where the unit of a pay item is lump sum, the lump sum amount shall be shown in the "extended amount" column and included in the summation of the total Bid.

All blank spaces in the Price Bid Schedule must be properly filled out.

Bids by corporations must be executed in the corporate name by the president or vice president or other corporate office accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Offeror's Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Contractor's Bid Form.

The contact information to which communications regarding the Bid are to be directed must be shown.

- 1.8. **Exclusions:** No oral, telephonic, emailed, or facsimile bid will be considered
- 1.9. **Contract Documents:** The complete IFB and bidder's response compose the Contract Documents. Copies of bid documents can be obtained from the City Purchasing website, <http://www.gjcity.org/BidOpenings.aspx>.
- 1.10. **Additional Documents:** The July 2010 edition of the "City Standard Contract Documents for Capital Improvements Construction", Plans, Specifications and other Bid Documents are available for review or download on the Public Works &

Planning/Engineering page at www.gjcity.org. Electronic copies may be obtained on a CD format at the Department of Public Works and Planning at City Hall.

- 1.11. Definitions and Terms:** See Article I, Section 3 of the General Contract Conditions in the *Standard Contract Documents for Capital Improvements Construction*.
- 1.12. Examination of Specifications:** Bidders shall thoroughly examine and be familiar with the project Statement of Work. The failure or omission of any Offeror to receive or examine any form, addendum, or other document shall in no way relieve any Offeror from any obligation with respect to his bid. The submission of a bid shall be taken as evidence of compliance with this section. Prior to submitting a bid, each Offeror shall, at a minimum:
- a. Examine the *Contract Documents* thoroughly;
 - b. Visit the site to familiarize themselves with local conditions that may in any manner affect cost, progress, or performance of the Work;
 - c. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress or performance of the Work;
 - d. Study and carefully correlate Bidder's observations with the *Contract Documents*, and;
 - e. Notify the Engineer of all conflicts, errors, ambiguities or discrepancies in or among the *Contract Documents*

On request, the Owner will provide each Offeror access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. It shall be the Offeror's responsibility to make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (including without limitation, surface, subsurface and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the work and which the Offeror deems necessary to determine its Bid for performing the work in accordance with the time, price and other terms and conditions of the Contract Documents. Location of any excavation or boring made by Offeror shall be subject to prior approval of Owner and applicable agencies. Offeror shall fill all holes, restore all pavements to match the existing structural section and shall clean up and restore the site to its former condition upon completion of such exploration. The Owner reserves the right to require the Offeror to execute an access agreement with the Owner prior to accessing the site.

The lands upon which the Work is to be performed, rights of way, and access thereto, and other lands designated for use by Contractor in performing the Work, are identified on the Drawings.

Information and data reflected in the *Contract Documents* with respect to underground utilities at or contiguous to the site are based upon information and data furnished to

the Owner and the Engineer by the owners of such underground utilities or others, and the Owner does not assume responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the *Contract Documents*.

By submission of a Bid, the Offeror shall be conclusively presumed to represent that the Offeror has complied with every requirement of these Instructions to Bidders, that the *Contract Documents* are not ambiguous and are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

- 1.13. Questions Regarding Statement of Work:** Any information relative to interpretation of Scope of Work or specifications shall be requested of the Purchasing Representative, in writing, in ample time prior to the response time.
- 1.14. Addenda & Interpretations:** If it becomes necessary to revise any part of this solicitation, a written addendum will be posted electronically on the City's website at <http://www.gjcity.org/BidOpenings.aspx>. The Owner is not bound by any oral representations, clarifications, or changes made in the written specifications by Owner, unless such clarification or change is provided in written addendum form from the City Purchasing Representative.
- 1.15. Taxes:** The Owner is exempt from State retail and Federal tax. The bid price must be net, exclusive of taxes.
- 1.16. Sales and Use Taxes:** The Contractor and all Subcontractors are required to obtain exemption certificates from the Colorado Department of Revenue for sales and use taxes in accordance with the provisions of the General Contract Conditions. Bids shall reflect this method of accounting for sales and use taxes on materials, fixtures and equipment.
- 1.17. Offers Binding 60 Days:** Unless additional time is required by the Owner, or otherwise specified, all formal offers submitted shall be binding for sixty (60) calendar days following opening date, unless the Bidder, upon request of the Purchasing Representative, agrees to an extension.
- 1.18. Collusion Clause:** Each bidder by submitting a bid certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all bids shall be rejected if there is evidence or reason for believing that collusion exists among bidders. The Owner may, or may not, accept future bids for the same services or commodities from participants in such collusion.
- 1.19. Disqualification of Bidders:** A Bid will not be accepted from, nor shall a Contract be awarded to, any person, firm, or corporation that is in arrears to the Owner, upon debt or contract, or that has defaulted, as surety or otherwise, upon any obligation to the Owner, or that is deemed irresponsible or unreliable.

Bidders may be required to submit satisfactory evidence that they are responsible, have a practical knowledge of the project bid upon and that they have the necessary financial and other resources to complete the proposed Work.

Either of the following reasons, without limitation, shall be considered sufficient to disqualify a Bidder and Bid:

- a. More than one Bid is submitted for the same Work from an individual, firm, or corporation under the same or different name; and
- b. Evidence of collusion among Bidders. Any participant in such collusion shall not receive recognition as a Bidder for any future work of the Owner until such participant has been reinstated as a qualified bidder.

1.20. Public Disclosure Record: If the bidder has knowledge of their employee(s) or sub-contractors having an immediate family relationship with a City/County employee or elected official, the bidder must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable "Public Disclosure Record", a statement of financial interest, before conducting business with the City/County.

2. General Contract Conditions for Construction Projects

2.1. The Contract: This Invitation for Bid, submitted documents, and any negotiations, when properly accepted by the City/County, shall constitute a contract equally binding between the City/County and Contractor. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The contract may be amended or modified with Change Orders, Field Orders, or Addendums.

2.2. The Work: The term Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.

2.3. Execution, Correlation, Intent, and Interpretations: The Contract Documents shall be signed in not less than triplicate by the Owner (City/County) and Contractor. City/County will provide the contract. By executing the contract, the Contractor represents that he/she has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the City/County are, and shall remain, City/County property. They are not to be used on any other project, and with the exception of one contract set for each party to the contract, are to be returned to the owner on request at the completion of the work.

2.4. The Owner: The Owner is the City of Grand Junction and/or Mesa County, Colorado and is referred to throughout the Contract Documents. The term Owner means the Owner or his authorized representative. The Owner shall, at all times, have access to the work wherever it is in preparation and progress. The Contractor shall provide

facilities for such access. The Owner will make periodic visits to the site to familiarize himself generally with the progress and quality of work and to determine, in general, if the work is proceeding in accordance with the contract documents. Based on such observations and the Contractor's Application for Payment, the Owner will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in the contract. The Owner will have authority to reject work which does not conform to the Contract documents. Whenever, in his reasonable opinion, he considers it necessary or advisable to insure the proper implementation of the intent of the Contract Documents, he will have authority to require the Contractor to stop the work or any portion, or to require special inspection or testing of the work, whether or not such work can be then be fabricated, installed, or completed. The Owner will not be responsible for the acts or omissions of the Contractor, and sub-Contractor, or any of their agents or employees, or any other persons performing any of the work.

- 2.5. Contractor:** The Contractor is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.
- 2.6. Sub-Contractors:** A sub-contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is referred to throughout the contract documents and means a sub-contractor or his authorized representative.
- 2.7. Award of Sub-Contractors & Other Contracts for Portions of the Work:** As soon as practicable after bids are received and prior to the award of the contract, the successful Contractor shall furnish to the Owner, in writing for acceptance, a list of the names of the sub-contractors or other persons or organizations proposed for such portions of the work as may be designated in the proposal requirements, or, if none is so designated, the names of the sub-contractors proposed for the principal portions of the work. Prior to the award of the contract, the Owner shall notify the successful Contractor in writing if, after due investigation, has reasonable objection to any person or organization on such list. If, prior to the award of the contract, the Owner has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the successful Contractor may, prior to the award, withdraw their proposal without forfeiture of proposal security. If the successful Contractor submits an acceptable substitute with an increase in the proposed price to cover the difference in cost occasioned by the substitution, the Owner may, at their discretion, accept the increased proposal or may disqualify the Contractor. If, after the award, the Owner refuses to accept any person or organization on such list, the Contractor shall submit an acceptable substitute and the contract sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued. However, no increase in the contract sum shall be allowed for any such

substitution unless the Contractor has acted promptly and responsively in submitting a name with respect thereto prior to the award.

- 2.8. Quantities of Work and Unit Price:** Materials or quantities stated as unit price items in the Bid are supplied only to give an indication of the general scope of the Work, and are as such, estimates only. The Owner does not expressly or by implication agree that the actual amount of Work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit item of the Work without a change in the unit price except as set forth in Article VIII, Section 70 of the *General Contract Conditions*. The City also reserves the right to make changes in the Work (including the right to delete any bid item in its entirety or add additional bid items) as set forth in Article VIII, Sections 69 through 71 of the *General Contract Conditions*.
- 2.9. Substitutions:** The materials, products and equipment described in the *Solicitation Documents* shall be regarded as establishing a standard of required performance, function, dimension, appearance, or quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless the Offeror submits a written request for approval to the City Purchasing Division at least ten (10) days prior to the date for receipt of Bids. Such requests for approval shall include the name of the material or equipment for which substitution is sought and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for evaluation, including samples if requested. The Offeror shall set forth changes in other materials, equipment, or other portions of the Work including changes of the work of other contracts, which incorporation of the proposed substitution would require to be included. The Owner's decision of approval or disapproval of a proposed substitution shall be final. If the Owner approves a proposed substitution before receipt of Bids, such approval will be set forth in an Addendum. Offerors shall not rely upon approvals made in any other manner.
- 2.10. Supervision and Construction Procedures:** The Contractor shall supervise and direct the work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.
- 2.11. Warranty:** The Contractor warrants to the Owner that all materials and equipment furnished under this contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards may be considered defective. If required by Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If within ten (10) days after written notice to the Contractor requesting such repairs or replacement, the Contractor should neglect to make or undertake with due diligence to the same, the City may make such repairs or replacements. All indirect and direct costs of such correction or removal or replacement shall be at the Contractor's expense. The Contractor will also bear the expenses of making good all work of others destroyed or damaged by the correction, removal or replacement of his defective work.
- 2.12. Permits, Fees, & Notices:** The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of

the work. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by approximate modification. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility and shall bear all costs attributable.

- 2.13. Responsibility for Those Performing the Work:** The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all sub-contractors, their agents and employees, and all other persons performing any of the work under a contract with the Contractor.
- 2.14. Use of the Site:** The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.
- 2.15. Cleanup:** The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of work he shall remove all his waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials.
- 2.16. Insurance:** The Contractor shall secure and maintain such insurance policies as will provide the coverage and contain other provisions specified in the General Contract Conditions, or as modified in the Special Contract Conditions.

The Contractor shall file a copy of the policies or Certificates of Insurance acceptable to the City with the Engineer within ten (10) Calendar Days after issuance of the Notice of Award. These Certificates of Insurance shall contain a provision that coverage afforded under the policies shall not be canceled unless at least thirty (30) Calendar Days prior written notice has been given to the City.

- 2.17. Indemnification:** The Contractor shall defend, indemnify and save harmless the Owner, and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Contractor, or of any Contractor's agent, employee, sub-contractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Contractor shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.
- 2.18. Miscellaneous Conditions:** **Material Availability:** Contractors must accept responsibility for verification of material availability, production schedules, and other pertinent data prior to submission of bid. It is the responsibility of the bidder to notify the Owner immediately if materials specified are discontinued, replaced, or not available for an extended period of time. **OSHA Standards:** All bidders agree and warrant that services performed in response to this invitation shall conform to the standards declared

by the US Department of Labor under the Occupational Safety and Health Act of 1970 (OSHA). In the event the services do not conform to OSHA standards, the Owner may require the services to be redone at no additional expense to the Owner.

- 2.19. Time:** Time is of the essence with respect to the time of completion of the Project and any other milestones or deadline which are part of the Contract. It will be necessary for each Bidder to satisfy the City of its ability to complete the Work within the Contract Time set forth in the Contract Documents. The Contract Time is the period of time allotted in the Contract Documents for completion of the work. The date of commencement of the work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Contract or such other date as may be established therein, or as established as entered on the Bid Form. The Date of Substantial Completion of the work or designated portions thereof is the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents.
- 2.20. Progress & Completion:** The Contractor shall begin work on the date of commencement as defined in the Contract, and shall carry the work forward expeditiously with adequate forces and shall complete it within the contract time.
- 2.21. Payment & Completion:** The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when he finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents.
- 2.22. Bid Bond:** Each Bid shall as a guaranty of good faith on the part of the Bidder be accompanied by a Bid Guaranty consisting of: a certified or cashier's check drawn on an approved national bank or trust company in the state of Colorado, and made payable without condition to the City; or a **Bid Bond** written by an approved corporate surety in favor of the City. The amount of the Bid Guaranty shall not be less than 5% of the total Bid amount. Once a Bid is accepted and a Contract is awarded, the apparent successful bidder has ten calendar days to enter into a contract in the form prescribed and to furnish the bonds with a legally responsible and approved surety. Failure to do so will result in forfeiture of the Bid Guaranty to the City as Liquidated Damages.

Each bidder shall guaranty its total bid price for a period of sixty (60) Calendar Days from the date of the bid opening.

- 2.23. Performance & Payment Bonds:** Contractor shall furnish a Performance and a Payment Bond, each in an amount at least equal to that specified for the contract amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These bonds shall remain in effect for the duration of the Warranty Period (as specified in the Special Conditions). Contractor shall also furnish other bonds that may be required by the Special Conditions. All bonds shall be in the forms prescribed by the Contract Documents and be executed by such sureties as (1) are licensed to conduct business in the State of Colorado and (2) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on

Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of the Authority Act. If the surety on any bond furnished by the Contractor is declared bankrupt, or becomes insolvent, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements of clauses (1) and (2) of this section, Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the City.

- 2.24. Retention:** The Owner will deduct money from the partial payments in amounts considered necessary to protect the interest of the Owner and will retain this money until after completion of the entire contract. The amount to be retained from partial payments will be five (5) percent of the value of the completed work, and not greater than five (5) percent of the amount of the Contract. When the retainage has reached five (5) percent of the amount of the Contract no further retainage will be made and this amount will be retained until such time as final payment is made.
- 2.25. Liquidated Damages for Failure to Enter Into Contract: CITY ONLY** Should the Successful Bidder fail or refuse to enter into the Contract within ten Calendar Days from the issuance of the Notice of Award, the City shall be entitled to collect the amount of such Bidder's Bid Guaranty as Liquidated Damages, not as a penalty but in consideration of the mutual release by the City and the Successful Bidder of all claims arising from the City's issuance of the Notice of Award and the Successful Bidder's failure to enter into the Contract and the costs to award the Contract to any other Bidder, to readvertise, or otherwise dispose of the Work as the City may determine best serves its interest.
- 2.26. Liquidated Damages for Failure to Meet Project Completion Schedule: CITY ONLY** If the Contractor does not achieve Final Completion by the required date, whether by neglect, refusal or any other reason, the parties agree and stipulate that the Contractor shall pay liquidated damages to the City for each such day that final completion is late. As provided elsewhere, this provision does not apply for delays caused by the City. The date for Final Completion may be extended in writing by the Owner.

The Contractor agrees that as a part of the consideration for the City's awarding of this Contract liquidated damages in the daily amount of **\$500.00** is reasonable and necessary to pay for the actual damages resulting from such delay. The parties agree that the real costs and injury to the City for such delay include hard to quantify items such as: additional engineering, inspection and oversight by the City and its agents; additional contract administration; inability to apply the efforts of those employees to the other work of the City; perceived inefficiency of the City; citizens having to deal with the construction and the Work, rather than having the benefit of a completed Work, on time; inconvenience to the public; loss of reputation and community standing for the City during times when such things are very important and very difficult to maintain.

The Contractor must complete the Work and achieve final completion included under the Bid Schedule in the number of consecutive calendar days after the City gives is written Notice to Proceed. When the Contractor considers the entire Work ready for its intended use, Contractor shall certify in writing that the Work is substantially complete. In addition to the Work being substantially complete, Final Completion date is the date by which the

Contractor shall have fully completed all clean-up, and all items that were identified by the City in the inspection for final completion. Unless otherwise stated in the Special Conditions, for purposes of this liquidated damages clause, the Work shall not be finished and the Contract time shall continue to accrue until the City gives its written Final Acceptance.

If the Contractor shall fail to pay said liquidated damages promptly upon demand thereof after having failed to achieve Final Completion on time, the City shall first look to any retainage or other funds from which to pay said liquidated damages; if retainage or other liquid funds are not available to pay said liquidated damages amounts, the Surety on the Contractor's Performance Bond and Payment Bond shall pay such liquidated damages. In addition, the City may withhold all, or any part of, such liquidated damages from any payment otherwise due the Contractor.

Liquidated damages as provided do not include any sums to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. Should the City incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the Contractor agrees to pay these costs that the City incurs because of the Contractor's delay, and these payments are separate from and in addition to any liquidated damages.

The Contractor agrees that the City may use its own forces or hire other parties to obtain Substantial or Final Completion of the work if the time of completion has elapsed and the Contractor is not diligently pursuing completion. In addition to the Liquidated Damages provided for, the Contractor agrees to reimburse the City for all expenses thus incurred.

2.27. Contingency/Force Account: Contingency/Force Account work will be authorized by the Owner's Project Manager and is defined as minor expenses to cover miscellaneous or unforeseen expenses related to the project. The expenses are not included in the Drawings, Specifications, or Scope of Work and are necessary to accomplish the scope of this contract. Contingency/Force Account Authorization will be directed by the Owner through an approved form. Contingency/Force Account funds are the property of the Owner and any Contingency/Force Account funds, not required for project completion, shall remain the property of the Owner. Contractor is not entitled to any Contingency/Force Account funds, that are not authorized by Owner or Owner's Project Manager.

2.28. Protection of Persons & Property: The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by

repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.

- 2.29. Changes in the Work:** The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by Change Order and shall be executed under the applicable conditions of the contract documents. A Change Order is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. The contract sum and the contract time may be changed only by Change Order.
- 2.30. Claims for Additional Cost or Time:** If the Contractor wishes to make a claim for an increase in the contract sum or an extension in the contract time, he shall give the Owner written notice thereof within a reasonable time after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property in which case the Contractor shall precede in accordance with the regulations on safety. No such claim shall be valid unless so made. Any change in the contract sum or contract time resulting from such claim shall be authorized by Change Order.
- 2.31. Minor Changes in the Work:** The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.
- 2.32. Field Orders:** The Owner may issue written Field Orders which interpret the Contract Documents in accordance with the specifications, or which order minor changes in the work in accordance with the agreement, without change in the contract sum or time. The Contractor shall carry out such Field Orders promptly.
- 2.33. Uncovering & Correction of Work:** The Contractor shall promptly correct all work rejected by the Owner as defective or as failing to conform to the contract documents whether observed before or after substantial completion and whether or not fabricated installed or completed. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. If within one (1) year after the date of completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the contract documents, any of the work found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discover of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner. The Contractor shall bear the cost of making good all work of separate Contractors destroyed or damaged by such removal or correction. If the Owner prefers to accept defective or non-conforming work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the

payment or contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.

- 2.30. Amendment:** No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All amendments to the contract shall be made in writing by the Owner.
- 2.31. Assignment:** The Contractor shall not sell, assign, transfer or convey any contract resulting from this IFB, in whole or in part, without the prior written approval from the Owner.
- 2.32. Compliance with Laws:** Bids must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements.
- 2.33. Confidentiality:** All information disclosed by the Owner to the Contractor for the purpose of the work to be done or information that comes to the attention of the Contractor during the course of performing such work is to be kept strictly confidential.
- 2.34. Conflict of Interest:** No public official and/or City/County employee shall have interest in any contract resulting from this IFB.
- 2.35. Contract Termination:** This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation.
- 2.36. Employment Discrimination:** During the performance of any services per agreement with the Owner, the Contractor, by submitting a Bid, agrees to the following conditions:
 - 2.36.1.** The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, handicap, or national origin except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Contractor. The Contractor agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
 - 2.36.2.** The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, shall state that such Contractor is an Equal Opportunity Employer.
 - 2.36.3.** Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.
- 2.37. Affirmative Action:** In executing a Contract with the City, the Contractor agrees to comply with Affirmative Action and Equal Employment Opportunity regulations presented in the General Contract Conditions.

- 2.38. Immigration Reform and Control Act of 1986 and Immigration Compliance:** The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).
- 2.39. Ethics:** The Contractor shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.
- 2.40. Failure to Deliver:** In the event of failure of the Contractor to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Contractor responsible for any costs resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.
- 2.41. Failure to Enforce:** Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.
- 2.42. Force Majeure:** The Contractor shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Contractor, unless otherwise specified in the contract.
- 2.43. Independent Contractor:** The Contractor shall be legally considered an Independent Contractor and neither the Contractor nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner shall be at no time legally responsible for any negligence or other wrongdoing by the Contractor, its servants, or agents. The Owner shall not withhold from the contract payments to the Contractor any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Contractor. Further, the Owner shall not provide to the Contractor any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.
- 2.44. Nonconforming Terms and Conditions:** A bid that includes terms and conditions that do not conform to the terms and conditions of this Invitation for Bid is subject to rejection as non-responsive. The Owner reserves the right to permit the Contractor to withdraw nonconforming terms and conditions from its bid prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions.

Items for non-responsiveness may include, but not be limited to:

- a. Submission of the Bid on forms other than those supplied by the City;
- b. Alteration, interlineation, erasure, or partial detachment of any part of the forms which are supplied herein;

- c. Inclusion of unauthorized additions conditional or alternate Bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite, or ambiguous as to its meaning;
- d. Failure to acknowledge receipt of any or all issued Addenda;
- e. Failure to provide a unit price or a lump sum price, as appropriate, for each pay item listed except in the case of authorized alternative pay items;
- f. Failure to list the names of Subcontractors used in the Bid preparation as may be required in the Solicitation Documents;
- g. Submission of a Bid that, in the opinion of the Owner, is unbalanced so that each item does not reasonably carry its own proportion of cost or which contains inadequate or unreasonable prices for any item;
- h. Tying of the Bid with any other bid or contract; and
- i. Failure to calculate Bid prices as described herein.

2.45. Evaluation of Bids and Offers: The Owner reserves the right to:

- reject any and all Bids,
- waive any and all informalities,
- negotiate final terms with the Successful Bidder, and
- disregard any and all nonconforming, nonresponsive or conditional Bids.

Discrepancies between words and figures will be resolved in favor of words. Discrepancies between Unit Prices and Extended Prices will be resolved in favor of the Unit Prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. The corrected extensions and totals will be shown in the tabulation of Bids.

The Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of Subcontractors and other persons and organizations must be submitted. Operating costs, maintenance considerations performance data, and guarantees of materials and equipment may also be considered by the Owner.

The Owner will conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Offeror, proposed Subcontractors and other persons and organizations to do the Work in accordance with the *Contract Documents* to the City's satisfaction within the Contract Time.

The Offeror shall furnish the Owner all information and data requested by the Owner to determine the ability of the Offeror to perform the Work. The Owner reserves the right to reject the Bid if the evidence submitted by, or investigation of such Offeror fails to satisfy the Owner that such Offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

By submitting a Bid, each Offeror authorizes the Owner to perform such investigation of the Offeror as the Owner deems necessary to establish the responsibility, qualifications and financial ability of the Offeror and, by its signature thereon, authorizes the Owner to obtain reference information concerning the Offeror and releases the party providing such information and the Owner from any and all liability to the Offeror as a result of such reference information so provided.

The Owner reserves the right to reject the Bid of any Offeror who does not pass any evaluation to the Owner's satisfaction.

If the Contract is to be awarded, it will be awarded to the Offeror who, by evaluation, the Owner determines will best meet the Owner's interests.

The Owner reserves the right to accept or reject the Work contained in any of the Price Bid Schedules or alternates, either in whole or in part.

2.46. Award of Contract: Unless otherwise indicated, a single award will be made for all the bid items in an individual bid schedule. In the event that the Work is contained in more than one Bid Schedule, the City may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative Schedules will be awarded. Within forty-five (45) Calendar Days of Bid Opening, the City will issue a Notice of Award to the Successful Bidder which will be accompanied by four (4) unsigned copies of the Contract and the Performance and Payment Bond forms. Within ten (10) Calendar Days thereafter, the Successful Bidder shall sign and deliver four (4) copies of the Contract, Performance Bond, Payment Bond and Certificates of Insurance to the City. Within ten (10) Calendar Days thereafter, the City will deliver two (2) fully executed counterparts of the Contract to the Contractor. No contract shall exist between the Successful Bidder and the City and the Successful Bidder shall have no rights at law or in equity until the Contract has been duly executed by the City.

The Successful Bidder's failure to sign and submit a Contract and other documents set forth in this Paragraph within the prescribed time shall be just cause of annulment of the award, and forfeiture of the Bid Guaranty. The award of Contract may then be made to the next qualified Bidder in the same manner as previously prescribed.

2.47. Ownership: All plans, prints, designs, concepts, etc., shall become the property of the Owner.

2.48. Oral Statements: No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.

- 2.49. Patents/Copyrights:** The Contractor agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Contractor for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this IFB.
- 2.50. Remedies:** The Contractor and Owner agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.
- 2.51. Venue:** Any agreement as a result of responding to this IFB shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.
- 2.52. Expenses:** Expenses incurred in preparation, submission and presentation of this IFB are the responsibility of the company and cannot be charged to the Owner.
- 2.53. Sovereign Immunity:** The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.
- 2.54. Non-Appropriation of Funds:** The contractual obligation of the Owner under this contract is contingent upon the availability of appropriated funds from this fiscal year budget as approved by the City Council or Board of County Commissioners from this fiscal year only. State of Colorado Statutes prohibit obligation of public funds beyond the fiscal year for which the budget was approved. Anticipated expenditures/obligations beyond the end of the current Owner's fiscal year budget shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.
- 2.55. Cooperative Purchasing:** Purchases as a result of this solicitation are primarily for the City/County. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Bid. The quantities furnished in this bid document are for only the City/County. It does not include quantities for any other jurisdiction. The City or County will be responsible only for the award for its jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The City/County accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.
- 2.56. Keep Jobs in Colorado Act:** Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and

residency required by C.R.S. §8-17-101(2)(a). If Contractor claims it is entitled to a waiver pursuant to C.R.S. §8-17-101(1), Contractor shall state that there is insufficient Colorado labor to perform the work such that compliance with Article 17 would create an undue burden that would substantially prevent a project from proceeding to completion, and shall include evidence demonstrating the insufficiency and undue burden in its response.

Unless expressly granted a waiver by the Owner pursuant to C.R.S. §8-17-101(1), Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a).

2.56.1. "Public project" is defined as:

- (a) any construction, alteration, repair, demolition, or improvement of any land, building, structure, facility, road, highway, bridge, or other public improvement suitable for and intended for use in the promotion of the public health, welfare, or safety and any maintenance programs for the upkeep of such projects
- (b) for which appropriate or expenditure of moneys may be reasonably expected to be \$500,000.00 or more in the aggregate for any fiscal year
- (c) except any project that receives federal moneys.

3. Statement of Work

3.1. GENERAL: The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the installation of an upgraded water filter system for the City of Grand Junction Water Treatment Plant. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

3.2. PROJECT DESCRIPTION: This project consists of upgrades to the existing water treatment filter system. The project generally comprises the removal of the existing surface wash system, supply pipes and pump; demolition of the wheeler block underdrain system inside the existing filter structures; installation of the new filter air scour system including blower, valves, electric actuators supports and associated piping for the filters; upgrade of the four existing dual-cell filters, to a Leopold Universal Type XA Underdrain system, including replacement of media; and installation of associated electrical, mechanical and control improvements.

The contractor will furnish and pay for all equipment, supplies, appurtenances except for those items noted in the pre-purchase agreements (see attached), provide all construction equipment and tools and perform all necessary labor and supervision.

The contractor will coordinate the progress of the work including coordination between trades, subcontractors, suppliers, public utilities, and Owner to insure the progress of the work

See Project Manual Division 01.1.5 for a more detailed description of work and work sequence. Allowable filter shutdown durations is between October 15, 2016 and March 31, 2017. The contractor will have no more than 2 filters of the four offline during any time during the project. The contractor is required to substantially complete the rehabilitation of all four filters before March 31, 2017. The work includes but is not limited to the installation and operability of the following items in the rehabilitated filters: underdrains; media and equipment; disinfection of filter basins (verified by bacteriological sampling); air scour system including piping, supports, blower, variable frequency drives associated appurtenances and encasement of all air headers where indicated; instrumentation and control work and all painting. It also includes the completion of startup and training. The contractor shall coordinate the filter shutdown periods with the Owner and Engineer. The contractor shall be responsible for removing all components of the filter including any remaining raw water the Owner is unable to remove for hydraulic reasons. The Water Treatment Plant must remain operational during the construction project.

3.3. SPECIAL CONDITIONS & PROVISIONS:

3.3.1 Mandatory Site Visit Meeting: Prospective bidders are required to attend a mandatory Site Visit meeting on August 24, 2016 at 10:00am. Meeting location shall be in the Grand Junction Water Treatment Plant, 244 26 ¼ Road, Grand Junction, CO 81503. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

3.3.2 QUESTIONS REGARDING SOLICIATION PROCESS/SCOPE OF WORK:

Duane Hoff Jr., Senior Buyer
City of Grand Junction
duaneh@gjcity.org

3.3.3 Project Manager: The Project Manager for the Project is John Eklund, Project Engineer, who can be reached at (970)244-1558. During Construction, all notices, letters, submittals, and other communications directed to the City shall be addressed and mailed or delivered to:

City of Grand Junction
Department of Public Works and Planning
Attn: John Eklund, Project Manager
250 North Fifth Street
Grand Junction, CO 81501

3.3.4 Affirmative Action: The Contractor is not required to submit a written Affirmative Action Program for the Project.

3.3.5 General Contractor Bidder Qualification Format: All information required from this section (00210) shall be include with the Contractor's electronic bid response. See attached Section 00210.

3.3.4 Davis Bacon Wages, Equal Employment Opportunity (EEO), and Women : The State Revolving Fund requires provide specificaitons for Davis Bacon Wages, Equal Employment Oportunity (EEO), bot have excepted DBE for the Water Treatment Plant Filter Upgrade project. All specifications can be found in the section titled State Revolving Fund Required Specifications. The Davis Bacon Wages are subject to General Decision Number CO160012, dated 06/03/2016 CO12 Heavy. Goals for Equal Opportunity Employment have been set at 10.2% (Mesa County) for Minority Participation and 6.9% (National) for Female Participation

3.3.4 Pricing: Pricing shall be all inclusive to include but not be limited to: all labor, equipment, supplies, materials, freight (F.O.B. Destination – Freight Pre-paid and Allowed to each site), travel, mobilization costs, fuel, set-up and take down costs, and full-time inspection costs, and all other costs related to the successful completion of the project.

The Owner shall not pay nor be liable for any other additional costs including but not limited to: taxes, shipping charges, insurance, interest, penalties, termination payments, attorney fees, liquidated damages, etc.

3.3.5 Freight/Shipping: All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to the project site(s), Grand Junction, CO.

Contractor must meet all federal, state, and local rules, regulations, and requirements for providing such services.

3.3.6 Contract: A binding contract shall consist of: (1) the IFB and any amendments thereto, (2) the bidder's response (bid) to the IFB, (3) clarification of the bid, if any, and (4) the City's Purchasing Department's acceptance of the bid by "Notice of Award" or by "Purchase Order". All Exhibits and Attachments included In the IFB shall be incorporated into the contract by reference.

A. The contract expresses the complete agreement of the parties and, performance shall be governed solely by the specifications and requirements contained therein.

B. Any change to the contract, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the bidder and the City Purchasing Division or by a modified Purchase Order prior to the effective date of such modification. The bidder expressly and explicitly understands and agrees that no other method and/or no other document, including acts and oral communications by or from any person, shall be used or construed as an amendment or modification to the contract.

3.3.7 Time of Completion: The scheduled time of Completion for the Project is 150 Calendar Days from the starting date specified in the Notice to Proceed. Equipment ordering lead time shall not be counted against in the calendar days for project completion.

Completion is achieved when site cleanup and all punch list items (resulting from the final inspection) have been completed. Completion shall have the meaning set forth in Article I, Section 3 (Definitions and Terms) of the General Contract Conditions.

3.3.8 Working Days and Hours: The working days and hours shall be as stated in the General Contract Conditions or as mutually agreed upon in the preconstruction meeting with the following exception:

All work shall be performed between the hours of 7:00 AM to 5:00 PM Monday through Friday. Other work hours and days may be allowed by the City and Engineer upon request. Written notice of alternative work hours and days must be requested a minimum of 48 hours in advance.

3.3.9 Licenses and Permits: Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See Section 2.12. Contractor shall supply to Owner all copies of finalized permits.

3.3.10 Permits: The following permits are required for the Project and will be obtained by the City at no cost to the Contractor:

None

The following permits are required for the Project and shall be obtained and paid for by the Contractor, with the costs included in the total bid price for the Project:

1. Permits and notices authorizing building demolition
2. Certificates of severance of utility service
3. Permit for transport and disposal of debris

3.3.11 City Furnished Materials: The City will furnish the following materials for the Project:

- Leopold Universal Type XA Underdrain System including
 - LMS 200 Media Retainer
 - Air Header Pipe
 - Filter Media
- Two (2) Denver Gardener Model -IQ HF 514 Blowers each with 75 HP motos including variable speed drive, Line Reactor and Communiation Module, EMC Filter, Oil Level Sensor and Oil Temperature Sensor
 - Spare Parts

3.3.12 Project Newsletters: A newsletter for the Project will be prepared and distributed by the City. It will include general information about the Project including interruptions in utility services, street closures, parking restrictions, project schedule, and the names and telephone numbers of the contacts for the City and Contractor. The newsletter will be mailed approximately one week before the Contractor commences work.

The Contractor will be responsible for notifying all businesses and / or residents located adjacent to the work.

3.3.13 Project Sign: Project signs, if any, will be furnished and installed by the City.

3.3.14 Authorized Representatives of the City: Those authorized to represent the City shall include Purchasing Agent, Engineers, and Inspectors employed by the City, only.

3.3.15 Stockpiling Materials and Equipment: All stockpiling/storage shall be in accordance with General Contract Condition Section 51.

3.3.16 Clean-Up: The Contractor is responsible for cleaning up all loose materials that have been deposited or swept into gutters, and onto sidewalks and driveways as a result of sidewalk operations. The costs for all clean-up work shall be considered incidental and will not be paid for separately.

3.3.17 Quality Control Testing: Supplier shall perform quality control testing on concrete. The City will perform all other necessary QA.

3.3.18 Schedule of Submittals: Contractor shall deliver these submittals at least two days prior to the pre-construction meeting:

- Project Schedule

3.3.22 Excess Material: All excess materials shall be disposed in accordance with General Contract Condition Section 50.

3.3.24 Incidental Items: Any item of work not specifically identified or paid for directly, but which is necessary for the satisfactory completion of any paid items of work, will be considered as incidental to those items, and will be included in the cost of those items.

3.3.26 Work to be Performed by the City (Prior to Construction):

3.4. SCOPE OF WORK: See attached drawings, scope, and specifications.

3.5. IFB TENTATIVE TIME SCHEDULE:

Invitation For Bids available	August 12, 2016
Mandatory Pre-Bid Meeting	August 24, 2016
Inquiry deadline, no questions after this date	August 31, 2016
Addendum Posted	September 7, 2016
Submittal deadline for bids	September 13, 2016
City Council Approval	October 19, 2016
Notice of Award & Contract execution	October 20, 2016
Bonding & Insurance Cert due	October 26, 2016
Preconstruction meeting	October 26, 2016
Work begins no later than	October 31, 2016
Final Completion	150 Calendar Days from Notice to Proceed
Holidays:	November 11, 2016 – Veterans Day November 24, 2016 – Thanksgiving December 25, 2016 – Christmas Day January 1, 2016 – New Years Day February 20, 2016 – Presidents' Day

4. Contractor's Bid Form

Bid Date: _____

Project: IFB-4285-16-DH "Installation for Water Treatment Plant Filter Upgrade"

Bidding Company: _____

Name of Authorized Agent: _____

Email _____

Telephone _____ **Address** _____

City _____ **State** _____ **Zip** _____

The undersigned Bidder, in compliance with the Invitation for Bids, having examined the Instruction to Bidders, General Contract Conditions, Statement of Work, Specifications, and any and all Addenda thereto, having investigated the location of, and conditions affecting the proposed work, hereby proposes to furnish all labor, materials and supplies, and to perform all work for the Project in accordance with Contract Documents, within the time set forth and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Contractor's Bid Form is a part.

The undersigned Contractor does hereby declare and stipulate that this offer is made in good faith without collusion or connection to any person(s) providing an offer for the same work, and that it is made in pursuance of, and subject to, all terms and conditions of the Instructions to Bidders, the Specifications, and all other Solicitation Documents, all of which have been examined by the undersigned.

The Contractor also agrees that if awarded the Contract, to provide insurance certificates within ten (10) working days of the date of Notification of Award. Submittal of this offer will be taken by the Owner as a binding covenant that the Contractor will be prepared to complete the project in its entirety.

The Owner reserves the right to make the award on the basis of the offer deemed most favorable, to waive any formalities or technicalities and to reject any or all offers. It is further agreed that this offer may not be withdrawn for a period of sixty (60) calendar days after closing time. Submission of clarifications and revised offers automatically establish a new thirty day (30) period.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: _____.

It is the responsibility of the Bidder to ensure all Addenda have been received and acknowledged.

Bid Schedule: Water Treatment Plant Filter Upgrade

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
1	1	Water Treatment Plant Filter Upgrade	1.	LS	Lump Sum \$	
MCR		Minor Contract Revisions	---	---	---	\$ 75,000.00
Bid Amount:						\$

Bid Amount: _____ **dollars**

The undersigned Bidder proposes to subcontract the following portion of Work:

<u>Name & address of Sub-Contractor</u>	<u>Description of work to be performed</u>	<u>% of Contract</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The undersigned Bidder acknowledges the right of the City to reject any and all Bids submitted and to waive informalities and irregularities therein in the City's sole discretion.

By submission of the Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without collusion, consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

SECTION 00210

GENERAL CONTRACTOR
BIDDER QUALIFICATION FORM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General Contractor Bidder Qualification Form

1.2 RELATED SECTIONS

- A. Not used.

1.3 GENERAL CONTRACTOR QUALIFICATIONS

Note: For joint ventures the requested information shall be provided for each firm individually.

- A. In determining the firm's qualifications, the following factors will be considered. Similar work most recently completed and whether the firm:
 - 1. Maintains permanent place of business;
 - 2. Owns adequate equipment to perform Work properly and expeditiously within Contract time;
 - 3. Has financial resources to meet obligations incidental to the Work;
 - 4. Has appropriate technical experience;
 - 5. Has good record of successful and timely project completion with minimal interference with existing plant operations as demonstrated through references;

- B. Minimum requirements that must be met in order to be considered for project participation and possible award as a General Contractor are:
 - 1. Successful completion or substantial progress towards completion of at least two potable water treatment plant projects with similar size, scope and complexity within the past 8 years.
 - a. One of the above projects must have been for a plant having a minimum permitted flow of 4.0 MGD;
 - b. One of the above projects must have exceeded a project cost of \$1 million;
 - c. Provide project name and brief description for each relevant project along with the name and phone number for the Owner and project engineer.
 - d. Demonstration of self-performance on over 50% of the physical construction on each project listed as relevant experience.
 - 2. No "fail to complete" projects as documented in writing from Owner by a person in position of authority;
 - 3. No "not allowed to work for" status with previous clients as documented in writing from Owner by a person in position of authority;
 - 4. Sufficient qualified staff available to complete the work per project schedule.

- C. The Owner or Engineer reserves the right to require the submission of additional information.
- D. The Owner or Engineer reserves the right to contact any past or present project owner, whether submitted with this bid or not, to verify and establish the accuracy of the information represented by the Contractor.
- E. Determination of experience and financial qualification shall be based solely on the opinion of the Owner and Engineer.
- F. The qualification of a firm shall not deprive the Owner of the right to reject any bid, where other circumstances and developments have, in the opinion of the Owner, changed the qualification or responsibility of the firm.
- G. A firm will be qualified for award of the Contract on the basis of all factors judged to be in the best interest of the Owner. These factors will include those listed above as well as the firm's previous performance on work for the Owner or the Engineer.
- H. The complete qualification package shall be submitted concurrent with firm's bid in a separate electronic file that clearly states "QUALIFICATION STATEMENT FOR CITY OF GRAND JUNCTION WATER TREATMENT PLANT FILTER UPGRADE PROJECT." The qualification package shall contain a cover sheet with same title (stated above), shall clearly identify the submitting company name, address, phone number and contact person, and shall contain sufficient information documenting the minimum qualifications listed above.

END OF SECTION



Project Name: _____

Period From: _____ To: _____

Davis-Bacon Act CERTIFICATION

I certify to the best of my knowledge and belief that the above referenced project:

Complies with Davis-Bacon and Related Acts and that all laborers and mechanics employed by contractors and subcontractors during the above referenced period were paid wages at rates not less than those listed on the prevailing wage rate contained in the contract documents and that all applicable provisions of the Davis-Bacon and Related Acts have been met.

Name of Loan Recipient

Date

Signature of Authorized Official

Print Name and Title of Authorized Official



General Decision Number: CO160012 06/03/2016 CO12

Superseded General Decision Number: CO20150012

State: Colorado

Construction Type: Heavy

Counties: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo and Weld Counties in Colorado.

HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016
1	01/15/2016
2	01/22/2016
3	03/11/2016
4	03/18/2016
5	03/25/2016
6	05/06/2016
7	06/03/2016

ASBE0028-001 10/01/2014

	Rates	Fringes
Asbestos Workers/Insulator (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....	\$ 28.83	13.53

BRCO0007-004 01/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER.....	\$ 26.01	7.71

BRCO0007-006 05/01/2015

EL PASO AND PUEBLO COUNTIES

	Rates	Fringes
BRICKLAYER.....	\$ 24.44	8.90

ELEC0012-004 09/01/2015

PUEBLO COUNTY

	Rates	Fringes
ELECTRICIAN		
Electrical contract over		
\$1,000,000.....	\$ 27.35	11.00+3%
Electrical contract under		
\$1,000,000.....	\$ 24.85	11.00+3%

* ELEC0068-001 06/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,
JEFFERSON, LARIMER, AND WELD COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 33.85	13.99

ELEC0111-001 01/01/2016

	Rates	Fringes
Line Construction:		
Groundman.....	\$ 18.79	22.25%+\$5.45
Line Equipment Operator.....	\$ 29.40	22.25%+\$5.45
Lineman and Welder.....	\$ 42.14	25.25%+\$5.45

ELEC0113-002 06/01/2015

EL PASO COUNTY

	Rates	Fringes
ELECTRICIAN.....	\$ 30.00	14.95

ELEC0969-002 06/01/2015

MESA COUNTY

	Rates	Fringes
ELECTRICIAN.....	\$ 24.00	7.92

ENGI0009-001 10/23/2013

	Rates	Fringes
Power equipment operators:		
Blade: Finish.....	\$ 25.04	9.15
Blade: Rough.....	\$ 24.73	9.15
Bulldozer.....	\$ 24.73	9.15

Cranes: 50 tons and under..\$	24.88	9.15
Cranes: 51 to 90 tons.....\$	25.04	9.15
Cranes: 91 to 140 tons.....\$	25.19	9.15
Cranes: 141 tons and over...\$	25.97	9.15
Forklift.....\$	24.37	9.15
Mechanic.....\$	24.88	9.15
Oiler.....\$	24.01	9.15
Scraper: Single bowl under 40 cubic yards.....\$	24.88	9.15
Scraper: Single bowl, including pups 40 cubic yards and over and tandem bowls.....\$	25.04	9.15
Trackhoe.....\$	24.88	9.15

IRON0024-003 11/01/2013

	Rates	Fringes
Ironworkers:.....\$	24.80	18.77
Structural		

LABO0086-001 05/01/2009

	Rates	Fringes
Laborers:		
Pipelayer.....\$	18.68	6.78

* PLUM0003-005 06/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,
JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PLUMBER.....\$	38.43	15.19

PLUM0058-002 07/01/2015

EL PASO COUNTY

	Rates	Fringes
Plumbers and Pipefitters.....\$	34.30	14.38

PLUM0058-008 07/01/2015

PUEBLO COUNTY

	Rates	Fringes
Plumbers and Pipefitters.....\$	34.30	14.38

PLUM0145-002 07/01/2013

MESA COUNTY

	Rates	Fringes
Plumbers and Pipefitters.....\$	32.67	11.55

PLUM0208-004 06/01/2015

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,
JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PIPEFITTER.....	\$ 35.35	13.39

SHEE0009-002 07/01/2015

	Rates	Fringes
Sheet metal worker.....	\$ 32.85	14.63

TEAM0455-002 07/01/2015

	Rates	Fringes
Truck drivers:		
Pickup.....	\$ 19.66	4.02
Tandem/Semi and Water.....	\$ 20.29	4.02

SUCO2001-006 12/20/2001

	Rates	Fringes
BOILERMAKER.....	\$ 17.60	
Carpenters:		
Form Building and Setting...	\$ 16.97	2.74
All Other Work.....	\$ 15.14	3.37
Cement Mason/Concrete Finisher...	\$ 17.31	2.85
IRONWORKER, REINFORCING.....	\$ 18.83	3.90
Laborers:		
Common.....	\$ 11.22	2.92
Flagger.....	\$ 8.91	3.80
Landscape.....	\$ 12.56	3.21
Painters:		
Brush, Roller & Spray.....	\$ 15.81	3.26
Power equipment operators:		
Backhoe.....	\$ 16.36	2.48
Front End Loader.....	\$ 17.24	3.23
Skid Loader.....	\$ 15.37	4.41

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

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Unlisted classifications needed for work not included within
the scope of the classifications listed may be added after
award only as provided in the labor standards contract clauses

(29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union

average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND RATE

CHECK APPROPRIATE BOX
 SERVICE CONTRACT
 CONSTRUCTION CONTRACT

OMB No.: **9000-0089**
 Expires: **02/28/96**

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NOTE: THE CONTRACTOR SHALL COMPLETE ITEMS 3 THROUGH 16 AND SUBMIT THE REQUEST, IN QUADRUPPLICATE, TO THE CONTRACTING OFFICER

1. TO: ADMINISTRATOR, Employment Standards Administration WAGE AND HOUR DIVISION U.S. DEPARTMENT OF LABOR WASHINGTON, D.C. 20210	2. FROM: <i>(REPORTING OFFICE)</i>
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11. PROJECT AND DESCRIPTION OF WORK *(ATTACH ADDITIONAL SHEET IF NEEDED)*

12. LOCATION *(CITY, COUNTY AND STATE)*

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16. SIGNATURE OF EMPLOYEE OR REPRESENTATIVE	TITLE	CHECK APPROPRIATE BOX-REFERENCING BLOCK 13. <input type="checkbox"/> AGREE <input type="checkbox"/> DISAGREE
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16. SIGNATURE OF EMPLOYEE OR REPRESENTATIVE	TITLE	CHECK APPROPRIATE BOX-REFERENCING BLOCK 13. <input type="checkbox"/> AGREE <input type="checkbox"/> DISAGREE
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TO BE COMPLETED BY CONTRACTING OFFICER (CHECK AS APPROPRIATE - SEE FAR 22.1019 (SCA) OR FAR 22.406-3 (DBA))

- THE INTERESTED PARTIES AGREE AND THE CONTRACTING OFFICER RECOMMENDS APPROVAL BY THE WAGE AND HOUR DIVISION. AVAILABLE INFORMATION AND RECOMMENDATIONS ARE ATTACHED.
- THE INTERESTED PARTIES CANNOT AGREE ON THE PROPOSED CLASSIFICATION AND WAGE RATE. A DETERMINATION OF THE QUESTION BY THE WAGE AND HOUR DIVISION IS THEREFORE REQUESTED. AVAILABLE INFORMATION AND RECOMMENDATIONS ARE ATTACHED.

(Send copies 1, 2, and 3 to Department of Labor)

SIGNATURE OF CONTRACTING OFFICER OR REPRESENTATIVE	TITLE AND COMMERCIAL TELEPHONE NO.	DATE SUBMITTED
--	------------------------------------	----------------

LABOR STANDARDS INTERVIEW

CONTRACT NUMBER			EMPLOYEE INFORMATION		
NAME OF PRIME CONTRACTOR			LAST NAME	FIRST NAME	MI
			STREET ADDRESS		
NAME OF EMPLOYER			CITY	STATE	ZIP CODE
			SUPERVISOR'S NAME		
LAST NAME	FIRST NAME	MI	WORK CLASSIFICATION	WAGE RATE	

ACTION	CHECK BELOW	
	YES	NO
Do you work over 8 hours per day?		
Do you work over 40 hours per week?		
Are you paid at least time and a half for overtime hours?		
Are you receiving any cash payments for fringe benefits required by the posted wage determination decision?		
WHAT DEDUCTIONS OTHER THAN TAXES AND SOCIAL SECURITY ARE MADE FROM YOUR PAY?		

HOW MANY HOURS DID YOU WORK ON YOUR LAST WORK DAY BEFORE THIS INTERVIEW?	TOOLS YOU USE	
DATE OF LAST WORK DAY BEFORE INTERVIEW (YYMMDD)		
DATE YOU BEGAN WORK ON THIS PROJECT (YYMMDD)		

THE ABOVE IS CORRECT TO THE BEST OF MY KNOWLEDGE

EMPLOYEE'S SIGNATURE		DATE (YYMMDD)
INTERVIEWER	SIGNATURE	TYPED OR PRINTED NAME
		DATE (YYMMDD)

INTERVIEWER'S COMMENTS			
WORK EMPLOYEE WAS DOING WHEN INTERVIEWED	ACTION <i>(If explanation is needed, use comments section)</i>	YES	NO
	IS EMPLOYEE PROPERLY CLASSIFIED AND PAID?		
	ARE WAGE RATES AND POSTERS DISPLAYED?		

FOR USE BY PAYROLL CHECKER

IS ABOVE INFORMATION IN AGREEMENT WITH PAYROLL DATA?
 YES NO

COMMENTS

CHECKER			
LAST NAME	FIRST NAME	MI	JOB TITLE
SIGNATURE			DATE (YYMMDD)



Dedicated to protecting and improving the health and environment of the people of Colorado

American Iron and Steel Certification

Project Name: _____

Period From: _____ To: _____

Section 436 of the Consolidated Appropriations Act, 2014 states that:

None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

To meet this requirement, the undersigned hereby certifies that all iron and steel products which are to be incorporated into the (Name of Construction Contract), has been manufactured and/or fabricated using domestic iron and steel as defined by the above referenced section 436 of P.L. 113-76 and EPA's Guidance Memorandum dated March 20, 2014 for Implementation of American Iron & Steel unless an appropriate waiver has been granted by the Administrator of the Environmental Protection Agency.

Name of Loan Recipient

Date

Signature of Authorized Official

Print Name and Title of Authorized Official

NOTE: A current completed copy of the American Iron and Steel Products tracking spreadsheet MUST accompany this document.





COLORADO
Department of Public
Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

State Revolving Fund Required Specifications

The following State Revolving Fund Required Specifications are designed for the subrecipient to cut and paste in their entirety and insert into the construction documents for bid and for construction. There is one exception to these specifications and that is the Disadvantaged Business Enterprise (DBE) section. Please refer to your loan agreement or contact the grants and loans unit project manager or compliance specialist for applicability of this requirement to your project. For more detailed information on the federal requirements of the SRF program please refer to the Navigating State Revolving Fund Requirements Handbook for Subrecipients.

If you have any questions regarding the information contained in this document, please contact your CDPHE Water Quality Control Division Grants and Loans Unit project manager or the compliance specialist:

Name	Title	Phone	Email
Michael Beck	Section Manager	303-692-3374	michael.s.beck@state.co.us
Randi Johnson-Hufford	Project Manager	303-692-2203	randi.johnson-hufford@state.co.us
Bradley Monson	Project Manager	303-692-2286	bradley.monson@state.co.us
Margaret Pauls	Project Manager	303-692-3290	margaret.pauls@state.co.us
Corrina Quintana	Project Manager	303-691-4025	corrina.quintana@state.co.us
Matthew Stearns	Compliance Specialist	303-691-4064	matthew.stearns@state.co.us
Paul Yong	Project Manager	303-692-3606	paul.young@state.co.us
Erick Worker	Project Manager	303-692-3594	erick.worker@state.co.us

State Revolving Fund Required Specifications

Section 1

Davis Bacon Prevailing Wage Requirements

This contract is governed by the Davis Bacon and related Acts and is subject to General Decision Number CO160012___dated 06/03/2016__CO12 Heavy_____.
A copy of this General Decision Number is included as Exhibit_____of this document.

The SRF Program is subject to "Davis Bacon and Related Acts" or DBRA, which extends the requirements of the Davis-Bacon Act. Compliance with the Davis Bacon Act is required for any project funded by the Drinking Water Revolving Fund (DWRF) or Water Pollution Control Revolving Fund programs. Non-Compliance with the Davis Bacon Act may result in debarment and suspension from working on future projects funded with federal dollars for up to three years and/or loss of funding for the current project.

Attachment 2

Wage Rate Requirements under the 2014 Consolidated Appropriations Act (The 2014 Act)

Preamble

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides sub grants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I -5.

I. For Subrecipients that Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis - Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under The 2014 Act with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Brian Friel at friel.brian@epa.gov or at 303-312-6277 of EPA, Region 8 for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at www.dol.gov/whd/

1. Applicability of the Davis-Bacon (DB) prevailing wage requirements.

Under The 2014 Act, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan

fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(1) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(2) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering

instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or The 2014 Act, the following clauses:

(1) Minimum wages.

- (i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov/

- (ii) (A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers

or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

- (iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each

payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or

subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and

Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

- (8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.
- (10) Certification of eligibility.
- (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
 - (ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
 - (iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph

(a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

- (3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or

subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of non compliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at: www.dol.gov/whd/index.htm

Section 2

American Iron and Steel

The State Revolving Fund Program is subject to, and requires compliance with, the American Iron and Steel requirement. AIS requires Water Pollution Control State Revolving Fund (WPCRF) and Drinking Water State Revolving Fund (DWSRF) assistance recipients use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed on or after January 17, 2014.

In providing bids, proposals, or services, the Contractor represents and warrants to and for the benefit of the borrower and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the borrower or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the borrower or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the borrower or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the borrower). While the Contractor has no direct contractual privity with the State, as a lender to the borrower for the funding of its project, the borrower and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of the Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

For purposes of the WPCRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- lined or unlined pipes or fittings;
- manhole Covers;
- municipal Castings (defined in more detail below);
- hydrants;
- tanks;
- flanges;
- pipe clamps and restraints;
- valves;
- structural steel (defined in more detail below);
- reinforced precast concrete; and
- construction materials.

If the subrecipient can justify a claim made under one of the categories below, a waiver may be granted. Until a waiver is granted by the EPA, the AIS requirement must be adhered to as described in the act.

A waiver may be provided if EPA determines that;

1. applying these requirements would be inconsistent with the public interest;
2. iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.
4. All waiver requests must be routed through the Grants and Loans unit project manager or compliance specialist.

[EPA's guidance on AIS](#) requirements includes specific instructions for communities interested in applying for a waiver. All waiver requests must be routed through the Grants and Loans Unit. After receiving a completed application for a waiver from the grants and loans unit, EPA will publish the waiver request and all material submitted with the application on this website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to the EPA.

Approved National Waivers

April 15, 2014 Plans and Specifications Waiver: "The EPA is hereby granting a nationwide waiver of the American Iron and Steel requirement pursuant to Section 436(b)(1) (public interest waiver), of the Consolidated Appropriations Act (CAA), 2014 for eligible projects that had engineering plans and specifications submitted to an appropriate state agency prior to and including January 17, 2014, the date of the enactment of the CAA, and approved between and including January 17, 2014, and the date of this waiver, where the state agency that approved such plans and specifications did so under the normal course of business for that agency.

If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this national waiver."

April 15, 2014 De Minimis Waiver: "The EPA is hereby granting a nationwide waiver pursuant to the American Iron and Steel requirements of P.L. 113-76 CAA 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the material used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of materials used in and incorporated into a project.

For more information on approved waivers visit the following website:

http://water.epa.gov/grants_funding/aisrequirement.cfm

Section 3

New National Term on Suspension and Debarment and Other Responsibility Matters

Following is the new National term on Suspension and Debarment. This condition applies to all recipients.

1. Recipient shall fully comply with Subpart C of 40 CFR Part 32, entitled "Responsibilities of Participants Regarding Transactions." Recipient is responsible for ensuring that any lower tier covered transaction, as described in Subpart B of 40 CFR Part 32, entitled "Covered Transactions," includes a term or condition requiring compliance with Subpart C. Recipient is responsible for further requiring the inclusion of a similar term or condition in any subsequent lower tier covered transactions. Recipient acknowledges that failing to disclose the information required under 40 CFR 32.335 may result in the delay or negation of this assistance agreement, or pursuance of legal remedies, including suspension and debarment.

Recipient may access the Excluded Parties List at the System for Award Management website at <http://www.sam.gov>.

Following are related steps which must be observed when awarding contracts, subcontracts, and purchase agreements.

- Familiarize yourself with Subpart D of 40 CFR Part 32, entitled "Responsibilities of EPA Officials Regarding Transactions." You must comply with this regulation. See below for full text of Subpart D.
- Check the Excluded Parties List System before awarding initial and supplemental funding packages. See Subpart D to determine the manner in which you must handle excluded or disqualified person(s).
- Review the information that participants* provide in response to 40 CFR 32.335, which requires participants to provide certain information before entering into a covered transaction with EPA.
- Attach the Suspension and Debarment National term and condition to all new, supplemental, and incremental funding packages. See IGMS Administrative Database, under National Conditions.

* Pursuant to 40 CFR 32.980, "Participant" means any person who submits a proposal for or who enters into a covered transaction, including an agent or representative of a participant.

A. INSTRUCTIONS

An individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a subagreement thereunder.

The status of prospective individuals or organizations can be checked at www.sam.gov it is the subrecipients' responsibility to verify the awarded

contractor is not on the excluded parties list. It is the prime contractor's responsibility to verify subcontractors, vendors, suppliers and manufacturers are not on the excluded parties list.

2. Prohibition Against Participation of Listed Violating Facilities

A. REQUIREMENTS

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Pub. L. 92-604) and section 308 of the Clean Water Act (33 U.S.C. 1251, as amended), respectively, which relate to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency list of violating facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from the listing.

(3) To use his best efforts to comply with clean air and clean water standards at the facilities in which the contract is being performed.

(4) To insert the substance of the provisions of this clause, including this paragraph (4), in any nonexempt subcontract.

B. DEFINITIONS

(1) Air Act means the Clean Air Act, as amended (42 U.S.C. 1857 et seq.).

(2) Water Act means the Clean Water Act, as amended (33 U.S.C. 1251 et seq.).

(3) Clean Air Standards means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 (d) of the Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under section 111 (c) or section 111(d), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(4) Clean Water Standards means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of Water Act (33 U.S.C. 1317).

(5) Compliance means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency in accordance with the requirements of the Air Act or Water Act and regulations.

(6) Facility means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be used in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are located in one geographical area.

Section 4

Equal Employment Opportunity and Affirmative Action Requirements on Federally Assisted Construction Contracts

A. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

This notice shall be included in, and shall be a part of, all solicitations for offers and bids on all federal and federally assisted construction contracts or subcontracts.

- (1) The Offerer's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
- (2) The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Minority Participation In Each Trade	Female Participation In Each Trade
10.2% (Mesa County)	6.9% (National)

These goals are applicable to all the contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non- federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- (3) The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under

the contract resulting from this solicitation. The notification shall list the name, address and telephone number for the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed (See Form C).

(4) As used in this Notice, and in the contract resulting from this solicitation, the covered area is Mesa County.

B. EQUAL OPPORTUNITY CLAUSES

(1) The Equal Opportunity Clause published at 41 CFR Part 60-1.4(b) is required to be included in, and is part of, all nonexempt federally assisted construction contracts and subcontracts. By operation of the order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the order and the regulations in this part to include such a clause whether or not it is physically incorporated.

(2) In addition to the clauses described above, all federal contracting officers, all applicants, and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all federal and federally assisted construction contracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6 of this part and in construction subcontracts in excess of \$10,000 necessary in whole or in part to the performance of nonconstruction Federal contracts and subcontracts covered under the Executive Order.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

A. DEFINITIONS AS USED IN SPECIFICATIONS

- (1) "Covered Area" means the geographical area described in solicitation from which this contract resulted;
- (2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
- (3) "Employer identification number" means the Federal Social Security number used on the employer's quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- (4) "Minority" includes:
 - (a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (c) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asian, the Indian Subcontinent, or the

Pacific Islands);

(d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North American and maintaining identifiable tribal affiliations through membership and participation or community identification).

B. DETAILED SPECIFICATIONS

- (1) Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$25,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
- (2) If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area, (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
- (3) The contractor shall implement the specific affirmative action standards provided in paragraphs (6)(a) through (p) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
- (4) Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
- (5) In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- (6) The contractor shall take specific affirmative action to ensure equal employment

opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific
- b. Attention to minority or female individuals working at such sites or in such facilities.
- c. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations where the contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.
- d. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the contractor may have taken.
- e. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- f. Develop on-the-job training opportunities and/or participate in training programs for the areas which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under (7)(b) above.
- g. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- h. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- i. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.
- j. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations servicing the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- k. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.
- l. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- m. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- n. Ensure that seniority practices, job classification, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations are followed.
- o. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- p. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

- q. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.
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- (7) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (6)(a) through (p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under (6)(a) through (p) of the specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.
 - (8) A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally, the contractor may be in violation of the order if a specific minority group of women is under-utilized).
 - (9) The contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
 - (10) The contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to Executive Order 11246.
 - (11) The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
 - (12) The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph (6) of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.3.

- (13) The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
- (14) Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

Section 5

Williams Steiger Occupational Safety and Health Act of 1970 - SRF Program Grant Agreement Information and Requirements

A. Authority

(1) The contractor is subject to the provisions of the Williams-Steiger Occupational Safety and Health Act of 1970.

(2) These construction documents and the joint and several phases of construction hereby contemplated are to be governed, at all times, by applicable provisions of the Federal law(s), including but not limited to the latest amendment of the following:

- a. Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 94-596;
- b. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;
- c. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

B. Safety and Health Program Requirements

(1) This project, its prime contractor and its subcontractors, shall at all times be governed by Chapter XVII of Title 29, Code of Federal Regulations, Part 1926 - Safety and Health Regulations for Construction (29 CFR 22801), as amended to date.

(2) To implement the program and to provide safe and healthful working conditions for all persons, general project safety meetings will be conducted at the site at least once each month during the course of construction, by the construction superintendent or his/her designated safety officer. Notice of such meeting shall be issued not less than three (3) days prior, stating the exact time, location, and agenda to be included. Attendance by the owner, architect, general foreman, shop steward(s), and trades, or their designated representatives, witnessed in writing as such, shall be mandatory.

(3) To further implement the program, each trade shall conduct a short gang meeting, not less than once a week, to review project safety requirements mandatory for all persons during the coming week. The gang foreman shall report the agenda and specific items covered to the project superintendent, who shall incorporate these items in his/her daily log or report.

(4) The prime contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the owner and architect, or their designated representatives, in writing. This shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Act of 1970.

(5) This program shall become a part of the contract documents and the contract between the owner and prime contractor, prime contractor and all subcontractors, as though fully written therein.

Section 6

Archaeological Discoveries

A. Construction Procedures

- (1) In the event of an archaeological or more recent historical find (e.g., artifacts, housing sites) during any phase of construction, the following procedure should be followed:
- (2)) Construction shall be halted, with as little disruption to the archaeological site possible.
- (3) The Contractor shall notify the Owner who shall contact the State Historical Preservation Officer.
- (4) The State Historical Preservation Officer may decide to have an archaeologist inspect the site and make recommendations about the steps needed to protect the site, before construction is resumed.
- (5) The entire event should be handled as expediently as possible in order to hold the loss in construction time to a minimum while still protecting archaeological finds.

B. National Register Status

In the event archaeological/historical data are evaluated to meet National Register criteria, the Advisory Council on Historic Preservation may be notified and asked to comment by the Water Quality Control Division.

Forms by Section

SRF forms can be found on this webpage: <https://www.colorado.gov/pacific/cdphe/water-quality-srf-forms>

Section 1 - Davis Bacon Prevailing Wages

- Davis Bacon Certification Form (SRF form)
- WH - 347 - Contractors Payroll Form
- Standard Form 1444 - Request for Authorization of Additional Classification and Rate
- Standard Form 1445 - Labor Standards Interview Form

Section 2 - American Iron and Steel

- American Iron and Steel Certification Form (SRF Form)
- American Iron and Steel Product Spreadsheet (SRF Form)
- American Iron and Steel Waiver Request Form

Section 3 - New National Term on Suspension and Debarment and Other Responsibility Matters

- No applicable forms

Section 4 - Equal Employment Opportunity and Affirmative Action Requirements on federally assisted construction contracts

- No applicable forms

Section 5 - Williams Steiger Occupational Safety and Health Act of 1970 - SRF Program Grant Agreement Information and Requirements

- No applicable forms

Section 6 - Archaeological Discoveries

- No applicable forms

SECTION 00315

PRE-PURCHASED EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pre-Purchased Equipment Specifications

1.2 RELATED SECTIONS

- A. Section 11140 – Filter Underdrains and Media (Installation Only)
- B. Section 11376 – PD Rotary Lobe Blowers (Installation Only)

1.3 FILTER UNDERDRAINS AND MEDIA INFORMATION

- A. The City of Grand Junction (Owner) has pre-purchased the Leopold Universal Type XA Underdrains with IMS 200 caps. Equipment for the underdrains includes underdrains, caps, new filter media (silica sand and anthracite), air scour system, valves and appurtenances.
- B. A reference copy of the Pre-Purchase Agreement, Specification, and Scope of Supply is attached as Supplement 00315A, dated July 12, 2016.
- C. Contractor shall examine the attached Scope of Supply and Specification to understand the scope of materials, equipment, submittals, and installation and startup services provided by manufacturer and contact Leopold (Mr. Bruce Wolf, Senior Sales Engineer, 724-453-2062) with questions prior to bid of work.

1.4 POSITIVE DISPLACEMENT BLOWERS INFORMATION

- A. The City of Grand Junction (Owner) has pre-purchased the positive displacement blowers. Equipment for the blowers includes butterfly valves for isolation, rubber expansion joints, etc.
- B. A reference copy of the Pre-Purchase Agreement, Specification, and Scope of Supply is attached as Supplement 00315B, dated July 12, 2016.
- C. Contractor shall examine the attached Scope of Supply and Specification to understand the scope of materials, equipment, submittals, and installation and startup services provided by manufacturer and contact UE Compression (Leslie Distel, Account Manager, 303-515-8611) with questions prior to bid of work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION



JVA, Incorporated
214 8th Street
Suite 210
Glenwood Springs,
CO 81601
970.404.3100
info@jvajva.com

VIA FACSIMILE #

Date: 7/12/2016

Purchase Order No. TBD

www.jvajva.com

Project Name City of Grand Junction WTP Upgrade Project

[Buyer] City of Grand Junction

[Address] 250 North 5th Street, Grand Junction, CO 81501

Attention: Bruce Wolfe (Leopold)

For this letter City of Grand Junction is the "Buyer" and Xylem Water Solutions USA, Inc. 227 S. Division St., Zelienople, PA, 16063, USA is the "Seller".

This letter is meant to memorialize the pre-purchase of equipment for the City of Grand Junction WTP Upgrade Project:

1. The one year warranty on all equipment will begin after substantial completion of the project. Substantial completion is defined as the time at which the Work has progressed to the point where, in the opinion of Engineer, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be utilized for the purposes for which it is intended.

2. No exceptions to the following terms and conditions will be allowed:

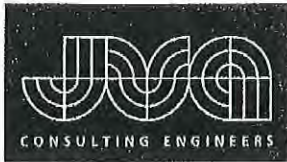
• Upon a fully executed contract	10%
• Upon shop drawing approval	10%
• Upon equipment delivery to the site	65%
• Upon O&M manual approval	5%
• Upon successful startup	5%
• Retainage held until Substantial Completion	5%

3. No exceptions to the following dates will be allowed:

• Manufacturer provided cost comparison	May 27, 2016
• Manufacturer's scope/proposal	June 3, 2016
• Executed contract	August 29, 2016
• Delivery of shop drawings	September 9, 2016
• Approval of shop drawings*	September 16, 2016
• Delivery of Equipment	December 5, 2016

*If shop drawings are marked Amend and Resubmit (A&R) the manufacturer delivery time shall not change. Any additional time for submittals would be made up through the manufacturing process. Engineer will review the revised submittal and provide comments/approval within 3 working days.

4. Manufacturer and Owner recognize time is of the essence and Owner will suffer financial loss if the Equipment is not delivered with the time specified above. The parties also



recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Equipment is not delivered on time. Accordingly, instead of requiring any such proof, Owner and Manufacturer agree that as liquidated damages for delay (but not as a penalty), Manufacturer shall pay Owner \$500 for each day that expires after the time specified above until the Equipment is delivered. Payment of liquidated damages shall be Seller's sole Liability and Buyer's sole remedy for late delivery. In no event shall liquidated damages exceed ten percent (10%) of the contract price.

5. Equipment shall be manufactured to meet the attached Specifications and Project Drawings. All filter media shall have an acid solubility of less than 5 percent.
6. Manufacturer shall provide costs from three successful, competitively bid projects within the last three months and within the Rocky Mountain region for price comparison. If the manufacturer does not have three projects that meet this requirement then projects of similar scope and size located in the state of Colorado may be substituted. On a separate page manufacturer should also provide contact information for the referenced projects.
7. Items outlined above shall supersede the terms and conditions set forth in the Manufacturer's proposal/scope of supply.
8. See Manufacturer's proposal/scope of supply for equipment costs.

Please indicate your agreement to the foregoing by countersigning this letter, retain one fully signed counterpart for your files and return the original copy to us via mail and a scanned copy via email.

Thanks,

Agreed to above:

[Seller]

Signature:

By:

BRUCE WOLFE

{Typed name}

Title:

SENIOR SALE ENGINEER

Date:

7/13/16

Agreed to above:

[Buyer]

Signature:

By:

BRET GALLAGHER

{Typed Name}

Title:

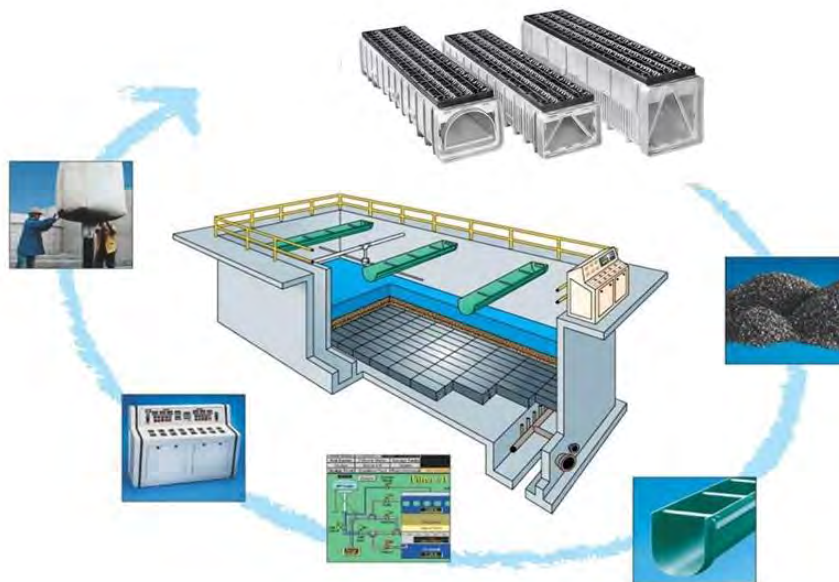
UTILITY ENGINEER

Date:

8/2/16

Grand Junction, CO Proposal

Grand Junction WTP



prepared for:

JVA Inc.

5/26/16



Xylem Water Solutions USA, Inc.
227 S. Division St.
Zelienople, PA 16063
Bruce Wolfe
Direct: 724-453-2062
Mobile: 724-504-0366
Email: bruce.wolfe@xyleminc.com

5/26/16

Project name : Grand Junction, CO
Project number : I13603

Mr. Racette:

Based on your inquiry, we are pleased to forward the following proposal to your attention. Thank you for the opportunity to offer our equipment and services for the Grand Junction, CO WTP project.

Enclosed is Leopold's priced proposal and cost comparisons for previous projects in Colorado.

We hope that our proposal comes up to your expectation. If you have any questions please do not hesitate to contact me or our local representative.

Respectfully,

Bruce Wolfe
Senior Sales Engineer



Xylem Water Solutions USA, Inc.

227 S. Division St.
Zelienople, PA 16063
tel 724-452-6300
fax 724-453-2122
email bruce.wolfe@xylem.com

May 26, 2016

PROPOSAL NO.: I13603 Rev 06
TO: To Whom It May Concern
SUBJECT: Grand Junction, CO WTP Filter Rehab

We are pleased to offer the following materials and services by Xylem Water Solutions USA, Inc.

This quotation has been prepared using the contract drawings.

FILTER UNDERDRAIN SYSTEM:

LEOPOLD UNIVERSAL® TYPE XA® UNDERDRAIN:

Under this section, we propose to furnish Leopold Universal® Type XA® Underdrain of the Dual/Parallel Lateral type, manufactured from corrosion resistant, high density polyethylene for installation in eight (8) filter cells (four (4) dual bay filters). Each filter cell measures 28'-0" lateral run x 10'-0". The total filter area is 2,240 square feet.

The blocks shall be arranged end-to-end and mechanically joined with an O-ring to form continuous underdrain laterals approximately equivalent to the length of the filter cell. The joints shall be gasketed, bell and spigot type with internal alignment tabs for proper alignment, and be air and water tight. Joints shall be snap-lock type so that the blocks are joined with integral interlocking snap lugs and lug receptors for ease of assembly and installation of the laterals, and supplied with carbon steel "L" anchor rods.

Each filter cell will be equipped with a 3" x 3" x 10' long shelf angle with securement hardware for the flume.

Each filter cell shall have a type 316 stainless steel baffle plate with securement hardware.

I.M.S® 200 MEDIA RETAINER:

Under this section, we propose to furnish 2,240 square feet of I.M.S® 200 media retainer. The scope includes molded thermoplastic I.M.S® 200 media retainer factory installed onto the proposed Leopold Universal® Type XA® Underdrain block prior to shipment.

AIR HEADER PIPING:



MANUFACTURER'S SERVICES:

The services of a qualified Leopold technical representative to instruct the Contractor's personnel about the proper installation technique of the equipment will be provided for a period of twelve (12) days (8 hr/day) on site plus eight (8) days travel time to and from the job-site in four (4) trips. Additional services may be obtained at the current prevailing rate plus living and travel expenses.

PRICING:

Pricing is for shipments on or before November 31, 2016. We do not include any applicable taxes.

MANUFACTURING LEADTIME:

See prepurchase agreement

BASIS of PRICING:

Any items and/or accessories not specifically called out in this quotation must be construed as being furnished by others.

This quotation is considered firm for 90 days. Orders received more than 90 days after the date of this quotation is reviewed by Xylem Water Solutions USA, Inc. before acceptance and is subject to changes in prices or delivery depending on conditions existing at the time of entry. Quoted prices are firm for delivery within 12 months from the delivery date stipulated in the plans & specifications or mutually agreed upon by Xylem Water Solutions USA, Inc. and Purchase Order issuer at time of order placement.

We do not include any applicable taxes.

Orders resulting from this quotation should be addresses to Xylem Water Solutions USA, Inc. 227 S. Division St., Zelienople, PA, 16063, USA.

We propose to furnish the material described in this document for **a total selling price of \$358,000.00**, FCA factory with full freight allowed to the job site.

FILTER MEDIA WARRANTY (if applicable): SELLER warrants that its filter media products will meet the standards established by the latest edition of AWWA (American Water Works Association) B100. SELLER shall be responsible for verifying that the filter media meets or exceeds the AWWA B100 Standard at the point of sale. Testing shall be by an independent laboratory, which regularly performs testing of filter media. BUYER shall notify Xylem Water Solutions USA, Inc. immediately upon discovery of any defective product. The SELLER shall have the right to inspect said product and BUYER shall, if



requested, return the defective product to the SELLER with transportation prepaid. NO LIABILITY IS ASSUMED BY THE SELLER UNDER ANY CIRCUMSTANCES FOR LABOR, MATERIAL OR OTHER COSTS ASSOCIATED WITH THE REMOVAL OR REPLACEMENT OF MEDIA UNLESS PREVIOUSLY APPROVED IN WRITING BY AN AUTHORIZED EMPLOYEE OF THE SELLER.

For additional information pertaining to the equipment contained in this proposal, please contact me or our area representative, who is:

ISI West
4175 Mulligan Dr.
Longmont, CO. 80504
Phone: 970-535-0571

Attention: Marc Hatfield

Payment terms:

10% net 30 days upon initial fully executed contract
10% net 30 days upon drawings approval
65% net 30 days upon delivery of equipment
5% net 30 days upon O&M manual approval
5% net 30 days upon start-up
5% retainage until substantial completion

Respectfully,

Xylem Water Solutions USA, Inc.

Bruce Wolfe
bruce.wolfe@xylem.com
Sr. Sales Engineer, Leopold

Attachment: Terms of Quotation



I13603 Rev 06 Grand Junction, CO

Xylem Water Solutions USA, Inc.
TERMS and CONDITIONS

DEFINITIONS

Wherever used in these terms and conditions, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

Buyer: _____

Seller: Xylem Water Solutions USA, Inc.

Purchase Order: Buyer's initial offer to purchase equipment from Supplier dated _____ and identified by the following reference number _____.

THE FOLLOWING TERMS AND CONDITIONS are an integral part of the offer by Xylem Water Solutions USA, Inc. to sell the equipment described in Proposal Number I13603 Rev 06 dated 5-25-16.

1. Agreement, Integration and Conflict of Terms. These terms and conditions, together with any special conditions expressly incorporated thereto in the quotation or sales form, are to govern any sale between the Seller and Buyer. The Seller shall mean the applicable affiliate of Xylem Inc. that is party to the Agreement ("Seller"). The Buyer shall mean the entity that is party to the Agreement with Seller. This writing is an offer or counteroffer by Seller to sell the goods and/or services set forth on the quotation or sales form subject to these terms and conditions and is expressly made conditional on Buyer's assent to these terms and conditions. Acceptance by Buyer is expressly limited to these terms and conditions. Any additional or different terms and conditions contained in Buyer's purchase order or other communication shall not be effective or binding upon Seller unless specifically agreed to in writing by Seller; Seller hereby objects to any such conditions, and the failure of Seller to object to specific provisions contained in any purchase order or other communication from Buyer shall not be construed as a waiver of these terms and conditions nor an acceptance of any such provisions. Neither Seller's commencement of performance nor delivery shall be deemed or construed as acceptance of Buyer's additional or different terms and conditions. Buyer agrees that these terms and conditions, together with any accompanying quotation and any special conditions or limited process guarantees or documents referred to or included within the quotation and expressly made a part of this agreement, (e.g., drawings, illustrations, specifications, or diagrams), is the complete and final agreement between Buyer and the Seller ("Agreement"). This Agreement supersedes all prior negotiations, representations, or agreements, either written or oral, between the parties and, further, can only be altered, modified or amended with the express written consent of Seller.

2. Quotation, Withdrawal, Expiration. Quotes are valid for thirty (30) calendar days from the date of issuance unless otherwise provided therein. Seller reserves the right to cancel or withdraw the quotation at any time with or without notice or cause prior to acceptance by Buyer. There is no Agreement if any conditions specified within the quotation *or* sales form are not completed by Buyer to Seller's satisfaction



within thirty (30) calendar days of Seller's acknowledgement in writing of an order. Seller nevertheless reserves its right to accept any contractual documents received from Buyer after this 30-day period.

3. Prices. Prices apply to the specific quantities stated on the quotation or sales form. Unless otherwise agreed to in writing by Seller, all prices are FCA; Origin (as defined in accordance with the latest version of Incoterms), and do not include transportation costs or charges relating to transportation unless otherwise specified. Prices include standard packing according to Seller's specifications for delivery. All costs and taxes for special packing requested by Buyer, including packing for exports, shall be paid by Buyer as an additional charge. Prices are subject to change without notice.

4. Taxes. The price for the goods does not include any applicable sales, use, excise, GST, VAT, or similar tax, duties or levies. Buyer shall have the responsibility for the payment of such taxes if applicable.

5. Payment Terms. Seller reserves the right to require payment in advance or C.O.D. and otherwise modify credit terms should Buyer's credit standing not meet Seller's acceptance. Unless different payment terms are expressly set forth in the quotation or sales form or order acknowledgment or Sales Policy Manual, goods will be invoiced upon shipment. Payment shall be made in U.S. Dollars. Payment in full is due within thirty (30) days from the invoice date. In the event payment is not made when due, Buyer agrees to pay Seller a service or finance charge of the lesser of (i) one and one-half percent (1.5%) per month (18% per annum), or (ii) the highest rate permitted by applicable law, on the unpaid balance of the invoice from and after the invoice due date. Buyer is responsible for all costs and expenses associated with any checks returned due to insufficient funds. All credit sales are subject to prior approval of Seller's credit department. Export shipments will require payment prior to shipment or an appropriate Letter of Credit. If, during the performance of the contract with Buyer, the financial responsibility or condition of Buyer is such that Seller in good faith deems itself insecure, or if Buyer becomes insolvent, or if a material change in the ownership of Buyer occurs, or if Buyer fails to make any payments in accordance with the terms of its contract with Seller, then, in any such event, Seller is not obligated to continue performance under the contract and may stop goods in transit and defer or decline to make delivery of goods, except upon receipt of satisfactory security or cash payments in advance, or Seller may terminate the order upon written notice to Buyer without further obligation to Buyer whatsoever. If Buyer fails to make payments or fails to furnish security satisfactory to Seller, then Seller shall also have the right to enforce payment to the full contract price of the work completed and in process. Upon default by Buyer in payment when due, Buyer shall immediately pay to Seller the entire unpaid amounts for any and all shipments made to Buyer irrespective of the terms of said shipment and whether said shipments are made pursuant to this Agreement or any other contract of sale between Seller and Buyer, and Seller may withhold all subsequent shipments until the full amount is settled. Acceptance by Seller of less than full payment shall not be a waiver of any of its rights hereunder. Buyer shall not assign or transfer this Agreement or any interest in it, or monies payable under it, without the written consent of Seller and any assignment made without such consent shall be null and void.

6. Delivery, Risk of Loss. Delivery dates are estimates, and time is not of the essence. All shipments will be made FCA; Origin, unless otherwise specified. Seller shall not be responsible to Buyer for any loss, whether direct, indirect, incidental or consequential in nature, including without limitation loss of profits, arising out of or relating to any failure of the goods to be delivered by the specified delivery date.



In the absence of specific instructions, Seller will select the carrier. Upon delivery to the common carrier, title and the risk of loss for the material shall pass to Buyer. Buyer shall reimburse Seller for the additional cost of its performance resulting from inaccurate or lack of delivery instructions, or by any act or omission on Buyer's part. Any such additional cost may include, but is not limited to, storage, insurance, protection, re-inspection and delivery expenses. Buyer further agrees that any payment due on delivery shall be made on delivery into storage as though goods had been delivered in accordance with the order.

Buyer grants to Seller a continuing security interest in and a lien upon the products and the proceeds thereof (including insurance proceeds), as security for the payment of all such amounts and the performance by Buyer of all of its obligations to Seller pursuant to the order and all such other sales, and Buyer shall have no right to sell, encumber or dispose of the products. Buyer shall execute any and all financing statements and other documents and instruments and do and perform any and all other acts and things which Seller may consider necessary, desirable or appropriate to establish, perfect or protect Seller's title, security interest and lien. In addition, Buyer authorizes Seller and its agents and employees to execute any and all such documents and instruments and do and perform any and all such acts and things, at Buyer's expense, in Buyer's name and on its behalf. Such documents and instruments may also be filed without the signature of Buyer to the extent permitted by law.

7. Warranty. For goods sold by Seller to Buyer that are used by Buyer for personal, family or household purposes, Seller warrants the goods to Buyer on the terms of Seller's limited warranty available on Seller's website. For goods sold by Seller to Buyer for any other purpose, Seller warrants that the goods sold to Buyer hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be (i) be built in accordance with the specifications referred to in the quotation or sales form, if such specifications are expressly made a part of this Agreement, and (ii) free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the date of shipment (which date of shipment shall not be greater than thirty (30) days after receipt of notice that the goods are ready to ship), whichever shall occur first, unless an alternate period of time is provided by law or is specified in the product documentation from Xylem (the "Warranty").

Except as otherwise provided by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty; provided, however, that under either option, Seller shall not be obligated to remove the defective product or install the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have complete discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall constitute a waiver of its rights and render all warranties void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. The Warranty is conditioned on Buyer giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest. Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that: (a) have been repaired by third parties other than Seller or without Seller's written approval; (b) have been subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) have been



used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) have been damaged from ordinary wear and tear, corrosion, or chemical attack; (e) have been damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) have been damaged due to a defective power supply or improper electrical protection; or (g) have been damaged resulting from the use of accessory equipment not sold by Seller or not approved by Seller in connection with products supplied by Seller hereunder. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO THE GOODS PROVIDED HEREUNDER, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. EXCEPT AS OTHERWISE PROVIDED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER HEREUNDER. IN NO EVENT IS SELLER LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

8. Inspection. Buyer shall have the right to inspect the goods upon their receipt. When delivery is to Buyer's site or to a project site ("Site"), Buyer shall notify Seller in writing of any nonconformity of the goods with this Agreement within three (3) days from receipt by Buyer. For all other deliveries, Buyer shall notify Seller in writing of any nonconformity with this Agreement within fourteen (14) days from receipt by Buyer. Failure to give such applicable notice shall constitute a waiver of Buyer's right to inspect and/or reject the goods for nonconformity and shall be equivalent to an irrevocable acceptance of the goods by Buyer. Claims for loss of or damage to goods in transit must be made to the carrier, and not to Seller.

9. Seller's Limitation of Liability. EXCEPT AS OTHERWISE PROVIDED BY LAW, IN NO EVENT SHALL SELLER'S LIABILITY UNDER THIS AGREEMENT EXCEED THE AMOUNT PAID BY BUYER UNDER THIS AGREEMENT. SELLER SHALL HAVE NO LIABILITY FOR LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY, LOSS OF REPUTATION, INDIRECT, CONSEQUENTIAL, INCIDENTAL, PUNITIVE OR EXEMPLARY DAMAGES.

10. Force Majeure. Seller may cancel or suspend this Agreement and Seller shall have no liability for any failure to deliver or perform, or for any delay in delivering or performing any obligations, due to acts or omissions of Buyer and/or its contractors, or due to circumstances beyond Seller's reasonable control,



including but not limited to acts of God, fire, flood or other natural disasters, war and civil disturbance, riot, acts of governments, terrorism, disease, currency restrictions, labor shortages or disputes, unavailability of materials, fuel, power, energy or transportation facilities, failures of suppliers or subcontractors to effect deliveries, in which case the time for performance shall be extended in an amount equal to the excused period, provided that Seller shall have, as soon as reasonably practicable after it has actual knowledge of the beginning of any excusable delay, notified Buyer of such delay, of the reason therefor and of the probable duration and consequence thereof. Seller shall use its best efforts to eliminate the cause of the delay, interruption or cessation and to resume performance of its obligations hereunder with the least possible delay.

11. Cancellation. Except as otherwise provided in this Agreement, no order may be cancelled on special or made-to-order goods or unless otherwise requested in writing by either party and accepted in writing by the other. In the event of a cancellation by Buyer, Buyer shall, within thirty (30) days of such cancellation, pay Seller a cancellation fee, which shall include all costs and expenses incurred by Seller prior to the receipt of the request for cancellation including, but not limited to, all commitments to its suppliers, subcontractors and others, all fully burdened labor and overhead expended by Seller, plus a reasonable profit charge.” Return of goods shall be in accordance with Seller’s most current Return Materials Authorization and subject to a minimum fifteen percent (15%) restocking fee.

Notwithstanding anything to the contrary herein, in the event of the commencement by or against Buyer of any voluntary or involuntary proceedings in bankruptcy or insolvency, or in the event Buyer shall be adjusted bankrupt, make a general assignment for the benefit of its creditors, or if a receiver shall be appointed on account of Buyer’s insolvency, or if Buyer fails to make payment when due under this Agreement, or in the event Buyer does not correct or, if immediate correction is not possible, commence and diligently continue action to correct any default of Buyer to comply with any of the provisions or requirements of this Agreement within ten (10) calendar days after being notified in writing of such default by Seller, Seller may, by written notice to Buyer, without prejudice to any other rights or remedies which Seller may have, terminate its further performance of this Agreement. In the event of such termination, Seller shall be entitled to receive payment as if Buyer has cancelled the Agreement as per the preceding paragraph. Seller may nevertheless elect to complete its performance of this Agreement by any means it chooses. Buyer agrees to be responsible for any additional costs incurred by Seller in so doing. Upon termination of this Agreement, the rights, obligations and liabilities of the parties which shall have arisen or been incurred under this Agreement prior to its termination shall survive such termination.

12. Drawings. All drawings are the property of Seller. Seller does not supply detailed or shop working drawings of the goods; however, Seller will supply necessary installation drawings. The drawings and bulletin illustrations submitted with Seller's quotation show general type, arrangement and approximate dimensions of the goods to be furnished for Buyer’s information only and Seller makes no representation or warranty regarding their accuracy. Unless expressly stated to the contrary within the quotation or sales form, all drawings, illustrations, specifications or diagrams form no part of this Agreement. Seller reserves the right to alter such details in design or arrangement of its goods which, in its judgment, constitute an improvement in construction, application or operation. All engineering information necessary for installation of the goods shall be forwarded by Seller to Buyer to upon Buyer’s acceptance of this Agreement. After Buyer’s acceptance of this Agreement, any changes in the type of goods, the arrangement of the goods, or application of the goods requested by Buyer will be made at Buyer’s



expense. Instructions necessary for installation, operating and maintenance will be supplied when the goods are shipped.

13. Proprietary Information, Injunction. Seller's designs, illustrations, drawings, specifications, technical data, catalogues, "know-how", economic or other business or manufacturing information (collectively "Proprietary Information") disclosed to Buyer shall be deemed proprietary and confidential to Seller. Buyer agrees not to disclose, use, or reproduce any Proprietary Information without first having obtained Seller's express written consent. Buyer's agreement to refrain from disclosing, using or reproducing Proprietary Information shall survive completion of the work under this Agreement. Buyer acknowledges that its improper disclosure of Proprietary Information to any third party will result in Seller's suffering irreparable harm. Seller may seek injunctive or equitable relief to prevent Buyer's unauthorized disclosure.

14. Installation and Start-up. Unless otherwise agreed to in writing by Seller, installation shall be the sole responsibility of Buyer. Where start-up service is required with respect to the goods purchased hereunder, it must be performed by Seller's authorized personnel or agents; otherwise, the Warranty is void. In the event Buyer has engaged Seller to provide an engineer for start-up supervision, such engineer will function in a supervisory capacity only and Seller shall have no responsibility for the quality of workmanship of the installation. In any event, Buyer understands and agrees that it shall furnish, at Buyer's expense, all necessary foundations, supplies, labor and facilities that might be required to install and operate the goods.

15. Specifications. Changes in specifications requested by Buyer are subject to approval in writing by Seller. In the event such changes are approved, the price for the goods and the delivery schedule shall be changed to reflect such changes.

16. Buyer Warranty. Buyer warrants the accuracy of any and all information relating to the details of its operating conditions, including temperatures, pressures, and where applicable, the nature of all hazardous materials. Seller can justifiably rely upon the accuracy of Buyer's information in its performance. Should Buyer's information prove inaccurate, Buyer agrees to reimburse Seller for any losses, liabilities, damages and expenses that Seller may have incurred as a result of any inaccurate information provided by Buyer to Seller.

17. Minimum Order. Seller reserves the right to refuse to process any order that does not meet quantity requirements that Seller may establish for any given product or group of products.

18. Quality Levels. Prices are based on quality levels commensurate with normal processing. If a different quality level is required, Buyer must specify its requirements, as approved in writing by Seller, and pay any additional costs that may be applicable.

19. Product Recalls. In cases where Buyer purchases for resale, Buyer shall take all reasonable steps (including, without limitation, those measures prescribed by the seller): (a) to ensure that all customers of the Buyer and authorised repairers who own or use affected products are advised of every applicable recall campaign of which the Buyer is notified by the Seller; (b) to ensure that modifications notified to Buyer by Seller by means of service campaigns, recall campaigns, service programmes or otherwise are made with



respect to any products sold or serviced by Buyer to its customers or authorized repairers. The reimbursement of Buyer for parts and labor used in making those modifications shall be as set forth in the campaign or program instructions. Without the prior consent of the Seller, the Buyer shall not disclose to any third party the information contained in service campaign, recall campaign or service programme literature. Should Buyer fail to perform any of the actions required under this section, Seller shall have the right to obtain names and address of the Buyer's customers and shall be entitled to get into direct contact with such customers.

19. GOVERNING LAW. THE TERMS OF THIS AGREEMENT AND ALL RIGHTS AND OBLIGATIONS HEREUNDER SHALL BE GOVERNED BY THE LAWS OF THE STATE OF SELLER'S OFFICE TO WHICH THIS ORDER HAS BEEN SUBMITTED (WITHOUT REFERENCE TO PRINCIPLES OF CONFLICTS OF LAWS). THE RIGHTS AND OBLIGATIONS OF THE PARTIES HEREUNDER SHALL NOT BE GOVERNED BY THE 1980 U.N. CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS.

20. Titles. The section titles are for reference only, and shall not limit or restrict the interpretation or construction of this Agreement.

21. Waiver. Seller's failure to insist, in any one or more instances, upon Buyer's performance of this Agreement, or to exercise any rights conferred, shall not constitute a waiver or relinquishment of any such right or right to insist upon Buyer's performance in any other regard.

22. Severability. The partial or complete invalidity of any one or more provisions of this Agreement shall not affect the validity or continuing force and effect of any other

AGREEMENT TO PURCHASE: BUYER agrees to purchase the equipment and services herein in accordance with the terms and conditions set forth above.

ACCEPTANCE: SELLER hereby accepts BUYER'S offer to purchase.

(BUYER)


Xylem Water Solutions USA, Inc.

BY: _____

BY: _____

_____, 20 _____

_____, 20 _____

	STANDARD SPECIFICATION	
	FILTRATION SYSTEMS	August 2013
	LEOPOLD® TYPE XA® UNDERDRAIN With I.M.S.-200 ® Cap (Air/Water)	PAGE 1 OF 16

PART 1.0 GENERAL

1.1 SCOPE OF WORK

A. Work Included

All of the equipment described in this section shall be supplied by a single underdrain manufacturer regularly engaged in that business. This section requires the furnishing and installation of eight (8) filter cells (four (4) dual bay filters) as shown on the contract drawings. Each filter has a 28'-0" lateral run x 10'0". The equipment to be supplied shall consist of:


1. Filter underdrain with I.M.S.-200 Media Retainer ®
2. Filter media
2. Other miscellaneous components

B. References


1. NSF - Standard 61 - Drinking Water Systems Components - Health Effects.
2. AWWA B100 Water Treatment Filtering Material latest edition.
3. ANSI/AWWA F101 Contact-Molded, Fiberglass-Reinforced Plastic Washwater Troughs and Launderers.
4. ANSI/AWWA F102 Matched-Die-Molded, Fiberglass-Reinforced Plastic Weir Plates Scum Baffles and Mounting Brackets.
5. ASTM Standards listed in Section 1.4.H, Table 1.

1.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. General Requirements

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1. The filter underdrain system shall be designed and installed to ensure long term stability in its operating characteristics. It shall be resistant to changes in head loss, flow uniformity, and any other effects which would in time cause loss of efficiency or effectiveness in its operation.
2. The underdrain system is intended to allow for the uniform collection of filtered water and uniform distribution of backwash water and air over the total area of the filter floor.
3. The backwash system shall allow for separate air scouring and water backwashing and for the simultaneous use of air and water at the specified rates.
4. The system shall be designed to avoid localized areas of excessive flow (maldistribution) which may cause mounding, lateral displacement, or other deleterious disturbances in the filter support gravel or media.
5. When subjected to a flow rate of 20 gpm/sf of filter area the headloss through an underdrain lateral 32 feet long shall not exceed 45 inches water column.
6. To ensure the underdrain will control distribution (limit maldistribution) and not be over-powered by the media headloss, the minimum headloss through the orifices (primary and secondary) of an individual underdrain block shall not be less than 20 inches water column at a backwash flow rate of 20 gpm/sf of filter area.
7. The underdrain system shall have an integral grout pocket designed to provide uplift resistance as a result of internal pressurization of 30 PSI without any external mechanical anchors. Underdrain blocks that do not have a grout pocket shall have external anchor rods embedded into the filter floor and shall extend above the underdrain and hold the underdrain down from the top. The external anchor system shall be designed for a minimum allowable load of 30 psi hold down across the filter.
All anchors shall be tested prior to the placement of the underdrain block to 130% of the allowable load. All anchors shall be type 316 stainless steel.
8. The filters shall consist of 12 inches of silica sand media, and 18 inches of anthracite media.

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9. An air scour system at the rate of 4scfm/sf shall be supplied to ensure optimum cleaning.

B. Design Flow Rates: The filter underdrain system shall be furnished and installed to perform satisfactorily and as specified when operated under the following conditions:


1. Downflow of filtered water up to 10 gpm/sf.
2. Upflow of backwash air of 4 scfm/sf.
3. Upflow of backwash air, together with backwash water at combined air and water rates: 4 scfm/sf and 5 gpm/sf.
4. Upflow of backwash water up to 20 gpm/sf.

C. Flow Distribution: The filter underdrain system, as installed, shall provide acceptable flow uniformity. Maldistribution (MD) of air and water flows during backwash shall be as follows:

1. **Lateral Water MD:** The maldistribution in a lateral 32 feet long or less shall not exceed +/- 3 percent of the average gpm/sf of filter for a backwash rate of 20 gpm/sf .
2. **Flume Water MD:** Note, additional maldistribution, due to specific flume arrangement, entry conditions into both flume and underdrain laterals and flow velocities, must be considered.
3. **System Air MD:** Visually, the air should show a uniform pattern.

D. Structural Design Requirements

1. **General:** The filter underdrain system, including anchorage, supports, etc. shall be designed to safely withstand loadings for the specified conditions.


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2. **Internal Loading:** The filter underdrain system, when installed, shall be designed for a net internal loading during backwash of the greater of either 1400 psf or 200 percent of the maximum pressure at maximum backwash rates. No credit shall be taken for the weight of gravel or filter media.
3. **Downward Load:** The filter underdrain system shall also be designed to withstand a net downward loading of not less than 2,800 psf.

E. **Air Temperature:** During backwash with air, the underdrain shall be suitable to withstand a maximum air temperature of 200° F.

1.3 QUALITY ASSURANCE

- A. **Manufacturer:** The underdrain system for the filters shall be the Leopold Type XA as manufactured by Xylem Water Solutions Zelienople LLC, Zelienople, Pennsylvania.
- B. **Experience:** The underdrain system shall be a standard product of a filter manufacturer who has been actively providing dual-parallel lateral air/water underdrain equipment for at least 35 years. Upon request, the filter manufacturer will provide the ENGINEER with a list of installations of similar dual parallel lateral underdrain which totals not less than 200.
- C. **NSF Certification:** All materials used in contact with the water and backwash air shall meet National Sanitation Foundation (NSF) Standard 61 Drinking Water System Components - Health Effects.
- D. **Underdrain:** The dual-parallel block units with integral flow metering elements and any specialties required for installation such as special anchorage, grout retaining bridges, closures, gaskets, etc., shall be the products of a single manufacturer/supplier.
- E. **Uplift Certification:**
 1. The underdrain manufacturer shall provide third party certification that the underdrain can withstand a minimum of 30 psi internal pressure without lifting or

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separating from the filter floor when properly installed with grout and no mechanical anchoring.

F. Hydraulic Demonstration


1. The **underdrain** manufacturer shall, at their own facilities, if requested by the ENGINEER, set up a test lateral run of equal length to that required by the project and provide an opportunity for the ENGINEER and/or OWNER to visit the facility to witness a full scale demonstration of the headloss and flow distribution during backwash.
2. The test facility shall be capable of demonstrating concurrent air and water distribution in a submerged trough and water only distribution on a non-submerged test bench.
3. These demonstration services shall be provided by the filter manufacturer with reasonable notice and at no additional expense to the OWNER or ENGINEER.

G. Media: The filter equipment manufacturer shall furnish a Quality Control Manual demonstrating that the filter media to be furnished will comply with the requirements of the contract specifications. The Quality Control Manual will define the following:

1. Qualification of the raw feedstock
2. Control procedures at the screening mill
3. Independent testing laboratories
4. Packaging definition
5. Purchase orders
6. Storage procedures

1.4 SUBMITTALS


- A.** Submit to the engineer complete shop drawings showing details of fabrication, materials of construction, installation and leveling data of all items furnished under this section.

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- B.** Details submitted shall include as a minimum, headloss data for air, water and combined air/water backwash, installation details, flow distribution calculations, certification of compatibility of the underdrain system with the filter media specified in this section, details for installing reinforcing and other items to be embedded in concrete.
- C.** Testing Procedures: Detailed start-up, hydraulic, and air scour test procedures.
- D.** Proper documentation showing NSF-61 certification of all underdrain components.
- E.** The media submittal and technical information will be provided and approved by a licensed engineer regularly employed by the filter manufacturer. The engineer shall have at least 15 years experience in water treatment. All submittal shall include the following information as a minimum:
1. Supplier's Name
 2. Resume of Engineer Providing Submittal
 3. Quality Control Manual
 4. Gradation of Each Media Type
 5. Date of Sampling/Lot Number
 6. Samples of Each Media Type (If Required)
 7. Representative Sample Analysis, (i.e. effective size, uniformity coefficient, specific gravity, acid solubility and MOH hardness for Anthracite only.)
 8. Material Quantities
 9. Diagram with Type of Material and Depth of Each
 10. Estimated Shipping Schedule
 11. Media Loading Procedure
 12. All testing shall conform to the requirements of the latest edition of AWWA B100.

1.5 SHIPMENTS

- A.** Media materials will not be shipped until the submittal is approved by the Owner. Approval of the submittal, including the Quality Control Manual, samples and independent testing, shall constitute acceptance of the media.


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- B.** The schedule of work shall be submitted to the Owner for approval prior to commencement of work.
- C.** The contractor shall be responsible for coordinating the shipment of supplies of materials and equipment specified herein. Coordination will be required during construction, startup and/or testing.
- D.** The Owner shall provide storage space for gravel and filter media and protect it from exposure to sunlight if stored for more than two weeks. Paper bags (if used) shall be protected from moisture at all times.
- E.** The contractor shall be responsible for storage of the filter control system equipment. The storage area shall be indoors, reasonably dust-free and protected from exposure to water or any corrosive materials.

PART 2.0 PRODUCTS

A. Underdrain

1. The underdrain system for the filters shall be a dual parallel lateral whereby feeder and compensating chambers are provided within the cross section of a single block. The cross section of the underdrain shall be where the feeder (or primary) chamber is adjacent and connected to the compensating (or secondary) chambers through a series of orifices. The orifices shall be located at four different elevations and sized to provide uniform distribution of air and water. All internal orifices shall be integrally molded to provide a smooth bore orifice. Underdrains requiring secondary drilling procedures to install internal orifices and underdrains with circular water orifices in the primary chamber will not be considered acceptable. The primary chamber should provide at least 43 square inches of cross sectional area per block to reduce flow velocity during backwash.
2. The compensating chambers shall provide the essential uniform pressure and flow distribution from the top of the blocks. The discharge flow from the top of the blocks into the filter bed shall be provided by approximately twenty-three dispersion orifices per square foot of filter area. The orifices shall be not less than 11/64 inch diameter to prevent clogging and shall be recessed from the surface by

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approximately 1/8 inch. The top of each orifice shall be encircled by a depression approximately 3/8 inch x 3/4 inch.


3. The underdrain shall have a horizontal flat top discharge surface, so that the finished filter bottom is essentially flat, with above stated dispersion orifices for uniform energy intensity of air and water coverage which direct flow vertically for effective penetration and cleaning of the media.
4. Dual water recovery channels with return holes shall be incorporated into the top of the underdrain block to ensure uniform and continuous air flow from the top deck orifices and greater air stability. Underdrains without a water recovery channel will not be considered acceptable.
5. The secondary chambers of the underdrain shall have baffles sized and located to provide effective air control and to reduce level sensitivity. Underdrains without baffles will not be considered.
6. The secondary chambers of the underdrain shall have baffles sized and located vertically along the exterior of the primary chamber to provide effective air and water control.
7. The underdrain shall have a lug located on the exterior of the underdrain to allow simple connection and disconnection of an optional handle. The optional handle shall be removed once the filter laterals are set in place within the filter tank.

B. Air Header

1. Because the proper distribution of air into the underdrain has a significant effect upon operation, the filter manufacturer shall have the responsibility to design and provide the air distribution header for this underdrain.

C. Filter Media

1. Filter sand shall be composed of hard, durable clean siliceous particles, free of all mica with an average specific gravity of 2.6 (± 0.05) and shall be in strict accordance with AWWA B100, and have an effective size of 0.45-0.55 mm, and a uniformity coefficient of 1.40 or less, for a finished depth after

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backwashing and scraping and removal of fines and debris of 12 inches. A skimming allowance of 1/2 inch shall be provided

2. Filter anthracite shall be composed of specially selected and graded hard, durable anthracite coal particles. The anthracite shall be composed entirely of deep mined material. A quality control manual shall be included to show the source of the material and the quality of the material produced. The anthracite shall have an average specific gravity of 1.65 (± 0.05) with a hardness (Mohs' scale) of 2.7 or more and shall be essentially free of iron, clay, shale, extraneous dirt, and excessive dust with moisture less than 4.0 percent as shipped. The anthracite shall be in accordance with AWWA B100, and have an effective size of 0.95-1.05mm, and a uniformity coefficient of 1.40 or less for a finished depth after backwashing and scraping and removal of fines and debris of 18 inches. A skimming allowance of 1 inch shall be provided.

2.1 MATERIALS AND CONSTRUCTION

A. Underdrain

1. **Material:** The individual blocks used in the system shall be of impervious high strength, completely corrosion-resistant, high-density polyethylene (HDPE) material. The blocks shall be resistant to erosion and corrosion and have uniform smooth surfaces.
2. **Dimensions:** The block size and weight shall permit ease of handling and installation. The block nominal dimensions shall be 8.25 inches high by 11 inches wide by 48 inches long. The weight of the block shall be approximately 24.5 pounds. Underdrains with heights greater than 8.25 inches shall not be allowed.
3. **Block Geometry:** The blocks shall be essentially rectangular in shape with dispersion orifices located in the top flat surface. The blocks shall have ridges and pockets for structural rigidity. The sides of the block shall have grout lock-in lugs to key into surrounding grout so that the walls can bond with the grout. The bottom of the block shall have integral grout pockets located at each end.
4. **Lateral Construction:** The blocks shall be arranged end-to-end and mechanically joined to form continuous underdrain laterals approximately equivalent to the length of the filter cell. The joints shall be gasketed, bell and spigot type with internal alignment tabs for proper joint alignment, and be air and water-tight. Joints shall be of

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snap-lock type so that the blocks are joined with integral interlocking snap lugs and lug receptors for ease of assembly and installation.


5. **I.M.S.[®] 200:** The I.M.S.[®] 200 media retainer shall be made of thermoplastic through the injection molded process and sealed to the top of the underdrain. The I.M.S.[®] 200 media retainer shall be made from two separate sections that are permanently sealed together to form slots or openings. The opening size shall be sufficient to prevent the media from obstructing or passing through the underdrain. Vertical baffles shall be located on the bottom side of the media retainer to “compartmentalize” the fluid to keep it from moving horizontally along the bottom side of the media retainer thus ensuring each pattern of slots in the media retainer receives equal quantities of air and or water during the backwash cycle. The I.M.S.[®] 200 media retainer shall replace the need for support gravel and shall not increase the underdrain height by more than 1 1/4 inch. The cap shall be attached and sealed to the underdrain at the factory using Type 316 stainless steel self-tapping screws and 3M Weatherban Sealant Tape.

B. Air Header

1. **General:** The air distribution system shall be generally comprised of a corrosion resistant header specially calibrated to evenly distribute air flow via properly located riser pipes to each underdrain lateral. Sufficient relative velocities shall be maintained in both the header and riser pipes to insure proper distribution of air.
2. **Material:** The air header piping shall be Sch. 5, type 304 stainless steel. The anchors and hardware for anchoring the air header shall be type 18-8 stainless steel.

C. Grout Retainer

1. A grout retainer (GROUT-TITE[®] bridge) shall be utilized over the filter flume. GROUT-TITE[®] bridge shall be of high-impact polystyrene properly keyed to fit the underdrain blocks to allow adjustment of lateral center-to-center distance without difficulty. The GROUT-TITE[®] bridge shall span the width of the flume and shall be laid side by side to cover the entire length of the flume and create a homogenous seal. The ends of the GROUT-TITE[®] bridge shall have overlapping edges formed into the piece to create a contiguous seal perpendicular to the width of the flume. The elevation of the

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GROUT-TITE® bridge can be adjusted vertically using flume sealing plates against the bottom side of the GROUT-TITE® bridges. GROUT-TITE® bridge shall be supplied by the filter manufacturer.


D. Grout

1. Cement: Cement shall be standard brand Portland cement conforming to ASTM C150, Type II, for general use. Cement that has become “lumpy” shall not be used.
2. Water: Water for mixing and curing shall be clean and clear potable water. The water shall be considered potable if it meets the requirements of the local government agencies. Water with a total dissolved solids of 1000 mg/l or higher or greater than 10 NTU shall not be used.
3. Sand: Sand shall be clean and washed masonry sand. When tested in accordance with ASTM D2419, the sand equivalency shall not be less than 90% for an average of three samples, or less than 85% for any individual sample. 100% of sand particles shall pass No. 4 sieve and not more than 4% of sand particles shall pass No. 200 sieve.
4. Chemical Admixtures: No chemical admixture is needed in most of the applications. The grout can be mixed in a small batch and used immediately.
5. Strength: The grout used in installing the blocks shall have a minimum compressive strength of 3000 psi after 30 days of curing. Normally, use a grout with one part Portland cement and two parts clean silica sand properly mixed and wetted with a maximum water-cement ratio by weight equal to 0.50 to 0.55 for the base grout and 0.61 to 0.67 for the fill grout.

PART 3.0 EXECUTION

3.1 PRODUCT HANDLING, STORAGE AND DELIVERY

- A. Place or store underdrains and specialties only in designated staging areas shown on the drawings and approved by the Engineer.


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- B.** Store underdrains and specialties off the ground, under ultraviolet-resistant tarps from time of delivery on-site until final installation of the filters.
- C.** Replace, at no charge to Owner, underdrains and specialties damaged during storage and delivery.
- D.** Underdrains and specialties are subject to inspection at the Engineer's request if visual evidence of damage is observed.
- E.** All filter media will be shipped in "semi-bulk" containers having lifting loops and bottom discharge spout. Anthracite superbags are 60 cubic feet weighing approximately 3,000 pounds each.
- F.** Delivery of "bulk" shipments will not be permitted

3.2 INSTALLATION

A. Filter Underdrains and Air Header

1. The CONTRACTOR shall install the filter underdrain system in strict accordance with: (1) the manufacturer's written instructions and recommendations and the manufacturer's installation drawings; (2) the oral and written directions provided by the manufacturer's technical representative who is supervising and observing the WORK; and (3) any additional requirements specified herein.
2. Floor Preparation
 - a. Care shall be exercised in preparing the filter floor slab and in setting the anchors to assure proper alignment and elevation. Steel anchor rods shall be furnished by the filter manufacturer and set in the floor slab on both sides of the distribution flume in accordance with the drawing provided. The floor slab shall be screeded into a flat level plane and be free of protrusions and depressions, but have a rough, broom finish. Do not trowel or finish the floor to a smooth finish.
 - b. DO NOT PAINT the floor or wall area where it will come in contact with the grout surrounding the underdrain. The filter floor and filter

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wall extending sixteen (16) inches up from the filter floor is not to be painted.

3. Underdrain Lateral Installation

- a. The underdrain laterals shall be set in relatively level rows on a bed of grout over the filter floor slab. Plates for closing the ends of each row of blocks shall be furnished by the filter manufacturer and installed by the CONTRACTOR. After joining, aligning and setting the blocks, and the bed grout is set-up, as soon as possible, all spaces between the rows of blocks and walls shall be filled with grout so that the entire bed is totally sealed and held firmly in place. Once all grouting is complete, the grout shall be allowed to cure for at least 3 full days before any functional testing.
- b. Anchor rods, if required as shown in the contract drawings, shall be supplied by the underdrain MANUFACTURER and installed by the CONTRACTOR. Installation of the anchor rods shall be in accordance with the MANUFACTURER'S approved installation drawings and instruction manual.
- c. After the anchor rods have been installed and the epoxy has cured, a non-destructive vertical pull test shall be performed. Testing shall be performed on 100% of the anchor rods. The pull test shall be performed by the underdrain MANUFACTURER in accordance with the MANUFACTURER'S instruction manual.

4. Cleaning and Protection During Installation, Testing, and Startup

- a. The CONTRACTOR shall take all precautions recommended by the underdrain manufacturer or specified herein to ensure that the filter underdrain system and any piping communicating therewith is completely clean and free of any debris, dirt, or other foreign materials which could clog the underdrain system or interfere with flow. Backwash air and water piping shall be thoroughly flushed clean. All loose debris and dirt within the filter cell and flume shall be removed by brooming down and vacuuming. Care shall be taken to keep grout from being deposited anywhere where it could interfere with flow. Any grout so deposited shall be removed. As installation progresses,


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partially completed portions of the WORK shall be protected with heavy plastic sheeting or other suitable material to maintain the cleanliness of the underdrain system. Such protection shall be maintained until the support gravel is installed.

- b. Any time the underdrain laterals are to be used as a work surface, the underdrain block shall be overlaid with ½ inch minimum plywood sheeting where necessary, to distribute the load of yard buckets, wheel barrows, ladders, scaffolds, etc., to prevent damage to the underdrain.

B. Media

1. Marks shall be placed on the side of the filter designating the top elevation of each layer.
2. Carefully place each layer so as not to disturb the previous layers.
3. Complete the installation of each layer before the next layer above is started. Do not stand or walk directly upon the filter materials. Workers must stand or walk on boards that will sustain their weight without displacing the gravel and media.
4. Measure depth of each layer of media after it has been backwashed and skimmed as recommended by the filter equipment manufacturer.
5. Clean the filter tanks before any media is placed and keep them clean throughout the placing operation.
6. Filter Sand: Place the filter sand in the bed in the order of their respective specific gravities. Place and level the filter sand first. Then backwash the bed a minimum of three times, and remove the surface fines by scraping as required to the correct elevation.
7. Filter Anthracite: Place the filter Anthracite and backwash the bed three times, and remove the surface fines by scraping as required to the correct elevation.

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3.3 FIELD TESTING


A. Underdrain Lateral Flow Distribution Test

1. The filter underdrain system in each filter cell shall be given a series of visual, qualitative, flow distribution tests to verify that I.M.S.® 200 slots are not clogged with debris and that flow distribution is uniform. These tests shall be performed before the filter media is placed.
2. During each test, the underdrain laterals shall be visually inspected for uniform distribution of air and water and for any signs of quiescent zones and excessive surface turbulence.

3.4 MANUFACTURER'S SERVICES

A. Mechanical Filter Equipment Services

1. Install all items in accordance with the filter equipment manufacturer's recommendations. Upon completion of the installation, the technical director shall furnish a certificate of compliance detailing that the filtering materials have been installed in accordance with the manufacturer's instructions.
2. The underdrain manufacturer shall retain on its permanent staff, field service representatives with at least 10 years of experience in the placement of underdrain. (Such persons shall be available on a fee-paid basis to instruct the CONTRACTOR in the proper placement and testing of the underdrain).
3. The CONTRACTOR shall provide the services of the manufacturer's technical representative for not less than 12 working days (8 hours per day) to inspect and supervise the installation and testing of the filter underdrain system in 4 trips.
4. Additional supervision for testing or other purposes in excess of that included above shall be made available by the manufacturer with reasonable notice and at the manufacturer's prevailing per diem rate plus living and travel expenses.

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3.5 SPARES

Spares shall be provided as follows:

- Ten (10) underdrain o-rings.
- Five (5) Plastic end caps.

***** END OF SECTION *****



JVA, Incorporated
 214 8th Street
 Suite 210
 Glenwood Springs
 CO 81601
 970.404.3100
 info@jvaja.com

VIA FACSIMILE #

Date: 07/12/2016

Purchase Order No. TBD

www.jvaja.com

Project Name City of Grand Junction WTP Upgrade Project

[Buyer] City of Grand Junction

[Address] 250 North 5th Street, Grand Junction, CO 81501

Attention: Leslie Distel (UE Compression)

For this letter City of Grand Junction is the "Buyer" and UE Compression, 9461 Willow Ct., Henderson, CO 80640 is the "Seller".

This letter is meant to memorialize the pre-purchase of equipment for the City of Grand Junction WTP Upgrade Project:

1. The one year warranty on all equipment will begin after substantial completion of the project. Substantial completion is defined as the time at which the Work has progressed to the point where, in the opinion of Engineer, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be utilized for the purposes for which it is intended.

2. No exceptions to the following terms and conditions will be allowed:

- Upon a fully executed contract 10%
- Upon shop drawing approval 10%
- Upon equipment delivery to the site 65%
- Upon O&M manual approval 5%
- Upon successful startup 5%
- Retainage held until Substantial Completion 5%

3. No exceptions to the following dates will be allowed:

- Manufacturer provided cost comparison May 27, 2016
- Manufacturer's scope/proposal July 29, 2016
- Executed contract August 29, 2016
- Delivery of shop drawings September 9, 2016
- Approval of shop drawings* September 16, 2016
- Delivery of Equipment December 5, 2016
- Startup Date** TBD by Contractor
- Substantial Completion*** April 30, 2017

*If shop drawings are marked Amend and Resubmit (A&R) the manufacturer delivery time shall not change unless specifications are changed by purchaser no less than 15 days prior to drawing submittal deadline. Any additional time for submittals would be made up through the manufacturing process. Engineer will review the revised submittal and provide comments/approval within 3 working days.



**The date of startup shall be no later than January 31, 2017.

***The warranty, which is based on the date of substantial completion, shall start no later this date.

4. Manufacturer and Owner recognize time is of the essence and Owner will suffer financial loss if the Equipment is not delivered with the time specified above. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Equipment is not delivered on time. Accordingly, instead of requiring any such proof, Owner and Manufacturer agree that as liquidated damages for delay (but not as a penalty), Manufacturer shall pay Owner \$250 for each day that expires after the time specified above until the Equipment is delivered. Payment of liquidated damages shall be Seller's sole Liability and Buyer's sole remedy for late delivery. In no event shall liquidated damages exceed ten percent (10%) of the contract price.
5. Equipment shall be manufactured to meet the attached Specifications and Project Drawings.
6. Manufacturer shall provide costs from three successful, competitively bid projects within the last three months and within the Rocky Mountain region for price comparison. If the manufacturer does not have three projects that meet this requirement then projects of similar scope and size located in the state of Colorado may be substituted. On a separate page manufacturer should also provide contact information for the referenced projects.
7. Items outlined above shall supersede the terms and conditions set forth in the Manufacturer's proposal/scope of supply.
8. See Manufacturer's proposal/scope of supply for equipment costs.

Please indicate your agreement to the foregoing by countersigning this letter, retain one fully signed counterpart for your files and return the original copy to us via mail and a scanned copy via email.

Thanks,

Agreed to above:

[Seller]

Signature: _____

By: Jay Holden

{Typed name}

Title: CEO

Date: 8/5/2016

Agreed to above:

[Buyer]

Signature: _____

By: John Eklund

{Typed Name}

Title: Project Engineer

Date: 8/8/2016



August 11, 2016

JVA
214 8th Street Suite 210
Glenwood Springs, Co 81601

Adam Racette
970-404-3004
aracette@jvajva.com

Freight Terms: FOB Job Site Freight Included

Terms : Stated in pre-purchase agreement – contract subject to confirmation from UE Compression based on delivery per below lead time. UE Compression has reviewed the customer supplied specifications and drawings however are not in full compliance. Comments and exception can follow after further discussion with customer.

Current lead-time: To be determined. Gardner Denver requires purchase date before providing firm delivery of equipment.

Thank you for making UE Compression your supplier of choice. I am looking forward to working with you. Please feel free to contact me with any further questions or concerns.

Sincerely,

Leslie Distel
Sr. Account Manager
Direct: 303-515-8611
Cell: 303-880-6913

ldistel@uecompression.com

Enclosures



PART I – GENERAL

The blower or vacuum package shall be of the positive displacement type, dual splash lubricated, with the blower assembly, accessories, controls and other components packaged and supplied by a single manufacturer, who shall be responsible for the compatibility of all included equipment. Depending on performance requirements, the blower package shall include one of the blowers described in more detail below of a helical 3 lobe type. The package to be fully enclosed, horizontal blower configuration, and factory tested prior to shipment. Each blower shall deliver **1120 SCFM** of air when operating at **75 hp** and against **6.1 psig**.

PART II – PRODUCT DESIGN CONDITIONS

Installation Site Conditions: 4900 FASL (12.25 psia); 105°F Maximum Inlet Air Temp; 50% Relative Humidity

Operating Range: 560 to 1120 SCFM @ 6.1 psig (max)

2. BLOWER CONSTRUCTION

2.1 HeliFlow® 5" gear diameter

a. Impeller Case

High-strength impeller case shall be one-piece ASTM A48 Class 30 close-grained cast iron with one separate and one integral head plate incorporating large external fins for strength and heat dissipation. Venting chambers vented to the atmosphere shall be located between the air and oil seals. This assures no oil enters the impeller housing or system air stream. The unique Helical 3 lobe rotors, triangular tuned ports, feedback slots, and extra casing mass shall aid in reducing noise levels.

b. Impellers-Shaft Assembly

Impellers shall be solid 3 lobe helical design, with integral shafting, produced from close grain ASTM A536, grade 65-45-12 ductile iron. Impellers shall be machined on all exterior surfaces to a precise contour for operating at close clearances and high efficiency operation. Impellers shall be dynamically balanced to minimize vibration. End plates shall be high strength cast iron with precision machined bearing fits to assure exact positioning of impellers in the main body housing. Air seals of controlled flow design, shall be piston ring type seals precision fitted to each impeller shaft to minimize air leakage and maximize efficiency.



c. Bearings

Oversized, precision fit, 4 (four) anti-friction bearings shall be double angular contact for fixed end, spherical on drive end drive shaft, and deep groove ball bearing on drive end idler shaft. Double angular contact bearings accommodate axial thrust and positioning while spherical bearing handles radial belt loading. Minimal forces on ball bearing.

d. Timing Gears

The impellers shall be timed by a pair of high strength ASTM A322-91 Grade 8620 UNS G86200 alloy steel timing gears. The gears shall be helical design, case hardened equal to or above 60 Rockwell C hardness and machined for precision timing, quiet operation and long life.

e. Fasteners

All fasteners shall be SAE Grade 5, high strength material as a minimum.

f. Lubrication

Lubrication of timing gears and bearings shall be a splash lubrication system. Formed steel splash plates shall be directly fastened to the impeller shafts to provide positive oil lubrication at all operating speeds. Oil seals of piston ring and oil flinger design, shall be provided on each internal impeller shaft to prevent leakage from the oil reservoirs. The drive seal shall be a high temperature elastomer lip type seal to prevent oil leakage from the oil reservoir.

3. PACKAGE COMPONENTS

3.1 AirSmart Controller (on enclosed packages)

AirSmart Controller shall be included for intelligent digital monitoring with features, such as:

- a. Inlet/Discharge Temperature Indication and Protection
- b. Excessive Filter Differential Indication and Protection
- c. Differential Temperature Protection
- d. Inlet/Discharge Pressure/Vacuum Indication and Protection
- e. Excessive Enclosure Temperature Protection
- f. Service Information (air filter, oil change, hour meter)
- g. Multiple Languages (English, Spanish, French, Italian, Portuguese, German, Czech and Russian)



3.2 Base

Base shall include motor auto-tension device for ease of drive installation. Forklift provisions to be integral with the base, with fork slots for easy maneuverability and fork slot covers as standard.

3.3 Inlet Filter/Silencer

The filter element shall be readily accessible for easy maintenance through hinged top panel. Filter efficiency shall be 99 percent with particles of 2 (two) micron diameter and larger. The inlet filter/silencer shall be carbon steel with paper filter elements. The silencer is integral with filter and able to provide the necessary acoustic silencing of the package.

3.4 Removable Discharge Silencer

A reactive, multiple chamber, silencer shall be used and be able to provide acoustic silencing of critical octave band dB levels. Discharge silencer shall be removable with 4 (four) vibration isolators. Silencer to be separate from base frame to reduce stresses and vibration in base caused by thermal expansion and sound attenuation of the silencer. The discharge silencer shall be ASME coded for all applications utilizing relief valve set pressures at or above 15 psig.

3.5 Pressure/Vacuum Relief Valve

Relief valve shall be a spring type valve. Pressure Relief Valve is to be set to 3 psi above maximum operating pressure, not to exceed 2 psi above maximum pressure rating of the blower. Gardner Denver IQ Blower Package Specification IQ-4-121 01/14 © 2014 Gardner Denver, Inc. Page 5/7

3.6 V-belt Drive with Belt Guard

Belt Guard shall be designed separate from the sound enclosure and meet OSHA standards. Lightweight removable polymer guard shall ensure ease of maintenance and operator protection. The basic blower package shall be designed as a fixed speed belt drive. The motor base shall incorporate auto tensioning capability to eliminate the need for regular field maintenance tensioning of the drive system. Belt tension status indicator shall advise when belt replacement is required.



3.7 Drive Motor

TEFC EPACT NEMA standard motor with 1.15 service factor shall be supplied according to specifications within the parameters of enclosure, speed, temperature rating and efficiency level. Motor shall be mounted and aligned prior to shipment to allow for rapid on-site check of alignment and tensioning prior to start-up. Motor shall be designed for inverter duty. Motor shall be suitable for 200/3/60, 230/3/60, 380/3/50, 415/3/50, 460/3/60 and 575/3/60 applications. Premium Efficiency option shall be available.

3.8 Enclosure cooling Fan

An enclosure cooling fan shall be supplied on enclosed packages to adequately control the temperature within the enclosure in order to eliminate overheating of components. Fan to include safety guard.

3.9 Connections

Process connection to be flanged with a 6" ANSI bolt pattern. All process connections and electrical service connections will enter/exit through the back of the package. Maintenance points to be accessed through removable panels on top, front, right and left side of the package when facing package.

3.10 Vibration Isolation Pads.

Vibration Isolation Pads shall be provided to minimize transmitted vibration from the blower package base to the support level or surrounding structures where the blower is situated. Isolating bellows/piping expansion joints or hoses required at inlet/discharge of the blower for same purpose.

3.11 Sound Attenuating Enclosure

The sound attenuating enclosure rigidly fabricated of 16 gauge formed sheet powder coated with additional foam padding, providing sound levels of 79-85 dBA, tested per CAGI adopted ISO 2151 specifications, shall be provided as standard. Enclosure will include one-piece removable panels for full access to all components and ease of maintenance.

3.12 Check Valve

Check valve shall be installed downstream of the discharge silencer and supplied with the package.



3.13 UL Type 1 Electrical Box Less starter shall be supplied as standard.

3.14 Oil Fill Reservoirs shall be supplied as standard

3.15 Local Visual Inlet Filter Restriction Indicator shall be supplied as standard for unenclosed packages.

3.16 Local Discharge Pressure Gauge or Inlet Vacuum Gauge shall be supplied on unenclosed packages.

Gardner Denver IQ Blower Package Specification IQ-4-121 01/14 © 2014 Gardner Denver, Inc. Page 6/7

3.17 Local Air Discharge Thermometer shall be supplied on unenclosed packages.

3.18 An oil drain system shall be supplied that allows easy servicing of the blower installed in the package.

3.19 AEON PD Lubricant shall be supplied as standard

4. OPTIONAL ACCESSORIES

4.1 AirSmart Optional Features:

a. Oil level monitoring using ultrasonic level sensors shall be available as an option for intelligent oil level monitoring.

b. Oil sump temperature monitoring shall be available as an option.

c. Remote monitoring shall be available to allow remote monitoring via Modbus protocol over serial or Ethernet.

d. Blower package sequencing shall be available as an option, allowing the blower package to communicate to other same brand blower packages to optimize system efficiency.

AirSmart Controller shall recognize the capabilities of other machines and coordinate their operation to minimize energy consumption.

e. Speed control for VFD option

f. KW readout (VFD option only)

4.2 Integral full-voltage starter shall be available as an option. All starters shall fit within the package.

4.3 Integrated Variable Frequency Drive (VFD) shall be available as an option. All VFDs shall fit within the package.

4.4 An unloader valve is available as an option to provide reduced motor amps during startups for standard starter units.

4.5 An ASME Coded Silencer can be supplied as an option.



4.6 Premium Efficiency TEFC motor can be supplied as an option

4.7 Premium Inlet Filter/Silencer can be supplied as an option for unenclosed packages only.

5. ENVIRONMENT AND OPERATING CONDITIONS

5.1 Environment

a. Suitable for indoor and outdoor installations (outdoor installations are recommended to have a canopy).

b. Altitude range up to 6,000 feet

c. Ambient temperature range 20° F to 100° F

d. 0 – 100% relative humidity

e. Air service only

5.2 Operating parameters

a. Pressure: 5 – 15 PSIG

b. Vacuum: 6 – 16" Hg

c. Air flow: 600 – 1500 ICFM

d. Inlet temperature: 20° F minimum

e. Maximum discharge temperature: 350° F

6. AESTHETICS AND DECALS

All equipment shall be factory painted. Unenclosed package painting shall be aesthetically pleasing painted per factory standards. Enclosure shall be painted white with red corners. Warning and danger decals shall be standard ISO symbols. Product decals shall be the current standard product decal and package logo. Gardner Denver IQ Blower Package Specification IQ-4-121 01/14 © 2014 Gardner Denver, Inc. Page 7/7

PART III – INSTALLATION / WARRANTY

1. INSTALLATION

The contractor, in accordance with the manufacturer's instructions, shall install the blower package.

2. WARRANTY

Gardner Denver equipment supplier shall also be a factory authorized warranty and repair center. The blower package shall come with a full 24 month factory warranty. The motor,



AirSmart controller and VFD or Full-voltage starter (if sold with the package) shall come with the five year warranty.

3. DOCUMENTATION

Units shall ship with operator's manuals, Air Smart Controller manual, Quick Start Guide and parts list in hard copy and/or CD ROM format. PowerPoint sales and training presentation, brochures and performance curves shall be available upon request.

4. TESTING

Package shall have a mechanical run validation test done prior to shipment. Each blower shall have a slip and hot test performed prior to shipment.

5. INSPECTION

Gardner Denver or their distributor shall furnish, if needed, knowledgeable technicians to review the inspection. The staff shall be available, if needed, to inspect the field startup of the equipment.



Pricing

Pricing for GD IQ HF 514 Package with 75 hp Drive Motor

Complete Blower Package:

Sound Enclosure, Quiet Enclosure with cooling fan; HF 514 Blower; Blower/Silencer Base; Inlet Filter/Silencer; V-Belt Drive with Guard; Automatic Belt Tensioner with Indicator; TEFC EPAct Motor, EISA-Compliant, premium efficiency, Minimum 1.15 SF, 460/3/60; Removable discharge silencer; vibration isolators (8); UL/NEMA Type 1 Electrical box less starter (see below); UL Listed, CSA Certified; Pressure Relief Valve;

Air Smart Digital Monitor/Controller with:

Inlet/Discharge Pressure

Inlet/Discharge Temperature

Excessive Filter Differential Indicator & Protection

Differential Temperature Protection

Excessive Enclosure Temperature Protection

Oil Fill Reservoirs; Oil Drain System; AEON-PD-XD Synthetic Lubricant; Standard non-ASME Code Silencer.

2 ea. Model HF 514 with 75 hp Motor **\$ 45,500.00 ea.**
IQ Blower Package (Includes Variable Speed Drive, Line Reactor and Communication Module, EMC Filter, Oil Level Sensor and Oil Temperature Sensor)

Recommended Spare Parts:

1 ea. 13AH8803 Replacement Belts	\$	200.00 ea.
1 ea. VP1069305 Filter Element	\$	300.00 ea.
1 ea. 300HYE6003 Maintenance Kit (Includes Shaft Seal and 8 quarts Aeon PD Lube)	\$	180.00 ea.
1 ea. 28G47 12 Quart Case Aeon PD XD Lube	\$	277.00 ea.



Ancillary Parts:

1 ea. Stoddard F64-8 Inlet Filter	\$	400.00 ea.
12 ea. Stoddard F8-111 Replacement Element (Actual usage will depend on site conditions)	\$	65.00 ea.
2 ea. Flexicraft 8X6X6 EPDM Concentric Reducer (Inlet)	\$	975.00 ea.
2 ea. Flexicraft 8X6X6 Viton Concentric Reducer (Hi Temp. Discharge)	\$	3,385.00 ea.
4 ea. 8" Butterfly Valves 150# RF Manual Apollo 215W08CSP8TA2	\$	1,265.00 ea.

Start up two Model -IQ HF514 / 75 H.P. / 406 volt Gardner Denver blower packages

Work Scope to include:

1. Travel to and from site (Grand Junction)
2. Perform inspection of the installation (provided by others)
3. Perform soft foot deflection
4. Perform motor / blower alignment (If applicable)
5. Run blower at design parameters for 1 hour
6. Record all temperatures / pressures
7. Provide operation / maintenance training
8. Record all amperages / voltages
9. Complete all required start up documentation



Customers Responsibilities:

1. Provide all electrical including; properly sized wiring, breakers and disconnects
2. If required provide line reactors
3. Electrical / plumbing to units completed
4. Insure properly sized safety devises are installed (High temperature shutdown switch, pressure switch and safety relief valve), if applicable
5. Have personnel / equipment readily available to support the system during start up and blower operation

Customer Notes: Warranty on UE Compression LLC. Repairs are one hundred eighty (180) days for workmanship. Manufacturers standard warranty terms and conditions apply, unless otherwise noted, for all parts.

This quote is for labor performed during normal business hours, which are Monday thru Friday, 7:30 am to 4:00 pm. Any work performed outside these hours will result in additional charges.

Customer to provide any required lifting equipment, including forklift, at customers' site. Customer is to provide all required electrical supply at customers' site.

SECTION 11376

POSITIVE DISPLACEMENT ROTARY LOBE BLOWERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. All labor, materials, equipment, and incidentals required for delivery to the project site ready for installation for two (2) rotary lobe positive displacement blowers. Blowers shall supply a variable volume of air and pressure during the air scour only and combination air/low rate backwash filter cleaning procedures.

1.2 DESCRIPTION

- A. Blower Manufacturer shall furnish, test, and place in satisfactory operation two (2) electric motor driven rotary positive displacement blower units. Air scour blowers, controls and all appurtenances shall be provided as indicated on Drawings and as specified herein for a complete and automated aeration system.
- B. All blower units shall include, but not be limited to, the following components for each unit:
 - 1. Rotary positive displacement blower with a belt-driven motor
 - 2. Blower inlet filter and silencer
 - 3. Discharge silencer
 - 4. Flexible connections and expansion joints
 - 5. Check valve
 - 6. Pressure relief valve
 - 7. Instrumentation
 - 8. Pressure monitoring devices
 - 9. Miscellaneous appurtenances as necessary for a fully operational system
- C. Blower equipment package and price shall include the following:
 - 1. Two (2) complete blowers, accessories and ancillary equipment as specified herein, and spare parts
 - 2. Shipping and insurance FOB jobsite
 - 3. Equipment submittals
 - 4. Operation and maintenance manuals
 - 5. Shop testing of equipment
 - 6. Project site equipment installation inspection and approval and mechanical testing
 - 7. Operation and maintenance training of Owner's personnel
 - 8. Any additional equipment or accessories not specified but are required to achieve the specified performance. If additional equipment or instrumentation not specified herein is required by the Manufacturer in order for the blowers to operate and perform as specified herein, the Manufacturer shall submit detailed information for the proposed items for the Engineer review and approval.

1.3 RELATED SECTIONS

- A. Section 05501 – Anchor Bolts and Expansion Anchors
- B. Section 05590 – Miscellaneous Metals
- C. Section 09900 – Painting
- D. Section 15060 – Pipe, Pipe Fittings, Valves, Cocks, Hydrants, and Disinfection of Water Systems
- E. Division 16 – Electrical

1.4 REFERENCES AND STANDARDS

- A. American National Standards Institute – ANSI:
 - 1. B16.1: Cast-Iron Pipe Flanges and Flanged Fittings
- B. American Gear Manufacturer’s Association – AGMA
- C. American Society of Mechanical Engineers – ASME
- D. Antifriction Bearing Manufacturer’s Association – ABMA:
 - 1. Load Rating and Fatigue Life for Ball Bearings
- E. Institute of Electrical and Electronics Engineers – IEEE
- F. National Electrical Manufacturer’s Association – NEMA:
 - 1. MG-1: Motors and Generators
- G. International Organization for Standardization - ISO

1.5 SUBMITTALS

- A. Provide as specified under provisions of Section 01340
- B. Shop Drawings and Product Data: Includes, but not limited to, the following:
 - 1. General
 - a. Certified general arrangement drawings showing materials, details of construction, dimensions and connections
 - b. Materials
 - c. Parts
 - d. Accessories
 - e. Assembly
 - f. Installation
 - 2. Blowers and silencers
 - a. Sufficient data to verify compliance with the specifications and to illustrate construction or assembly of the products
 - b. Equipment manufacturer, model, and type

- c. Complete and detailed assembly and installation drawings, prepared to scale
 - d. Detailed specifications and data describing materials, parts, and accessories used that together make up the complete blower package
 - e. Electrical wiring diagrams (if not provided by manufacturer, shall be provided by process controls and instrumentation integrator)
 - i) Power and control schematic diagram indicating factory and field wiring
 - ii) All diagrams shall be complete and be uniquely numbered for terminals, wires and devices
 - f. Manufacturer's rating, performance data for all blower accessories
 - g. Indicated capacities at the specified conditions shall be at the minimum acceptable efficiency
 - h. Submit performance curves and data to show the blower output, horsepower requirement, and blower efficiency, and surge point. Performance curves for blowers and motors shall be submitted for the following site conditions and for standard conditions:
 - i) Elevation (reference to mean sea level): 4,900 feet
 - a) Summer - inlet air of 105 degrees F, 50% RH (high) & 10% RH (low)
 - b) Winter - inlet air of 5 degrees F, 90% RH (high) & 50% RH (low)
 - ii) Curves shall indicate brake horsepower and efficiency at specified conditions
 - i. Submit noise attenuation curves to verify the suitability of the silencers for use with the blowers
3. Submit manufacturer's rating, performance data for all blower accessories
 4. Testing
 - a. Factory test all units with all components installed through full range with all data documented
 - b. Submit all data from factory tests including noise dB rating at 3 feet from machine
 - c. Blowers shall be tested in accordance with ASME power test code. Final performance curves shall be representative of this test. Submit test results as specified
 5. Control panel layout with devices and nameplates shown
 6. Wiring schematics and diagrams with all devices, terminals, and wires uniquely numbered
 7. Control panel device catalog data with bill of material. The bill of material shall be shown on the control panel drawings with all items numbered
 8. Motor nameplate data:
 - a. Name of manufacturer
 - b. Type and model
 - c. Type of bearings
 - d. Rated hp size
 - e. Full load current
 - f. Motor performance data
 9. Motor data and instrumentation and wiring diagram
 10. Operating and maintenance manuals, including recommended spare parts list in accordance with Division 1

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01730
- B. Operation Data: Include manufacturer's instructions, description of system operation, start-up data and trouble-shooting check lists, and repair data for blowers
- C. Maintenance Data: Include manufacturer's literature, cleaning procedures replacement parts lists, wiring diagrams, and repair data for blowers and components

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Blower manufacturer to provide delivery to the site. Storage and Handling by the Contractor.

1.9 MAINTENANCE MATERIALS AND SPARE PARTS

- A. For each blower provide the spare parts shown in the proposal

1.10 QUALITY ASSURANCE

- A. All equipment specified herein shall be furnished complete by one manufacturer
- B. Manufacturer shall be responsible for providing equipment, accessories, installation supervision, and testing services in order to provide a complete functioning blower system
- C. Components specified herein establish minimum requirements only and does not relieve the manufacturer of responsibility for providing a properly complete functioning blower system
- D. The blowers and equipment covered by this specification are intended to be standard blower equipment, of proven ability, as manufactured by a reputable CE certified manufacturer having at least two (2) years experience in the production of such blowers. The blowers furnished shall be designed, constructed, and installed in accordance with the best practice and methods and shall operate satisfactorily when installed
- E. Manufacturer of blower shall have a minimum of five (5) installations of rotary positive displacement blowers of similar design in the continental United States
- F. Similar items of equipment shall be the end product of a single manufacturer in order to achieve standardization of appearance, maintenance, operation, spare parts, and service
- G. Contractor shall schedule blower manufacturer's authorized personnel representative to the job site to verify proper equipment installation, supervise and direct initial start-up of

blowers, partake in performance testing and plant personnel training. Training of personnel shall consist of training required in order properly operate and maintain blower and control equipment

1.11 WARRANTY

- A. The manufacturer and contractor shall warrant the rotary lobe blowers being supplied to the owner against all defects in workmanship and materials for a period of eighteen (18) months from date of commissioning or twenty-four months from date of shipment, whichever occurs first.

1.12 SPACE CONSTRAINTS

- A. Blower unit and motors shall fit into the space indicated on Drawings. Any modifications to piping or equipment as indicated on the Drawings shall be at no cost to the Owner

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Blower equipment manufacturer
 - 1. Dresser Roots
 - 2. Gardner Denver
 - 3. Kaeser
 - 4. Aerzen
 - 5. Or accepted substitution

2.2 PERFORMANCE AND DESIGN CONDITIONS

- A. Rotary lobe positive displacement blowers shall be designed to minimize the life-cycle costs and maximize plant reliability
- B. Design and selection of components shall be based on a minimum useful life of 20 years
- C. Design equipment with due regards to safety of operation, accessibility, and durability of parts, and comply with applicable OSHA, state, and local safety regulations
- D. Blowers shall be motor driven, positive displacement type complete with integral gearbox and accessories as specified herein.
- E. Blowers shall be sized such that the specified speed of operation at the specified conditions does not exceed 100% of the maximum blower design speed set forth by the manufacturer
- F. No special concrete housekeeping foundations shall be required for installation
 - 1. Blower units shall be installed directly on a concrete slab without grouting the base frame

- G. Each blower shall have two dynamically balanced multi-lobe rotors constructed of high strength cast iron. Rotors shall be designed to carry loads that exceed those required at maximum design conditions
- H. Blower casings shall be one piece with separate head plates and shall be made of close-grained cast iron. The casings shall be suitably ribbed for maximum strength and to prevent distortion under the operating conditions
- I. Inlet and outlet connections shall be flanged and oriented as shown on Drawings
- J. Blower manufacturer shall be responsible for attenuating noise and vibration in the blower package such that no special installation base shall be required nor shall any vibration from the blower package be transmitted to the base or the piping
- K. Blower manufacturer shall provide the blower inlet filter/silencer unit with a pressure differential monitor included in blower unit and blower discharge silencer
- L. Blower manufacturer shall supply and start-up all items specified in this section. Contractor responsible for all coordination and calibration of all items specified in this section.
- M. Each blower shall be provided with blower inlet filter and silencer, discharge silencer, flexible connectors, discharge temperature gauge, discharge pressure gauge, inlet filter pressure gauge, check valve, blow off valve and all instrumentation and controls specified herein, indicated on the Drawings, and in Division 16
- N. Intermittent operation in an indoor environment
- O. Blowers shall start no more than 6 times per hour when operating in intermittent service
- P. Blowers shall meet rated performance and sound level when operating at maximum gear speed. Operational speed of blowers shall not exceed 100 percent of rated speed.
- Q. Maximum Sound Pressure Level of 80 dBA, factory calculated, with inlet and discharge silencers, measured at noise enclosure
- R. System discharge pressure includes all losses from the discharge of the blower to the filter including all piping, fittings and appurtenances (i.e. check valve, etc.). Manufacturer shall add all pressure losses ahead of this point such as the outdoor clean air inlet filter/silencer, inlet piping, blower inlet filter silencer, blower discharge silencer and any other required appurtenances to the pressure requirements stated below.
- S. Air Scour Blowers Design Conditions
 - 1. Manufacturer shall ensure the design capacity and pressure for both design points are met by the blower across the design condition range stated below:
 - 2. Number of blowers: Two (2)
 - 3. Nominal size of inlet connection: Per manufacturer (6")
 - 4. Nominal size of outlet connection: Per manufacturer (6")
 - 5. Design discharge operating capacity: 560 to 1,120 scfm

- 6. System Discharge Pressure:
 - a. At design Point 1 (1,120 scfm): 2.6 to 6.1 psi
 - b. At design Point 2 (560 scfm): 2.0 to 5.2 psi
- 7. Site Elevation: 4,900 feet above mean sea level
- 8. Ambient air temperature
 - a. Summer: 105 deg F (high)
 - b. Winter: 5 deg F
- 9. Relative Humidity
 - a. Summer
 - i) High: 50%
 - ii) Low: 10%
 - b. Winter
 - i) High: 90%
 - ii) Low: 50%
- 10. Maximum blower speed: Per manufacturer
- 11. Maximum motor hp: Per manufacturer
- 12. Minimum efficiency: Motor full load premium efficiency

T. Blower Inlet Silencers/Filter

- 1. Shall have front access for element access
- 2. Provide 99 percent removal efficiency on 5 micron particle size and larger
- 3. Manufacturer shall supply the inlet filter silencer suitable for outdoor use
- 4. Maximum pressure loss through entire filter/silencer unit: 3-inches w.c. at specified design airflow with a new element

U. Discharge Silencer

- 1. Maximum pressure drop across filter: 3-inches of w.c. at specified design airflow with clean filter

V. Motors

- 1. Number of units: Two (2)
- 2. Maximum motor size, hp: per manufacturer
- 3. Maximum motor rpm: per manufacturer
- 4. Satisfactory operation without surging or overloading the motor over the range of capacity and environmental conditions specified
- 5. Motors
 - a. Class F insulation

2.3 DESIGN, FABRICATION AND MATERIALS

A. Blower Inlet Filter/Silencer

- 1. Silencer shall be carbon steel and wear-free absorptive type
- 2. Filter elements shall be polyester
- 3. Shall be suitable for an outdoor environment

B. Discharge Silencer

- 1. Shall be designed specifically for the frequency of the blower for maximum attenuation

2. Base/discharge silencer shall be manufactured using carbon steel
3. Shall have plain pipe stub connections
4. Base/discharge silencer shall have connections for a pressure relief valve, pressure gauge, discharge temperature gauge, and mechanical unloading valve and
5. Discharge silencer unit shall be provided blower manufacturer

C. Blowers

1. Shall be capable of variable speed operation
2. Base
 - a. Per blower manufacturer
3. Balance
 - a. Rotating parts: Accurately machined and as perfect rotational balance as practical
 - b. Sufficient mass of assembly to avoid resonance at normal operating speeds
 - c. Vibration: Amplitude measured at inlet and discharge flanges not to exceed 2 mils
4. Casing
 - a. Shall be one piece with separate head plates that are bolted and pinned to the housing
 - b. Shall be made of close-grained cast iron ASTM A48 suitably ribbed to prevent distortion under the specified operating conditions
 - c. Inlet and outlet shall be flanged connections
 - d. Inlet and discharge opening shall be rectangular or round with maximum area for minimum pressure drop
 - e. Casings shall be suitably ribbed for maximum strength and to prevent distortion under the operating conditions
5. Enclosures - Package
 - a. Blower noise rating at the stated conditions shall not exceed 80 dBA at 3 feet distance, exclusive of enclosure
 - i) Enclosure shall provide up to 20-dba attenuation free field
 - b. Shall be sheet steel construction with powder coat finish or zinc coated steel powder coat finish
 - c. At least one installed, integral ventilation fan, sized to provide adequate cooling of package shall be provided with all controls associated with fan
 - i) If not provided by blower manufacturer, shall be the responsibility of process controls and instrumentation integrator
 - d. Blower package sound enclosure shall be designed for permanent indoor installation
 - e. Enclosure shall include an ambient air inlet when applicable and discharge connection and shall be flanged connection
 - f. Electrical components, instrumentation, and instrument connections shall not be mounted or interface with moving panels of the sound enclosure
 - g. The enclosure shall include a vent system and removable panels for easy access and maintenance mounted access doors
6. Impellers-Shaft Assembly
 - a. Each impeller shaft assembly integrally cast from high strength ductile iron with a minimum tensile strength of 60,000 pounds per square inch

- b. Straight, three-lobed involute type, rotating in opposite directions in common casing, without rubbing, liquid seals, or lubrication or approved equal such as screw type.
 - c. Positioned by timing gears shall be mounted on shaft supported by antifriction bearings, fixed to control the axial location of the impeller/shaft in the casing
 - d. Shall be statically and dynamically balanced by removing metal from the impeller body
 - e. Each shaft is fitted with a cast iron ASTM A48 Class 30B sleeve and ductile iron piston ring
 - f. Piston ring seal shall be located on the shaft at the point where the shaft passes through the head plate
7. Timing Gears
- a. Positively timed by a pair of accurately machined and carbonized steel spur gears hardened to 58-62 Rockwell alloy timing gears manufactured to comply with AGMA and have a minimum AGMA quality rating of 10
 - b. Gears mounted on shafts with tapered fit and secured by locknuts
8. Bearings
- a. Each impeller and shaft assembly shall be supported by oversized anti-friction bearings engineered for long service life and fixed to control the axial location of the impeller/shaft in the unit
 - b. Cylindrical roller bearing shall be provided at all four (4) locations for each blower or approved equal such as spherical. A wavy washer shall be installed on the gear end of both shafts between the bearing and bearing clamp to control rotor axial movement
 - c. All bearings shall be oil-splash lubricated from oil-tight housing
 - i) Oil level sight glasses shall be provided
9. Fasteners
- a. Shall be SAE Grade 5, high strength materials at a minimum
10. Lubrication
- a. Each bearing housing shall include a PTFE hydrodynamic lip seal designed to prevent lubricants from entering the air stream
 - b. PTFE hydrodynamic lip seal shall be installed on the drive end of the drive shaft.
 - c. Bearings and timing gears are splash lubricated with a disc slinger

D. Motors

- 1. Rotary positive displacement type belt driven by horizontal motors
- 2. Motors shall be TEFC, 460V/3-Phase/60 Hz in accordance with Division 16
- 3. Each blower shall be suitable for operation with a variable frequency drive
- 4. Brake horsepower requirement with relief valve fully open shall at the specified pressure per blower manufacturer, which is typically +2 psig above operating pressure.
- 5. Motors operating in the service factor at design and or relief setting are not acceptable
- 6. Motors to be horizontal foot mounted, ball bearings, heavy-duty steel or cast iron frame, gasketed conduit boxes and manufactured to NEMA/IEC standards
- 7. Minimum service factor: 1.15

E. Belt Drive System

1. V-belt drive
2. Belt tension device must be designed to allow the maintenance personnel to replace the belts without exerting or lifting over 40 pounds (OSHA Limitation) without the use of lifting, jacking or pulling tools
3. Minimum service factor of 1.4
4. Designed not to exceed allowable overhung load limits of blower and motor
5. Provide belt guard
 - a. Shall be designed into noise enclosure and meet OSHA standards

F. Accessories

1. Blower accessories specified herein shall be provided by the blower manufacturer
2. Blower inlet filter/silencer
3. Blower discharge silencer
4. Butterfly valves (air service)
 - a. Inlet and discharge as shown in the drawings
 - b. Manufactures must have AIS approval
 - c. Valve design and conditions
 - i) Bi-directional pressure ratings: 175 psi for 2 inch through 12 inch valves
 - ii) Temperature rating: 350°F or approved equal
 - iii) Bi-directional and tested to 110% of full rating
 - iv) Wafer style or approved equal
 - v) The use of a stop or lug cast integrally with or mechanically secured to the body for the purpose of limiting disc travel by means of direct contact or interference with the valve disc (in either the open or closed position) will not be acceptable.
5. Flexible connections
 - a. Each blower unit shall be provided a flexible ANSI style inlet and discharge connector
 - b. Flanged rubber sleeve, synthetic fiber reinforcements, galvanized steel retaining ring
 - c. Provide each blower with an elastomeric compensator/flexible connector at the inlet and discharge of blower to reduce transmission of structure borne noise as well as prevent unacceptable loading of the silencer and blower casing
 - i) Shall be sized for standard pipe diameter and shall prevent noise transmission and vibrations from blower into the blower piping
 - ii) Shall have flanged ends to connect to blower
 - d. Provide each blower with an EPMD expansion joint at the inlet and discharge of blower
 - i) Discharge expansion joint shall be capable of withstanding vacuum, pressure, and temperature under all operating conditions
 - ii) Shall be suitable for maximum operating temperature and pressure ratings of equipment in the air stream
 - e. Suitable for an operating temperature of 350°F
 - f. Connectors to have flanges conforming to ANSI 150 lb
6. Discharge Pressure Relief Valve
 - a. Provide a properly sized pressure relief valve to protect blower
 - b. Shall be spring type pressure relief valve type

- c. Capable of operating at 400°F discharge air
 - d. Shall be furnished on each blower
 - e. Shall be sized at a minimum of 120 percent of full-specified air flow and set at 2.0 psig above the maximum specified discharge pressure or as recommended by manufacturer
7. Check Valve
 - a. Provide each blower with a discharge flap type check valve
 - b. Resilient seat capable of operating with 400°F discharge air
 8. Temperature switch and gauge
 - a. NEMA 4 discharge pressure switch and gauge
 - i) Supplied by process controls and instrumentation integrator
 - b. Temperature switch manufacturer shall be Murphy Switchgauge or accepted substitution
 - c. Discharge temperature gauge shall be manufactured by Weiss model 25UB3-5131 with 2.5" dial or accepted substitution
 9. Pressure switch and gauge
 - a. Blower package shall include a NEMA 4 discharge pressure switch
 - b. Switch to be installed by Contractor
 - c. Switch manufacturer shall be Ashcroft Type 400, B-Series model B424V or accepted substitution
 - d. Blower package shall include an inlet filter differential pressure gauge mounted on the noise enclosure to indicate filter change requirement
 - e. Inlet filter pressure gauge shall be supplied by blower manufacturer
 - f. Pressure filter gauge manufacturer shall be Dwyer model 2-5040 Minihelic II with 2.5" dial or accepted substitution
 10. Oil fill container with a blower oil drain manifold where oil drains from the blower drive-end and gear-end lubricating oil sumps shall be piped to the front of the base for ease of maintenance or provide manifolds each oil sump to the front of blower package with a capped ball valve at the end to drain oil
 11. Mounting
 - a. Blower package to be installed on an existing concrete floor which may not be level
 - b. Vibration mounts shall be supplied and capable of leveling the blower package to insure proper oil level to increase service and longevity of the equipment
 - c. Vibration mounts to be supplied by blower manufacturer
 - d. Vibration mounts shall be made of rubber in a steel footing designed to bear the weight of entire blower package assembly without degrading
 - e. Blower manufacture must insure proper selection for the specific blower system offered
 - f. Blower manufacturer shall provide all nuts, bolts, and accessories required for proper anchoring of blowers
 12. Blower packaged system shall be provided with all internal space cooling fans required by the manufacturer along with all associated controls for these fans
 - i) If not supplied by blower manufacturer, process controls and instrumentation integrator to supply

G. Anchor

1. Contractor to provide 316 stainless steel anchor bolts as required for installation of equipment

H. Motor Control Center and Control Equipment

1. The locally mounted control panel with Hand-Off-Auto switch and local control potentiometer, shall be provided by the system integrator
2. All relays listed below will be provided by the manufacturer and installed by the system integrator. In addition the listed relays, any signals from the equipment requiring special relays or sensors shall be provided by the equipment supplier and provided to the system integrator
3. PTC Thermistors or approved equal and associated relay to ensure complete communication. Refer to Division 16 - Electrical specifications for additional wiring and electrical requirements

2.4 COATING

- A. Factory coat assembly with manufacturer's standard coating suitable for intended service

PART 3 EXECUTION

3.1 INSTALLATION

- A. Contractor to provide/complete installation in accordance with manufacturers instructions
- B. Contractor to provide all necessary lubrication for initial start-up, testing and final acceptance

3.2 MANUFACTURER'S FIELD SERVICES

- A. As stated in this specification and the agreement
- B. Prior to start-up
 1. Test all valves, switches and gages for proper settings an operation
 2. Check completion of all electrical connections
 3. Check assembly alignment
 4. Check to ensure all rotational parts are properly lubricated
 5. Bump motors to check direction or rotation
 6. Direct Contractor in necessarily corrections for start-up
 7. Provide written approval for start-up when system is satisfactory
 8. All aeration diffusers shall be installed and basin filled with water prior to start-up of blowers
- C. Start-up
 1. Check equipment vibration for conformance with specification
 2. Test blower controls for proper operation
 3. Provide written directions to Contractor detailing adjustments and corrections as necessary

4. Provide preliminary instruction to plant personnel on operation and maintenance of blowers
5. Manufacturer will provide two 8-hour days on-site for start up, as well as an additional day if needed for training at no additional cost. Manufacturer requires two (2) weeks' notice. Contractor to coordinate.
 - a. Manufacturer's local sales representative is not acceptable

3.3 PERFORMANCE TESTS

A. Factory

1. All critical dimensions of the blower components actually provided by the manufacturer shall be verified and documented prior to assembly
2. The rotating parts of each blower actually provided by the manufacturer shall be statically and dynamically balanced before final assembly. The blower alone shall operate without vibration in excess of the limits stated in the latest revision of NEMA MG-1. Removal of material from the face of the rotors for balancing purpose is not allowed
3. Each blower actually provided by the manufacturer shall be slip tested and slip rpm shall be documented. Each bare blower provided by the manufacturer shall be operated at its maximum rated speed and differential pressure for thirty (30) minutes. Documentation certifying that the supplied blowers conform to design specifications shall be provided
4. On completion of final assembly of the packaged blower and prior to shipment, each packaged blower shall be mechanically run for a minimum of 15 minutes

B. Field Tests

1. Operational
 - a. Prior to start-up, all blowers shall be inspected for proper alignment, function and connection
2. Performance
 - a. Contractor shall perform tests to demonstrate that the blowers conform to specifications to the satisfaction of Engineer
 - b. Performance shall be documented by obtaining concurrent readings indicating supply voltage, blower speed/inlet pressure/outlet pressure/inlet temperature/outlet temperature, and motor amperage
 - c. Each blower motor lead shall be inspected for proper current balance
3. Blowers shall operate at rated capacity for 4 continuous hours
4. Blowers shall be run for 30 minutes at full capacity and 10 minutes off for a total of 4 hours. Blower shall also be run at design parameters for one (1) hour
5. Blowers that fail to meet specifications to the Engineer's satisfaction shall be corrected and re-tested by Contractor
6. If upon failing a second test, the blower will be rejected and the Contractor shall furnish a blower that will perform as specified herein
7. A test log shall be submitted to Engineer and Owner upon completion of each test. Tests shall record the following:
 - a. Blower model number and facility tag ID
 - b. Serial number
 - c. Date of testing with time of testing on that day (start and end)

- d. Motor hp and speed
- e. All other performance documentation parameters specified herein

END OF SECTION



COLORADO
Department of Public
Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

State Revolving Fund Required Specifications

The following State Revolving Fund Required Specifications are designed for the subrecipient to cut and paste in their entirety and insert into the construction documents for bid and for construction. There is one exception to these specifications and that is the Disadvantaged Business Enterprise (DBE) section. Please refer to your loan agreement or contact the grants and loans unit project manager or compliance specialist for applicability of this requirement to your project. For more detailed information on the federal requirements of the SRF program please refer to the Navigating State Revolving Fund Requirements Handbook for Subrecipients.

If you have any questions regarding the information contained in this document, please contact your CDPHE Water Quality Control Division Grants and Loans Unit project manager or the compliance specialist:

Name	Title	Phone	Email
Michael Beck	Section Manager	303-692-3374	michael.s.beck@state.co.us
Randi Johnson-Hufford	Project Manager	303-692-2203	randi.johnson-hufford@state.co.us
Bradley Monson	Project Manager	303-692-2286	bradley.monson@state.co.us
Margaret Pauls	Project Manager	303-692-3290	margaret.pauls@state.co.us
Corrina Quintana	Project Manager	303-691-4025	corrina.quintana@state.co.us
Matthew Stearns	Compliance Specialist	303-691-4064	matthew.stearns@state.co.us
Paul Yong	Project Manager	303-692-3606	paul.young@state.co.us
Erick Worker	Project Manager	303-692-3594	erick.worker@state.co.us

State Revolving Fund Required Specifications

Section 1

Davis Bacon Prevailing Wage Requirements

This contract is governed by the Davis Bacon and related Acts and is subject to General Decision Number [CO160012](#) dated [06/03/2016](#) [CO12](#).

A copy of this General Decision Number is included as Exhibit [00800B](#) of this document.

The SRF Program is subject to “Davis Bacon and Related Acts” or DBRA, which extends the requirements of the Davis-Bacon Act. Compliance with the Davis Bacon Act is required for any project funded by the Drinking Water Revolving Fund (DWRP) or Water Pollution Control Revolving Fund programs. Non-Compliance with the Davis Bacon Act may result in debarment and suspension from working on future projects funded with federal dollars for up to three years and/or loss of funding for the current project.

Attachment 2

Wage Rate Requirements under the 2014 Consolidated Appropriations Act (The 2014 Act)

Preamble

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides sub grants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients’ compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I -5.

I. For Subrecipients that Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis - Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under The 2014 Act with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Brian Friel at friel.brian@epa.gov or at 303-312-6277 of EPA, Region 8 for guidance. The recipient or subrecipient may also obtain additional guidance from DOL’s web site at www.dol.gov/whd/

1. Applicability of the Davis-Bacon (DB) prevailing wage requirements.

Under The 2014 Act, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan

fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(1) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(2) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering

instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or The 2014 Act, the following clauses:

(1) Minimum wages.

- (i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov/

- (ii) (A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers

or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

- (iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

- (iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
- (2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
- (3) Payrolls and basic records.
- (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.
- (ii) (A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each

payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or

subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

- (i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and

Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

- (8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.
- (10) Certification of eligibility.
- (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph

(a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

- (3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or

subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of non compliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at: www.dol.gov/whd/index.htm

Section 2

American Iron and Steel

The State Revolving Fund Program is subject to, and requires compliance with, the American Iron and Steel requirement. AIS requires Water Pollution Control State Revolving Fund (WPCRF) and Drinking Water State Revolving Fund (DWSRF) assistance recipients use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed on or after January 17, 2014.

In providing bids, proposals, or services, the Contractor represents and warrants to and for the benefit of the borrower and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the borrower or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the borrower or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the borrower or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the borrower). While the Contractor has no direct contractual privity with the State, as a lender to the borrower for the funding of its project, the borrower and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of the Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

For purposes of the WPCRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- lined or unlined pipes or fittings;
- manhole Covers;
- municipal Castings (defined in more detail below);
- hydrants;
- tanks;
- flanges;
- pipe clamps and restraints;
- valves;
- structural steel (defined in more detail below);
- reinforced precast concrete; and
- construction materials.

If the subrecipient can justify a claim made under one of the categories below, a waiver may be granted. Until a waiver is granted by the EPA, the AIS requirement must be adhered to as described in the act.

A waiver may be provided if EPA determines that;

1. applying these requirements would be inconsistent with the public interest;
2. iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.
4. All waiver requests must be routed through the Grants and Loans unit project manager or compliance specialist.

[EPA's guidance on AIS](#) requirements includes specific instructions for communities interested in applying for a waiver. All waiver requests must be routed through the Grants and Loans Unit. After receiving a completed application for a waiver from the grants and loans unit, EPA will publish the waiver request and all material submitted with the application on this website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to the EPA.

Approved National Waivers

April 15, 2014 Plans and Specifications Waiver: “The EPA is hereby granting a nationwide waiver of the American Iron and Steel requirement pursuant to Section 436(b)(1) (public interest waiver), of the Consolidated Appropriations Act (CAA), 2014 for eligible projects that had engineering plans and specifications submitted to an appropriate state agency prior to and including January 17, 2014, the date of the enactment of the CAA, and approved between and including January 17, 2014, and the date of this waiver, where the state agency that approved such plans and specifications did so under the normal course of business for that agency.

If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this national waiver.”

April 15, 2014 De Minimis Waiver: “The EPA is hereby granting a nationwide waiver pursuant to the American Iron and Steel requirements of P.L. 113-76 CAA 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the material used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of materials used in and incorporated into a project.

For more information on approved waivers visit the following website:

http://water.epa.gov/grants_funding/aisrequirement.cfm

Section 3

New National Term on Suspension and Debarment and Other Responsibility Matters

Following is the new National term on Suspension and Debarment. This condition applies to all recipients.

1. Recipient shall fully comply with Subpart C of 40 CFR Part 32, entitled "Responsibilities of Participants Regarding Transactions." Recipient is responsible for ensuring that any lower tier covered transaction, as described in Subpart B of 40 CFR Part 32, entitled "Covered Transactions," includes a term or condition requiring compliance with Subpart C. Recipient is responsible for further requiring the inclusion of a similar term or condition in any subsequent lower tier covered transactions. Recipient acknowledges that failing to disclose the information required under 40 CFR 32.335 may result in the delay or negation of this assistance agreement, or pursuance of legal remedies, including suspension and debarment.

Recipient may access the Excluded Parties List at the System for Award Management website at <http://www.sam.gov>.

Following are related steps which must be observed when awarding contracts, subcontracts, and purchase agreements.

- Familiarize yourself with Subpart D of 40 CFR Part 32, entitled "Responsibilities of EPA Officials Regarding Transactions." You must comply with this regulation. See below for full text of Subpart D.
- Check the Excluded Parties List System before awarding initial and supplemental funding packages. See Subpart D to determine the manner in which you must handle excluded or disqualified person(s).
- Review the information that participants* provide in response to 40 CFR 32.335, which requires participants to provide certain information before entering into a covered transaction with EPA.
- Attach the Suspension and Debarment National term and condition to all new, supplemental, and incremental funding packages. See IGMS Administrative Database, under National Conditions.

* Pursuant to 40 CFR 32.980, "Participant" means any person who submits a proposal for or who enters into a covered transaction, including an agent or representative of a participant.

A. INSTRUCTIONS

An individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a subagreement thereunder.

The status of prospective individuals or organizations can be checked at www.sam.gov it is the subrecipients' responsibility to verify the awarded

contractor is not on the excluded parties list. It is the prime contractor's responsibility to verify subcontractors, vendors, suppliers and manufacturers are not on the excluded parties list.

2. Prohibition Against Participation of Listed Violating Facilities

A. REQUIREMENTS

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Pub. L. 92-604) and section 308 of the Clean Water Act (33 U.S.C. 1251, as amended), respectively, which relate to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency list of violating facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from the listing.

(3) To use his best efforts to comply with clean air and clean water standards at the facilities in which the contract is being performed.

(4) To insert the substance of the provisions of this clause, including this paragraph (4), in any nonexempt subcontract.

B. DEFINITIONS

(1) Air Act means the Clean Air Act, as amended (42 U.S.C. 1857 et seq.).

(2) Water Act means the Clean Water Act, as amended (33 U.S.C. 1251 et seq.).

(3) Clean Air Standards means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 (d) of the Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under section 111 (c) or section 111(d), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(4) Clean Water Standards means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of Water Act (33 U.S.C. 1317).

(5) Compliance means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency in accordance with the requirements of the Air Act or Water Act and regulations.

(6) Facility means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be used in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are located in one geographical area.

Section 4

Equal Employment Opportunity and Affirmative Action Requirements on Federally Assisted Construction Contracts

A. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

This notice shall be included in, and shall be a part of, all solicitations for offers and bids on all federal and federally assisted construction contracts or subcontracts.

- (1) The Offerer's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
- (2) The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Minority Participation In Each Trade	Female Participation In Each Trade
10.2% (Mesa County)	6.9% (National)

These goals are applicable to all the contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non- federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- (3) The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under

the contract resulting from this solicitation. The notification shall list the name, address and telephone number for the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed (See Form C).

(4) As used in this Notice, and in the contract resulting from this solicitation, the covered area is Mesa County.

B. EQUAL OPPORTUNITY CLAUSES

(1) The Equal Opportunity Clause published at 41 CFR Part 60-1.4(b) is required to be included in, and is part of, all nonexempt federally assisted construction contracts and subcontracts. By operation of the order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the order and the regulations in this part to include such a clause whether or not it is physically incorporated.

(2) In addition to the clauses described above, all federal contracting officers, all applicants, and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all federal and federally assisted construction contracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6 of this part and in construction subcontracts in excess of \$10,000 necessary in whole or in part to the performance of nonconstruction Federal contracts and subcontracts covered under the Executive Order.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

A. DEFINITIONS AS USED IN SPECIFICATIONS

- (1) "Covered Area" means the geographical area described in solicitation from which this contract resulted;
- (2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
- (3) "Employer identification number" means the Federal Social Security number used on the employer's quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- (4) "Minority" includes:
 - (a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (c) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asian, the Indian Subcontinent, or the

Pacific Islands);

(d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North American and maintaining identifiable tribal affiliations through membership and participation or community identification).

B. DETAILED SPECIFICATIONS

- (1) Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$25,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
- (2) If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area, (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
- (3) The contractor shall implement the specific affirmative action standards provided in paragraphs (6)(a) through (p) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
- (4) Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
- (5) In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- (6) The contractor shall take specific affirmative action to ensure equal employment

opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific
- b. Attention to minority or female individuals working at such sites or in such facilities.
- c. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations where the contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.
- d. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the contractor may have taken.
- e. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- f. Develop on-the-job training opportunities and/or participate in training programs for the areas which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under (7)(b) above.
- g. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- h. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- i. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.
- j. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations servicing the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- k. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.
- l. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- m. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- n. Ensure that seniority practices, job classification, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations are followed.
- o. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- p. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

- q. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.
- (7) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (6)(a) through (p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under (6)(a) through (p) of the specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.
- (8) A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally, the contractor may be in violation of the order if a specific minority group of women is under-utilized).
- (9) The contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- (10) The contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to Executive Order 11246.
- (11) The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
- (12) The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph (6) of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.3.

- (13) The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
- (14) Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

Section 5

Williams Steiger Occupational Safety and Health Act of 1970 - SRF Program Grant Agreement Information and Requirements

A. Authority

(1) The contractor is subject to the provisions of the Williams-Steiger Occupational Safety and Health Act of 1970.

(2) These construction documents and the joint and several phases of construction hereby contemplated are to be governed, at all times, by applicable provisions of the Federal law(s), including but not limited to the latest amendment of the following:

- a. Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 94-596;
- b. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;
- c. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

B. Safety and Health Program Requirements

(1) This project, its prime contractor and its subcontractors, shall at all times be governed by Chapter XVII of Title 29, Code of Federal Regulations, Part 1926 - Safety and Health Regulations for Construction (29 CFR 22801), as amended to date.

(2) To implement the program and to provide safe and healthful working conditions for all persons, general project safety meetings will be conducted at the site at least once each month during the course of construction, by the construction superintendent or his/her designated safety officer. Notice of such meeting shall be issued not less than three (3) days prior, stating the exact time, location, and agenda to be included. Attendance by the owner, architect, general foreman, shop steward(s), and trades, or their designated representatives, witnessed in writing as such, shall be mandatory.

(3) To further implement the program, each trade shall conduct a short gang meeting, not less than once a week, to review project safety requirements mandatory for all persons during the coming week. The gang foreman shall report the agenda and specific items covered to the project superintendent, who shall incorporate these items in his/her daily log or report.

(4) The prime contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the owner and architect, or their designated representatives, in writing. This shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Act of 1970.

(5) This program shall become a part of the contract documents and the contract between the owner and prime contractor, prime contractor and all subcontractors, as though fully written therein.

Section 6

Archaeological Discoveries

A. Construction Procedures

- (1) In the event of an archaeological or more recent historical find (e.g., artifacts, housing sites) during any phase of construction, the following procedure should be followed:
- (2)) Construction shall be halted, with as little disruption to the archaeological site possible.
- (3) The Contractor shall notify the Owner who shall contact the State Historical Preservation Officer.
- (4) The State Historical Preservation Officer may decide to have an archaeologist inspect the site and make recommendations about the steps needed to protect the site, before construction is resumed.
- (5) The entire event should be handled as expediently as possible in order to hold the loss in construction time to a minimum while still protecting archaeological finds.

B. National Register Status

In the event archaeological/historical data are evaluated to meet National Register criteria, the Advisory Council on Historic Preservation may be notified and asked to comment by the Water Quality Control Division.

Forms by Section

SRF forms can be found on this webpage: <https://www.colorado.gov/pacific/cdphe/water-quality-srf-forms>

Section 1 - Davis Bacon Prevailing Wages

- Davis Bacon Certification Form (SRF form)
- WH - 347 - Contractors Payroll Form
- Standard Form 1444 - Request for Authorization of Additional Classification and Rate
- Standard Form 1445 - Labor Standards Interview Form

Section 2 - American Iron and Steel

- American Iron and Steel Certification Form (SRF Form)
- American Iron and Steel Product Spreadsheet (SRF Form)
- American Iron and Steel Waiver Request Form

Section 3 - New National Term on Suspension and Debarment and Other Responsibility Matters

- No applicable forms

Section 4 - Equal Employment Opportunity and Affirmative Action Requirements on federally assisted construction contracts

- No applicable forms

Section 5 - Williams Steiger Occupational Safety and Health Act of 1970 - SRF Program Grant Agreement Information and Requirements

- No applicable forms

Section 6 - Archaeological Discoveries

- No applicable forms

General Decision Number: CO160012 06/03/2016 CO12

Superseded General Decision Number: CO20150012

State: Colorado

Construction Type: Heavy

Counties: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo and Weld Counties in Colorado.

HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016
1	01/15/2016

2	01/22/2016
3	03/11/2016
4	03/18/2016
5	03/25/2016
6	05/06/2016
7	06/03/2016

ASBE0028-001 10/01/2014

	Rates	Fringes
Asbestos Workers/Insulator (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....	\$ 28.83	13.53

BRCO0007-004 01/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS AND
JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER.....	\$ 26.01	7.71

BRCO0007-006 05/01/2015

EL PASO AND PUEBLO COUNTIES

	Rates	Fringes
BRICKLAYER.....	\$ 24.44	8.90

ELEC0012-004 09/01/2015

PUEBLO COUNTY

	Rates	Fringes
ELECTRICIAN		
Electrical contract over		
\$1,000,000.....	\$ 27.35	11.00+3%
Electrical contract under		
\$1,000,000.....	\$ 24.85	11.00+3%

* ELEC0068-001 06/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,
JEFFERSON, LARIMER, AND WELD COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 33.85	13.99

ELEC0111-001 01/01/2016

	Rates	Fringes
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Line Construction:

Groundman.....	\$ 18.79	22.25%+\$5.45
Line Equipment Operator.....	\$ 29.40	22.25%+\$5.45
Lineman and Welder.....	\$ 42.14	25.25%+\$5.45

ELEC0113-002 06/01/2015

EL PASO COUNTY

	Rates	Fringes
ELECTRICIAN.....	\$ 30.00	14.95

ELEC0969-002 06/01/2015

MESA COUNTY

	Rates	Fringes
ELECTRICIAN.....	\$ 24.00	7.92

ENGI0009-001 10/23/2013

	Rates	Fringes
Power equipment operators:		
Blade: Finish.....	\$ 25.04	9.15
Blade: Rough.....	\$ 24.73	9.15
Bulldozer.....	\$ 24.73	9.15
Cranes: 50 tons and under..	\$ 24.88	9.15
Cranes: 51 to 90 tons.....	\$ 25.04	9.15
Cranes: 91 to 140 tons.....	\$ 25.19	9.15
Cranes: 141 tons and over...	\$ 25.97	9.15

Forklift.....	\$ 24.37	9.15
Mechanic.....	\$ 24.88	9.15
Oiler.....	\$ 24.01	9.15
Scraper: Single bowl under 40 cubic yards.....	\$ 24.88	9.15
Scraper: Single bowl, including pups 40 cubic yards and over and tandem bowls.....	\$ 25.04	9.15
Trackhoe.....	\$ 24.88	9.15

IRON0024-003 11/01/2013

	Rates	Fringes
Ironworkers:.....	\$ 24.80	18.77
Structural		

LABO0086-001 05/01/2009

	Rates	Fringes
Laborers:		
Pipelayer.....	\$ 18.68	6.78

* PLUM0003-005 06/01/2016

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,
JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
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PLUMBER.....\$ 38.43 15.19

PLUM0058-002 07/01/2015

EL PASO COUNTY

Rates Fringes

Plumbers and Pipefitters.....\$ 34.30 14.38

PLUM0058-008 07/01/2015

PUEBLO COUNTY

Rates Fringes

Plumbers and Pipefitters.....\$ 34.30 14.38

PLUM0145-002 07/01/2013

MESA COUNTY

Rates Fringes

Plumbers and Pipefitters.....\$ 32.67 11.55

PLUM0208-004 06/01/2015

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS,
JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PIPEFITTER.....	\$ 35.35	13.39

SHEE0009-002 07/01/2015

	Rates	Fringes
Sheet metal worker.....	\$ 32.85	14.63

TEAM0455-002 07/01/2015

	Rates	Fringes
Truck drivers:		
Pickup.....	\$ 19.66	4.02
Tandem/Semi and Water.....	\$ 20.29	4.02

SUCO2001-006 12/20/2001

	Rates	Fringes
BOILERMAKER.....	\$ 17.60	
Carpenters:		
Form Building and Setting...	\$ 16.97	2.74
All Other Work.....	\$ 15.14	3.37
Cement Mason/Concrete Finisher...	\$ 17.31	2.85
IRONWORKER, REINFORCING.....	\$ 18.83	3.90

Laborers:

Common.....	\$ 11.22	2.92
Flagger.....	\$ 8.91	3.80
Landscape.....	\$ 12.56	3.21

Painters:

Brush, Roller & Spray.....	\$ 15.81	3.26
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Power equipment operators:

Backhoe.....	\$ 16.36	2.48
Front End Loader.....	\$ 17.24	3.23
Skid Loader.....	\$ 15.37	4.41

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the

cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average

rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work covered by contract documents
- B. Work by others
- C. Contractor use of site and premises
- D. Work sequence
- E. Easements and right-of-way
- F. Protection of public and private property
- G. Maintenance of traffic
- H. Barricades and lights
- I. Lines and grades
- J. Regulatory requirements
- K. Cutting and patching

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. This project consists of upgrades to the existing water treatment facility. The project is generally comprised of the following components:
 - 1. Removal of the existing surface wash system, supply pipes and pump
 - 2. Demolition of the wheeler block underdrain system inside the existing filters
 - 3. Installation of new filter air scour system that includes a blower, valves, electric actuators, supports and associated piping for the filters
 - 4. Upgrade of four existing dual-cell filters, including replacement of media
 - 5. Associated electrical, mechanical, and control improvements
- B. Furnish and pay for all materials, equipment, supplies, appurtenances; provide all construction equipment and tools; and perform all necessary labor and supervision
- C. Coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities, and Owner to insure the progress of Work
- D. It is the intent of this contract that Work proceed in the most expeditious manner possible

- E. Construct the Work under contract indicated in the Bid Form

1.3 WORK BY OTHERS

- A. City manned plant operating times:
 - 1. 6:00 am to 5:00 pm, Monday thru Sunday

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. Contractor shall limit use of the premises for Work and will use the designated staging area for field offices, equipment, and material storage. Areas have been designated for contractor's use.
- B. Coordinate use of premises under direction of Owner
- C. Assume full responsibility for the protection and safekeeping of equipment and products stored on site under this Contract
- D. Contractor may use only those areas indicated on the Drawings for storage and such additional areas as Engineer may designate
- E. Contractor should plan for normal work days, Monday through Friday, within the hours of 7:00 am to 5:00 pm. Other work hours and days will be allowed by City and Engineer upon 48 hours written notice.

1.5 WORK SEQUENCE

- A. Provide open access for Owner to property at all times during construction. Maintain minimum width clearance for access of City and Contractor personnel and emergency vehicles at all times
- B. Existing water treatment plant is an operating treatment plant and must remain in operation during the contract period. At least two (2) filter units shall remain in service during all phases of construction as designated in the plans and specifications.
- C. During Phase I, Filter #1 and #3 will be in use by City during demolition, modification and installation of Filter #2 and #4 equipment and all other associated piping, equipment and appurtenances.
- D. During Phase II, Filter #2 and #4 will be in use by City during demolition, modification, and installation of Filter #1 and #3 equipment and all other associated piping, equipment and appurtenances.
- E. Modification of filters will require the Contractor to coordinate sequence for demolition of existing filters based on space and building constraints. Demolition and installation of equipment for each filter shall be through the existing roll-up doorway.

- F. Allowable Filter Shutdown Duration – Between October 15, 2016 and March 31, 2017: During this timeframe the Owner requires two filters to be online and fully operational at all times. The Contractor is allowed to have two of the four existing filters offline during this time frame. The two remaining filters cannot be taken offline for rehab work until the other two filters are completed as described below. The Contractor is required to substantially complete the rehabilitation of all four filters before March 31, 2017. Completion means the rehabilitated filters are fully operational in both the manual and automatic modes according to the Project Documents and acceptance has been granted by the Engineer and Owner for the work. The work includes, but is not limited to, installation and operability of the following items in the rehabbed filters: underdrains, media and equipment; disinfection of filter basins (verified by bacteriological sampling); air scour system including piping, supports, blower, variable frequency drives, associated appurtenances and encasement of all air headers where indicated; instrumentation and controls work and all painting. It also includes completion of all start-up and training. The Contractor shall coordinate the filter shutdown periods with the Owner and Engineer. The Contractor shall be responsible for removing all components of the filter including any remaining raw water the Owner is unable to remove for hydraulic reasons.
- G. The Contractor shall develop its own sequence of work to minimize construction time, site disturbances and interruptions of existing plant operations. Testing and Startup schedule and sequence shall be thoroughly discussed and coordinated with Engineer and Owner. Sequences other than those specified will be considered by Engineer, provided they afford equivalent continuity of operations. A suggested general work sequence is outlined as follows:
1. Install all barriers, fans, etc. for dust removal and containment in the water treatment plant. Dust removal/containment barriers need to be configured to allow plant staff access to all plant equipment including the filters.
 2. Verify water tightness of each filter effluent valve.
 3. Begin demo work on Filters 2 and 4 and installation of all air scour piping and associated appurtenances in the existing Water Treatment Plant.
 4. Once the demo work is complete (i.e. media and underdrains are removed) Contractor shall notify the Owner and JVA, so a structural inspection of the filter boxes can be scheduled. JVA will provide recommendations for spalled areas, bush hammer, concrete preparation, grout repairs and/or structural repairs if needed.
 5. Begin sandblasting and painting of interior waste gullet walls and floor of each filter.
 6. Sandblasting and painting of the filter gallery floor and concrete walkways surrounding the filters are left to the discretion of the Contractor. If these operations are done after the underdrains are installed then the filters should be protected from contamination while this work is being performed. If they are painted before the project is substantially complete then they should be protected during the remaining work operations.
 7. Begin work to raise the filter floors of Filters 2 and 4.
 8. After new filter floors are complete leak test filter basins according to Section 03300.
 9. Begin installation of all filter equipment as it arrives onsite.
 10. Begin construction of the blower equipment pads and install all remaining air scour piping.

11. Perform required instrumentation and controls upgrades to assimilate Filters 2 and 4 filter operations.
12. Begin installing mechanical components.
13. Perform underdrain system testing on Filters 2 and 4 as well as preliminary testing of air scour system including the blower.
14. Install media in Filters 2 and 4 after underdrain testing has passed.
15. Disinfect Filters 2 and 4.
16. Complete all testing and commissioning activities for Filters 2 and 4 and the blower.
17. Perform start-up testing on all remaining equipment.
18. Verify Filters 2 and 4 are performing properly and reliably.
19. Provide equipment training to the water treatment plant staff.
20. Contractor shall provide written notice to the Owner and Engineer stating Filters 2 and 4 and all associated equipment are operating in the manual and automatic modes per the Project Documents. This includes successful completion of Specification Section 01650 (Starting of Systems).
21. Owner and Engineer will perform a site visit within 5 working days to verify the equipment is operable as described in the Project Documents. Any deficiencies will be noted and shall be corrected before acceptance is granted by the Owner and Engineer and the Contractor is allowed to take the remaining two filters offline.
22. The Contractor will not be allowed to take Filters 1 and 3 offline until both Filters 2 and 4 are accepted by the Owner and Engineer.
23. After acceptance of both Filters 2 and 4, demo work shall begin on Filters 1 and 3 after the dust removal and containment barriers have been installed around the filters. Dust removal/containment barriers need to be configured to allow plant staff access to all plant equipment including the filters.
24. Once the demo work is complete (i.e. media and underdrains are removed) Contractor shall notify the Owner and JVA, so a structural inspection of the filter boxes can be scheduled. JVA will provide recommendations for spalled areas, bush hammer, concrete preparation, grout repairs and/or structural repairs if needed.
25. Begin installation of the air scour piping associated with Filters 1 and 3 and all associated appurtenances.
26. Begin sandblasting and painting of interior waste gullet walls and floor of each filter.
27. Sandblasting and painting of the filter gallery floor and concrete walkways surrounding the filters are left to the discretion of the Contractor. If these operations are done after the underdrains are installed then the filters should be protected from contamination while this work is being performed. If they are painted before the project is substantially complete then they should be protected during the remaining work operations.
28. Begin work to raise the filter floors of Filters 1 and 3.
29. After new filter floors are complete leak test filter basins according to Section 03300.
30. Begin installation of all filter equipment
31. Perform required instrumentation and controls upgrades to assimilate Filters 1 and 3 filter operations.
32. Perform underdrain system testing on Filters 1 and 3 as well as preliminary testing of air scour system including the blower.
33. Install media in Filters 1 and 3 after underdrain testing has passed.

34. Disinfect Filters 1 and 3.
35. Complete all testing and commissioning activities for Filters 1 and 3.
36. Perform start-up testing on all remaining equipment.
37. Verify Filters 1 and 3 are performing properly and reliably.
38. Provide equipment training to the water treatment plant staff.
39. Contractor shall provide written notice to the Owner and Engineer stating Filters 1 and 3 and all associated equipment are operating in the manual and automatic modes per the Project Documents. This includes successful completion of Specification Section 01650 (Starting of Systems).
40. Owner and Engineer will perform a site visit within 5 working days to verify the equipment is operable as described in the Project Documents. Any deficiencies will be noted and shall be corrected before acceptance is granted by the Owner and Engineer.
41. As stated above in the "Allowable Filter Shutdown Duration" all rehabilitated filters must be fully functional and online by March 31, 2017.
42. Clean up the site and return all disturbed areas to their present condition if required. This includes all grading, seeding and mulching as weather permits and during the first growing season.
43. Achieve Substantial Completion and commissioning of all improvements. Confirm they are fully functional.
44. Achieve Final Completion.

H. Power outages of up to 4 hours duration is allowed.

1. Schedule each outage with Engineer and Owner 48 hours in advance
 - a. Number of outages to be kept to a minimum
2. Power outages will not be permitted before November 1, 2016 or after March 31, 2017.

1.6 EASEMENTS AND RIGHT-OF-WAY

- A. All of the Work will be performed on the City of Grand Junction's property.
- B. Confine construction operations to the immediate vicinity of the location indicated on drawings and use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to property
- C. On Private Property
 1. Do not enter for material delivery or occupy for any purpose with personnel, tools, equipment, construction materials, or excavated materials, any private property outside the designated construction easement without written permission of the owner.

1.7 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. Protect, shore, brace, support, and maintain underground conduits, drains, and other underground construction uncovered or otherwise affected by construction operations

- B. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, street lighting and/or signage, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any part or site thereof, whether by him or his subcontractors
- C. Make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage

1.8 MAINTENANCE OF TRAFFIC

- A. Conduct Work to interfere as little as possible with City and public travel, whether vehicular or pedestrian
 - 1. Whenever it is necessary to cross, close, or obstruct private roads, driveways and walks, provide and maintain suitable and safe detours, or other temporary expedients for accommodation of private travel

1.9 BARRICADES AND LIGHTS

- A. Protect streets, roads, highways, and other public thoroughfares which are closed to traffic by effective barricades with acceptable warning and directional signs
- B. Locate barricades at the street intersecting public thoroughfare on each side of the blocked section
- C. Provide suitable barriers, signs, and lights to the extent required to adequately protect the public
- D. Provide similar warning signs and lights at obstructions such as material piles and equipment
- E. Illuminate barricades and obstructions with warning lights from sunset to sunrise
- F. Store materials and conduct work to cause the minimum obstruction to the other contracts

1.10 LINES, GRADES AND SURVEY

- A. Construct all Work to the lines, grades, and elevations indicated on the Drawings
 - 1. Contractor is responsible for correcting all incorrect grades or grades not meeting specified tolerances
- B. Engineer has established basic vertical control in the Drawings
 - 1. Use these points as datum for the Work
 - 2. Provide such competent personnel and tool, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking layout survey, and measurement work performed by Contractor

- C. Provide all additional survey, layout, and measurement work required
 - 1. Work performed by a qualified professional engineer or registered land surveyor acceptable to Engineer
 - 2. Preserve all permanent reference points during construction
 - a. Make no changes or relocations without prior written notice to Engineer
 - b. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations
 - 3. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means
 - a. Temporary project benchmark
 - b. Stakes for grading, fill and topsoil placement
 - c. Utility slopes and invert elevations
 - 4. From time to time, verify layouts by the same methods
 - 5. Maintain a complete, accurate log of all control and survey work as it progresses
 - 6. On request of Engineer, submit documentation to verify accuracy or field engineering work

1.11 REGULATORY REQUIREMENTS

- A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work
- B. Other standards and codes which apply to the Work are designated in the specific technical specifications

1.12 CUTTING AND PATCHING

- A. Contractor shall be responsible for all cutting, and patching, including attendant excavation and backfill, required to complete the Work or to
 - 1. Uncover portions of the Work to provide for installation of ill-timed work
 - 2. Remove and replace defective work
 - 3. Remove and replace work not conforming to requirements of Contract Documents
 - 4. Remove samples of installed work as specified for testing
- B. Provide products as specified or as required to complete cutting and patching operations
- C. Inspection
 - 1. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching
 - 2. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
 - 3. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions
- D. Preparation
 - 1. Provide devices and methods to protect other portions of the Project from damage
 - 2. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water

3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
4. Restore work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements
- B. Coordination
- C. Field engineering
- D. Alteration project procedures
- E. Preconstruction conference
- F. Progress meetings
- G. Requests for information

1.2 RELATED SECTIONS

- A. Section 01010 - Summary of Work
- B. Section 01340 - Shop Drawings and Product Data
- C. Section 01700 - Contract Closeout

1.3 GENERAL REQUIREMENTS

- A. Refer to General Conditions for Owner meetings and other requirements
- B. Engineer will schedule and administer pre-construction meeting according to agenda
 1. Prepare agenda for meetings including items required by Owner and Contractor
 2. Notify Contractor and Owner 4 days in advance of meeting date
 3. Preside at meeting
- C. Contractor will schedule and administer site mobilization and weekly progress meetings. Contractor will also be responsible for coordination, field engineering, alteration, project procedures, cutting and patching procedures outlined herein. If work progress does not warrant a meeting, all parties can mutually agree to postpone meeting.
 1. Arrange for the attendance of Contractor's agents, employees, subcontractors, and suppliers as appropriate to the agenda
 2. Record the minutes; include all significant proceedings and decisions
 3. Reproduce and distribute copies of minutes within one week after each meeting
 - a. To all participants in the meetings

- b. To Engineer
 - c. To Owner
 - 4. Owner and other inspecting parties such as the geotechnical engineer/technician as well as plant operators may attend meetings
 - 5. Engineer will attend weekly meetings either via phone or on site
- D. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents

1.4 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later by others.
- B. Verify that utility requirement characteristics of operating equipment are compatible with available utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment, and coordinate preparation of grading and other requirements for installation utility work by others.
- C. Coordinate completion and clean-up of Work of separate Sections in preparation for final completion and for portions of Work designated for Owner's use
- D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities

1.5 FIELD ENGINEERING

- A. Employ a Land Surveyor registered in the State of Colorado and acceptable to the Engineer and Owner
- B. Contractor will locate and protect survey control and reference points
- C. Control datum for survey is that established by Owner provided survey and shown on Drawings
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.6 ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in product Sections; match existing products and work for patching and extending work
- B. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.

- C. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer
- D. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Engineer review
- E. Patch or replace portions of existing surfaces, which are damaged, lifted, or showing other imperfections
- F. Finish surfaces as specified in individual product sections

1.7 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule a conference after Notice of Award
- B. Location: On site
- C. Attendance
 - 1. Owner's Representative
 - 2. Engineer and his professional consultants
 - 3. Geotechnical Engineer
 - 4. Contractor's Project Manager
 - 5. Contractor's Superintendent
 - 6. Major Subcontractors
 - 7. Others as Appropriate
- D. Agenda:
 - 1. Execution of Owner Contractor Agreement
 - 2. Submission of executed bonds and insurance certificates
 - 3. Distribution of Contract Documents
 - 4. Submission of list of subcontractors and suppliers, list of products, Schedule of Values, and Construction Project Schedule in critical path format
 - 5. Designation of personnel representing the parties in Contractor, Owner, and the Engineer
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures
 - 7. Construction scheduling and updates
 - 8. Scheduling activities of Geotechnical Engineer, equipment manufacturers representatives, and other field tests
 - 9. Critical work sequencing
 - 10. Major equipment deliveries and priorities
 - 11. Procedures for maintaining Record Documents
 - 12. Construction facilities, controls and construction aids
 - 13. Temporary utilities provided by Owner
 - 14. Safety and first-aid procedures
 - 15. Security and housekeeping procedures

16. Procedures for testing

1.8 PROGRESS MEETINGS

- A. Contractor will schedule and administer meetings throughout progress of the Work at weekly intervals. If work progress does not warrant meeting, all parties can mutually agree to postpone the weekly meeting.
- B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties. Owner will allow for construction progress meetings to be held in the conference room at the City of Grand Junction Water Treatment Plant
- C. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within one week to Contractor, Owner, participants, and those affected by decisions made
- D. Attendance
 - 1. Owner's Representative
 - 2. Engineer, and his professional consultants as needed
 - 3. Contractor's Superintendent
 - 4. Subcontractors as appropriate to the agenda
 - 5. Suppliers as appropriate to the agenda
 - 6. Others, as appropriate
- E. Suggested Agenda
 - 1. Review Minutes of Previous meetings
 - 2. Review unresolved issues from Last Meeting
 - 3. Review of Work Progress
 - 4. Field Observations, Problems, Conflicts and Decisions
 - 5. RFI Review
 - 6. Review of Submittals Schedule and Status of Submittals
 - 7. Schedule
 - a. General Schedule Issues
 - b. Review of off-site fabrication and delivery schedules
 - c. Planned progress during succeeding work period (3-week "Look ahead")
 - d. Maintenance of construction project schedule
 - e. Corrective measures to regain project schedules
 - 8. Maintenance of Quality and Work Standards
 - 9. Change Orders
 - 10. New PR's or CCR's
 - 11. Accepted Change Orders
 - 12. Pay Requests
 - 13. Other Business

1.9 REQUESTS FOR INFORMATION (RFI)

- A. The Contractor shall prepare and submit an RFI upon the discovery of the need for interpretation of the Contract Documents or additional information
 - 1. Only the Contractor shall submit RFIs to the Engineer
 - 2. RFIs shall be submitted on Engineer's RFI form. Engineer will provide a template for the Contractor upon request.

- B. RFI shall include:
 - 1. Project Name
 - 2. Engineer Job Number
 - 3. Date
 - 4. Name of Contractor
 - 5. Name of Engineer
 - 6. RFI number, numbered sequentially
 - 7. Related specification section number, title, and related paragraphs, as needed
 - 8. Drawing number and detail references, as needed
 - 9. Field conditions
 - 10. Contractor's proposed solution. If the Contractor's solution(s) affect contract times or contract price, Contractor shall state the effects on the RFI.
 - 11. Contractor's signature
 - 12. Relevant attachments including but not limited to drawings, descriptions, measurements, photos, product data, and shop drawings

- C. Electronically Submitted RFIs
 - 1. Contractor shall submit one (1) complete RFI file in Adobe Acrobat PDF format

- D. Engineer's Response
 - 1. Engineer will review each RFI, determine action required, and respond
 - 2. Engineer will review and respond to each RFI within seven (7) working days
 - 3. If Engineer receives an RFI after 1:00 P.M. local time, the RFI will be considered as received the following working day
 - 4. Engineer will not respond to RFIs requesting approval of submittals, approval of substitutions, coordination and information already indicated in Contract Documents, adjustment in contract time or contract amount, or erroneous RFIs
 - 5. Engineer may respond to RFIs on related issues with a single response
 - 6. If Engineer requests additional information as a result of the RFI, any further action or RFIs submitted by the Contractor will restart a new seven (7) day review period
 - 7. Contractor shall submit any request for change of contract time or contract price utilizing proper Change Order forms

- E. Contractor shall log and track all RFIs submitted organized by RFI number
 - 1. RFI log shall be submitted at each progress meeting
 - 2. RFI log shall include:
 - a. Project name
 - b. Name, address, and phone number of Contractor
 - c. Contractor representative name

- d. RFI number
- e. RFI description
- f. RFI submittal date
- g. RFI response date
- h. Related Change Order number, as needed

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01080
IDENTIFICATION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Color coding, lettering, and tagging of all new exposed pipe and electrical equipment

1.2 RELATED SECTIONS

- A. Section 09900 – Coatings
- B. Section 16050 – Basic Electrical Materials and Methods

1.3 REFERENCES

- A. ANSI 13.1 – Scheme for the Identification of Piping Systems

PART 2 PRODUCTS

2.1 MATERIALS

- A. Paint: As specified in Section 09900
- B. Nameplates: Plastic, two colors for surface and core

PART 3 EXECUTION

3.1 LOCATION OF IDENTIFICATION

- A. Lettering and flow direction arrows
 1. Near equipment served
 2. Close to valve or flanges
 3. Adjacent to branches, tees and changes in direction of pipeline
 4. At intervals of not more than 20 feet on straight runs, unless otherwise indicated by Engineer

3.2 LETTERING

- A. Lettering to be provided by:
 1. Paint, stencil
 2. Cylindrically coiled printed plastic sheets meeting ANSI A13.1-2007
 - a. Seton, Setmark Pipe Markers
 - b. Or accepted equal

B. Letter size as follows:

<u>Outside Diameter of Pipe Or Covering (inch)</u>	<u>Minimum Height of Letters (inch)</u>
¾ Through 4	¾
>4 to <8	1 1/4
8 or larger	2 1/2

3.3 NAME PLATES

- A. Provide nameplates on all electrically powered equipment and electrical enclosures
 1. Size: Approximately 3-inch wide by 2-inch high, on red plastic surface engraved through to a yellow core
 2. Label: “Danger” in capital ½ inch letters on top line. The balance of sign in 3/8 inch capital letters reading: “Do not perform any equipment maintenance until main power disconnect is turned off and padlocked”
 3. Provide additional electrical nameplates of the size and colors indicated in the individual specification sections
 4. Install in prominent location agreed to by the Engineer and Owner
- B. Provide nameplate at all non-potable water outlets
 1. Size: approximately 3- inch wide by 2-inch high, on red plastic surface engraved through to a white core
 2. Label: “Non-Potable Water” top line and “Do Not Drink” second line in ½ inch capital letters
 3. Securely attach to wall (if possible) or attach with stainless steel chain

3.4 SCHEDULED COLOR CODING

- A. All 24-inch pipe and smaller
- B. Bands where scheduled: 6 inch wide, at 5 foot intervals
- C. Provide only bands of color on un-insulated steel and PVC, elsewhere natural finish

3.5 PIPING NOT SCHEDULED

- A. Paint to match wall or ceiling, unless otherwise directed by Engineer
- B. Appropriately identify and place arrows
- C. Un-insulated stainless steel and PVC
 1. Natural finish

3.6 SCHEDULE

A. Paint and letter colors

Letters	Color of Pipe	Color of Letters
Raw Water Influent	Match Existing	White
Water Process Piping	Match Existing	Black
Potable Water Piping	Match Existing	White
Backwash Water	Match Existing	Black
Non-potable Water Piping	Match Existing	White
Air Piping - instrument	Match Existing	White
Air piping – low pressure	Match Existing	Black
Natural Gas Line	Match Existing	White

B. For piping not specified above refer to “Ten State Standards-Water Works, 2012 Edition” and/or the CDPHE “Design Criteria for Potable Water Systems, March 1997” as well as consult with Engineer

- C. Specifically paint the following items:
1. Valve hand-wheels and levers: Red
 2. Any other requests by the City of GJ

END OF SECTION

SECTION 01200

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.
- B. This information is supplemental to the requirements as stated in the General Conditions.

1.2 SUMMARY

- A. This Section includes additional administrative and procedural requirements necessary to prepare and process Applications for Payment. Refer to General Conditions for most requirements of the Owner.
 - 1. Schedule of Values assisting in processing Applications for Payment
 - 2. Unit Prices for administrative requirements governing use of unit prices
 - 3. State Revolving Loan Fund project administrative requirements
 - 4. Construction Progress Schedules

1.3 DEFINITIONS

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

1.4 PROCEDURES FOR THE SCHEDULE OF VALUES

- A. Coordination: coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets
 - b. Submittals Schedule
 - c. O&M Manuals Schedule
 - 2. Submit the Schedule of Values to Engineer at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment
 - 3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: include the following Project identification on the Schedule of Values:
 - a. Project name and location
 - b. Name of Engineer
 - c. Engineer's project number.
 - d. Contractor's name and address
 - e. Date of submittal
 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Change Orders (numbers) that affect value.
 - d. Dollar value.
 - e. Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

1.5 APPLICATION FOR PAYMENTS

A. General

1. Submit itemized payment request as required in General Conditions together with Schedule of Values and other submittals as specified herein
 2. Contractor shall not "project" work completed beyond the date of Application for Payment submittal for the purpose of payment request
- B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.
1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements
- C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application
- E. Transmittal
1. Submit copy of each Application for Payment to the Engineer by means ensuring receipt within 24 hours
 2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer
- F. Initial Application for Payment
1. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
 - a. List of subcontractors
 - b. List of principal suppliers and fabricators
 - c. Schedule of Values
 - d. Contractor's Construction Schedule (preliminary if not final)
 - e. Schedule of principal products
 - f. List of Contractor's staff assignments
 - g. Copies of building permits
 - h. Copies of authorizations and licenses from governing authorities for performance of the Work
 - i. Certificates of insurance and insurance policies
 - j. Performance and payment bonds, if required
- G. Application for Payment at Substantial Completion

1. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work
 - a. Administrative actions and submittals that shall precede or coincide with this application include:
 - i) Occupancy permits and similar approvals
 - ii) Warranties (guarantees) and maintenance agreements
 - iii) Test/adjust/balance records
 - iv) Maintenance instructions
 - v) Meter readings
 - vi) Start-up performance reports
 - vii) Change-over information related to Owner's occupancy, use, operation and maintenance
 - viii) Final cleaning
 - ix) Application for reduction of retainage, and consent of surety
 - x) Advice on shifting insurance coverages
 - b. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion

H. Application for Final Payment

1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
2. Application for Final Payment will not be considered until the following have been accomplished:
 - a. Completion of Project closeout requirements
 - b. Completion of items specified for completion after Substantial Completion
 - c. Assurance that unsettled claims will be settled
 - d. Assurance that Work not complete and accepted will be completed without undue delay
 - e. Transmittal of required Project construction records to Owner
 - f. Proof that taxes, fees and similar obligations have been paid
 - g. Removal of temporary facilities and services
 - h. Removal of surplus materials, rubbish and similar elements

1.6 PROCEDURES FOR STATE REVOLVING FUND (SRF) LOAN PROJECTS

- A. Coordination: coordinate preparation of the SRF forms and reports with preparation of Contractor's Construction Schedule and Pay Applications
 1. Correlate line items in the Project Schedule with other required administrative forms and schedules, including the following:
 - a. Certifications regarding debarment (General and Subcontractors)
 - b. Certified payrolls (Davis-Bacon wage determination)
 - c. Disadvantaged Business Enterprise (DBE) Procurement
 2. Make required submittals to the Engineer on a timely basis based on monthly and quarterly reporting requirements

1.7 PROCEDURES FOR THE CONSTRUCTION PROGRESS SCHEDULE

- A. Coordination: coordinate preparation and updates of Contractor's Construction Schedule with the preparation of Schedule of Values.
 - 1. Correlate line items in the Construction Schedule with required project tasks, including the following:
 - a. Mobilization/demobilization
 - b. Permits and regulatory requirements
 - c. Submittals
 - d. Equipment
 - e. O&M Manuals
 - f. Work breakdown of major project work
 - g. Major subcontractors work
 - h. Startup and commissioning
 - i. Training
 - j. Substantial completion
 - k. Final completion
 - l. Milestones and operational shutdown requirements
- B. Utilize the Critical Path Method (CPM) type construction schedule to establish preliminary progress schedule and track Work progress
 - 1. After acceptance by Engineer of preliminary Progress Schedule submitted per requirements of General Conditions, set preliminary Progress Schedule as the Construction Baseline Schedule
 - 2. Update and submit the construction progress schedule on a monthly basis with the pay application
 - a. Monthly submittal should indicate progress of tasks, changes to baseline schedule logic, work additions such as change orders, milestone and contract date changes
 - b. Submit two (2) color print copies, 11" x 17" size, and one Adobe pdf copy
 - c. Upon request provide copy of project schedule CPM data file

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submission of all shop drawings and product data as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise

1.2 RELATED SECTIONS

- A. Section 01600 – Materials and Equipment
- B. Section 01730 – Operations and Maintenance Data
- C. Specification Divisions 2 through 16

1.3 SUBMITTALS

A. Definitions

1. Technical submittals: Shop drawings, product data and samples prepared by Contractor, subcontractors, suppliers, or manufacturers
 - a. Shall be submitted by the Contractor to Engineer for approval for the use of Equipment and Materials to complete the Work or as needed to describe the following:
 - i) Operation and maintenance
 - ii) Technical properties
 - iii) Installation
 - b. Shop drawings: Custom prepared data for the Project and Work including performance and capacity curves, diagrams, bills of material, instructions, and other information
 - c. Product data: Non-custom prepared printed information for the Project and Work on materials and products
 - d. Samples: Fabricated and non-fabricated tangible samples of products and material
 - i) Used for visual inspection and testing and analysis
2. Informational submittals: Reports, administrative informational submittals, certification and guarantees not including and defined as shop drawings, samples and product data
 - a. Reports: Include laboratory reports and tests, technical procedures and records and design analysis
 - b. Administrative informational submittals: Submittals necessary for administrative records such as construction photographs, work records, schedules, standards, record project data, safety data, and similar information submittals
 - c. Certification: Includes manufacturer or supplier certificates and guarantees

B. General Requirements

1. Quality

- a. Shall be of suitable quality for legibility and reproduction purposes
- b. Shall be useable for reproduction yielding legible hard copy
- c. Submittals not conforming to specified requirements herein and as specified in Divisions 2 through 16 shall be subject to rejection by Engineer and upon Engineer request, Contractor shall resubmit documents that are in conformance

2. Dimensions

- a. English units shall be provided on submittals
- b. Metric units are acceptable in addition to English units
- c. English units shall govern

3. Form of submittals

- a. Submittals shall be transmitted in electronic format as specified herein
- b. Scanned submittals are acceptable
- c. Electronic project documents and submittals shall be transmitted in the following format:
 - i) Native electronic format, nonproprietary
 - ii) Adobe PDF produced from native electronic format
- d. Filename:
 - i) Shall be consistent for the initial and any subsequent submission revisions for a single submittal
 - ii) Contractor shall use a consistent naming convention for all submittals
 - a) Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)

4. Non-conforming submittals shall be subject to rejection by Owner and/or Engineer

5. Submittal completion requirements

- a. Submittals shall include design criteria, dimensions, construction materials and all other information specified for a complete submittal to facilitate Engineer review of the submittal information adequately
- b. In the event various drawings are included a submittal for a class of Equipment, Contractor shall annotate clearly which parts apply to furnished Equipment
 - i) Information not pertaining to the submittal shall be clearly annotated. Highlighting of such information will cause rejection of the submittal by the Engineer
- c. Contract Drawings
 - i) Copies or portions thereof will not be allowed as acceptable fabrication or erection drawings
 - ii) In the event Contract Drawings are used by the Engineer for erection drawings to annotate information on erection or identify reference details, Engineer title block and professional seal shall be removed and replaced with the Contractor's title block on the Contract Drawing(s). Contractor shall revise such erection drawings for subsequent revisions by the Engineer to Contract Drawings

C. Preparation

1. Shop Drawings

- a. Drawings shall be presented in a clear and thorough manner:
 - b. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings
 - c. Identify equipment by reference to equipment name and tag number shown on Contract Drawings
 - d. Scale and Measurements: Make drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices
 - e. Minimum sheet size: 8.5" by 11"
 - f. Fabrication drawing size: 11" by 17" or 24" by 36"
2. Product Data
- a. Clearly mark each copy to identify pertinent products or models submitted for review
 - b. Identify equipment by reference to equipment name and P&ID number
 - c. Catalog cut sheets: Cross-out or hatch irrelevant data
- D. Technical Submittals: Shop Drawings and Product Data Submittal Requirements
1. Shop Drawings and Product Data shall include the following, at a minimum:
- a. Specifications of manufacturer(s)
 - b. Equipment parts and catalogs
 - c. Bills of materials, material lists, and schedules
 - d. Shop erection and fabrication drawings
 - e. Drawings shall include equipment dimensions, weights, installation location requirements, plates required, main components, support details, anchor bolt details/sizes/locations, support base sizes, baseplate sizes, spacing and clearance requirements for installation, erection, operation and maintenance disassembly
 - f. Electrical requirements:
 - i) Shall include schematic diagrams including one-line diagrams, terminal block numbers, internal wiring diagrams, external connections, controls, and any other information as requested in individual specification sections
 - g. List of spare parts
 - h. Instruction and Operation and Maintenance (O&M) manuals
 - i) As specified herein and in Specification Section 01730
 - i. Manufacturer's performance testing of equipment
 - j. Concrete mix design data and information
 - k. Performance characteristics and capacities
 - l. External connections, anchorages, and supports required
 - m. Other drawings, parts, catalogs, specifications, samples, or data necessary for the Engineer to determine conformance with Contract Documents
2. Samples – Office samples shall be of sufficient size and quantity to clearly illustrate:
- a. Functional characteristics of the product, with integrally related parts and attachment devices
 - b. Full range of color, texture and pattern
 - c. Comply with requirements identified in individual specification sections

- E. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed Shop Drawings and Product Data will be needed, if accelerated review is requested
- F. Field samples and Mock-ups:
 - 1. Contractor shall erect, at the Project Site, at a location acceptable to the Engineer and Owner
 - 2. Size or area: as specified in the respective specification section
 - 3. Fabricate each sample and mock-up complete and finished
 - 4. Remove mock-ups at conclusion of Work or when acceptable to Engineer

1.4 CONTRACTOR RESPONSIBILITIES

- A. Review shop drawings and product data prior to submission for accuracy and completeness of each submission
- B. Approve and stamp each submission before submitting to Engineer
- C. Determine and verify:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - 4. Conformance with specifications and identification of all deviations
 - 5. Confirm assignment of unit responsibility
- D. Prior to each submission, carefully review and coordinate all aspects of each item being submitted
- E. Verify that each item and the corresponding submittal conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto
- F. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor
- G. Limit requirement for accelerated submittal review by Engineer to no more than 10% percent of total number of submittals
 - 1. Accelerated submittal review period: less than 14 calendar days
- H. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
 - 1. Identify and tabulate all deviations in transmittal letter
 - 2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation
 - 3. Include required piping and wiring diagrams

1.5 SUBMISSION REQUIREMENTS

- A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery
- B. In scheduling, allow fourteen (14) calendar days for review by Engineer following receipt of submission in Engineer's office:
 - 1. Time required to mail submissions or resubmissions is not considered a part of review period
- C. Submittal Naming and Numbering
 - 1. Assign a unique number to include all shop drawings, product data and other information required for individual specification sections, beginning with #001.
 - 2. Resubmissions shall have the original number with a letter, starting with "A". If the first submittal required resubmission, it would be labeled #001A.
 - 3. Each specification section may still have more than one submittal number for later submissions (i.e., Preliminary O&M Manuals, Final O&M Manuals, etc.)
 - 4. Contractor shall use a consistent naming convention for all submittals
- D. Quantity of Submittals Required
 - 1. Shop Drawings and Product Data:
 - a. Initial submittal:
 - i) Electronic – One (1) copy to Engineer
 - b. Resubmittal:
 - i) Electronic – One (1) copy to Engineer
 - c. Final Submittal for Distribution
 - i) Paper hard copy - Maximum of two (2) copies for Contractor's use, plus a maximum of three (3) copies which will be distributed by Engineer when approved. Do not submit more than five (5) copies
 - ii) One (1) electronic copy to Engineer
 - d. As-constructed document submittals
 - i) Paper hard copy – Maximum of two (2) copies for Contractor's use, plus a maximum of three (3) copies which will be distributed by Engineer when approved. Do not submit more than five (5) copies
 - ii) Electronic – One (1) copy to Engineer and one (1) copy to Owner
 - 2. Samples
 - a. Initial submittal:
 - i) Submit three (3) of each sample unless specified otherwise in individual specification section
 - b. Resubmittal:
 - i) Submit three (3) to Engineer
 - c. One (1) sample of approved sample submittal will be returned to Contractor
 - 3. Informational submittals
 - a. Technical reports and administrative submittals
 - i) Electronic – One (1) copy to Engineer
 - ii) Paper: Three (3) copies to Engineer
 - b. Certificates and guarantees:

- i) Electronic – One (1) copy to Engineer
 - ii) Paper: Three (3) copies to Engineer
 - c. Test reports
 - i) Paper
 - a) Owner: Two (2) copies
 - b) Engineer: One (1) copy
 - c) Contractor: Two (2) copies
 - d) Manufacturer/supplier: One (1) copy
 - 4. Instruction and O&M manuals
 - a. In accordance to Specification Section 01730
 - 5. At no additional cost to the Owner and whether or not submittals are copyrighted, the Owner may copy and use for staff training and/or internal operations any submittals approved for final distribution as well as required by this Contract
- E. Submittal Transmittal Requirements
- 1. Accompany each submittal with a letter of transmittal showing all information required for identification and checking
 - 2. Shall include:
 - a. Drawing numbers and titles
 - b. Revision number
 - c. Electronic filename
 - d. Deviations from Contract Documents: As specified herein
 - e. Submittals unidentifiable will be returned for proper identification
 - f. Date
- F. Submittals Requirements
- 1. Submittal number
 - 2. Date of submission and dates of any previous submissions
 - 3. Project title and number
 - 4. Owner Contract identification number if applicable
 - 5. Names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 6. Identification of the product, with the specification section number
 - 7. Field dimensions, clearly identified as such
 - 8. Relation to adjacent or critical features of the Work or materials
 - 9. Applicable standards, such as ASTM or Federal Specification numbers
 - 10. Identification of deviations from Contract Documents:
 - a. If Contractor proposes to provide material or equipment of Work which deviates from the Project Manual, Contractor shall indicate so under “deviations” on the transmittal form accompanying the submittal copies
 - b. Identify all requested deviations as specified and on the copies of Specifications and Drawings required by paragraph below.
 - 11. Confirmation of compliance with Contract Documents and, if applicable, identification of deviations from Contract Documents:

- a. Provide the following documents to demonstrate compliance with the contract specifications:
 - i) A copy of the relevant Drawing(s) with all addendum updates that apply to the equipment in various Divisions marked to show specific changes necessary for the equipment proposed in the Contractor's submittal
 - a) If no changes are required, the Drawing(s) shall be clearly marked "No Changes Required"
 - b) Failure to include copies of relevant Drawing(s) with the submittal, whether changes are required or not, shall be cause for rejection of the entire submittal with no further review by Engineer
 - c) Relevant Drawing(s) include as a minimum the control diagrams, process and instrumentation diagrams (P&IDs), and Process (P) drawings.
 - ii) A copy of each pertinent specification section with all addendum updates included, all referenced and applicable specifications sections, with their respective addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements:
 - a) If deviations from the specifications are indicated and, therefore requested, by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation
 - b) Failure to include a copy of the marked up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further review by Engineer

- 12. Identification of revisions on resubmissions
- 13. An 8" by 4" blank space for Contractor's and Engineer's stamps
- 14. Stamp cover sheet of each submittal as identified in letter of transmittal
- 15. Contractor's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

This submittal has been reviewed by [Name of Contractor] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. [Name of Contractor] also warrants that this submittal complies with contract documents and comprises no deviations thereto:
 Section No: _____ Submittal No: _____
 Date: _____ By: _____

- G. For equipment that is provided directly by manufacturer without specification provide:
 - 1. Shop drawings: Illustrate complete assembly of products; foundation, installation and anchor requirements; dimensions and total weights of each, electrical wiring diagrams

2. Product data: Provide manufacturer's literature including general assembly, materials of construction, model and type, detailed data describing parts and accessories, sufficient data to verify compliance with specifications
 3. Manufacturer's installation instructions: Provide detailed connection requirements and startup instructions
 4. Manufacturer's field report: Indicate personnel present and actual start-up procedures that were performed by manufacturer's representative
 5. Field report and test results shall be submitted to the Engineer by the Contractor
- H. Submittal Log:
1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions
 2. Show submittal number, section number, section title, submittal description, dates and disposition of submittal
 3. Make submittal log available to Engineer for Engineer's review upon request
- I. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:
1. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received
 2. Submit a complete initial submittal including all components when an item consists of components from several sources
 3. Partial submittals may be rejected as not complying with provisions of the Contract
 4. Engineer will not be held liable for delays due to poorly organized or incomplete submissions
 5. Do not include items from more than one specification section for any one submittal number
- J. Contractor may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between Contractor and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents
- K. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility
- 1.6 DISPOSITION OF SHOP DRAWINGS, PRODUCT DATA, AND INFORMATION SUBMITTALS
- A. "No Exceptions Taken": Approved with No Corrections Noted
1. One copy sent to Owner
 2. One copy sent to Resident Project Representative
 3. One copy retained in Engineer's file
 4. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers, or subcontractors

5. No corrections or comments noted on the submittal or on a Submittal Response Summary Sheet
 6. Issues or miscellaneous comments pertaining to other related items of the Work may be included in transmittal letter
 7. Resubmission not required
- B. "Exceptions Noted": Approved with Corrections Noted
1. One copy sent to Owner
 2. One copy sent to Resident Project Representative
 3. One copy retained in Engineer's file
 4. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers or subcontractors
 - c. Copies of submittal data in operation and maintenance manuals to be revised according to corrections
 5. Comply with corrections or comments as noted on the submittal or on a Submittal Response Summary Sheet
 6. Resubmission not required
- C. "Revise And Resubmit": Incorrect information provided or Significant Information Still Required
1. One copy sent to Resident Project Representative
 2. One copy retained in Engineer's file
 3. All remaining copies returned to Contractor for revision and re-submittal
 4. Copy of transmittal letter and/or Submittal Response Summary Sheet sent to Owner. A "No Exceptions Taken" or "Exceptions Noted" submittal it will be forwarded to Owner after review per above disposition requirements
 5. Submittal is either: incorrectly annotated; specific comments need to be addressed and incorporated in re-submittal; and/or additional information may be required as noted on the submittal or on a Submittal Response Summary Sheet
 6. Submitted information may not include or address specific item required per the specification as identified on the submittal or on a Submittal Response Summary Sheet
 7. Specific information related to identified item may be required for final approval of submittal
 8. Resubmission of entire submittal may be required or resubmission of specific item may be required as identified on the submittal or on a Submittal Response Summary Sheet
- D. "Rejected": Returned for Correction
1. One copy sent to Resident Project Representative
 2. One copy retained in Engineer's file
 3. All remaining copies returned to Contractor
 4. Copy of transmittal letter and/or Submittal Response sent to Owner
 5. Contractor required to resubmit complete submittal package in accordance with Contract Documents
 6. Submittal does not comply with provisions of Contract Documents as noted on the submittal or on a Submittal Response Summary Sheet

7. Resubmission required

- E. "Receipt Acknowledged": For Reference Purposes Only, or for Record Copy:
1. Applicable to manufacturer or Contractor provided calculations and other miscellaneous documentation no subject to Engineer review and approval
 2. One copy sent to Resident Project Representative
 3. One copy retained in Engineer's file
 4. One copy returned to Contractor
 5. Copy of transmittal letter sent to Owner
 6. Remaining submittal copies destroyed
 7. Detailed review and comment by Engineer not required
 8. Resubmission not required

1.7 DISPOSITION OF SAMPLES

- A. "No Exceptions Taken": Approved with No Corrections Noted
1. One sample sent to Owner
 2. One sample sent to Resident Project Representative
 3. One sample retained in Engineer's file
 4. Acknowledgement: Copy of transmittal letter sent to Contractor
 5. Resubmission not required
- B. "Exceptions Noted": Approved with Corrections Noted
1. One sample sent to Owner
 2. One sample sent to Resident Project Representative
 3. One sample retained in Engineer's file
 4. Acknowledgement: Copy of transmittal letter sent to Contractor
 5. Work performed or products furnished to comply with exceptions noted in acknowledgement
 6. Resubmission not required
- C. "Rejected": Returned for Correction
1. One sample retained in Engineer's file
 2. Remaining samples sent to Contractor for resubmittal and compliance with the Contract Documents as noted in transmittal letter
 3. Copy of transmittal letter sent to Owner
 4. Resubmission required

1.8 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until approved
- B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)
- C. Shop Drawings and Product Data

1. Revise initial drawings or data and resubmit as specified for the initial submittal
2. Indicate any changes which have been made other than those requested by Engineer

D. Samples: Submit new samples as required for initial submittal

E. Reimbursement of Resubmission Review Costs:

1. Review of first submittal and one resubmittal will be performed by Engineer at no cost to Contractor
2. Cost for review of subsequent resubmissions will be directly paid by Contractor
3. Engineer will document work-hours required for review and costs for Engineer review will be deducted from payments due Contractor as Change Order deducts
4. Charges for review of resubmissions will include Engineer at maximum rate of \$150 per hour and administrative staff at maximum rate of \$75 per hour

1.9 PROJECT RECORD SUBMITTALS

A. After completion of the Work and prior to final payment, Contractor shall furnish record documents and final approved shop drawings and samples (as-constructed shop drawings and samples) in the number of copies specified herein.

1. Contractor shall provide additional copies of final approved shop drawings and samples for insertion in Equipment instruction and O&M manuals as required
2. All copies shall be clearly marked "Project Record"

1.10 ENGINEER'S DUTIES

A. Review submittals with reasonable promptness and in accordance with approved submission schedule provided that each submittal has been called for by the Contract Documents and is stamped by Contractor as indicated above

1. No extensions of time are allowed due to Engineer's delay in reviewing submittals unless all the following criteria are met:
 - a. Contractor has notified Engineer in writing that timely review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
 - b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later
 - c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer's failure to return submittal within 21 days
2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions
3. Engineer's review shall not extend to means, methods, techniques, sequences, construction operations, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals
4. In the event that Engineer will require more than 21 calendar days to perform review, Engineer shall so notify Contractor

B. Review drawings and data submitted only for general conformity with Contract Documents

1. Engineer's review of drawings and data returned marked No Exceptions Taken or Exceptions Noted does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown
 2. Engineer's review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents
- C. Assume that no shop drawing or related submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
1. Consider and review only those deviations from the Contract Documents clearly identified as such on the submittal and tabulated on the Contractor's transmittal sheet.
- D. Review informational submittals for indications of Work or Material deficiencies and will respond to Contractor regarding such deficiencies
- E. Return submittals to Contractor for distribution or for resubmission
- F. Transmit, unreviewed, to Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors
- G. Transmit, unreviewed, to Contractor all copies of submittals not called for by the Contract Documents or which have not been approved by Contractor
- H. Engineer will not review uncalled-for shop drawings or product data except by special arrangement
- I. Affix stamp and indicate approval for submittal or resubmission requirements with the following stamp:

<input type="checkbox"/> NO EXCEPTIONS TAKEN <input type="checkbox"/> EXCEPTIONS NOTED <input type="checkbox"/> REVISE & RESUBMIT <input type="checkbox"/> REJECTED <p style="font-size: small;">This review was performed only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Modifications or comments made on the shop drawings and product data during this review do not relieve Contractor from responsibility for compliance with the requirements of the plans and specifications. Contractor is responsible for: dimensions and quantities; information that pertains solely to the fabrication processes or to the means, methods, of construction; coordination of the work of all trades.</p> <p style="text-align: center;">JVA, Inc.</p> <p>Date _____ By _____</p>
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1.11 SUBMITTAL SCHEDULE

- A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.
- B. Contractor to produce schedule of submittals for Engineer review

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction record photographs prior to commencing and during the course of the Work

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01700 – Contract Closeout: Project Record Documents

1.3 PHOTOGRAPHY REQUIRED

- A. Take photographs of the existing conditions prior to commencing work to document existing conditions
- B. Take photographs on the date on which each scheduled Application for Payment is due. Intent is for digital photos to be kept as project record
- C. CD of Digital photos become the property of Owner

1.4 COSTS OF PHOTOGRAPHY

- A. Pay all costs for specified photography and printing
 - 1. Parties requiring additional photography or prints will pay for them directly

1.5 DELIVERY OF PHOTOS

- A. Submit digital photos to the Engineer with monthly pay requests or within 20 days of photo date

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 TECHNIQUE

- A. Factual Presentation
- B. Correct Exposure and Focus
 - 1. High resolution and sharpness
 - 2. Maximum depth-of-field

3. Minimum distortion

3.2 VIEWS REQUIRED

- A. Photograph from locations to adequately illustrate the condition of construction and the state of the Project
 - 1. Photographic survey of the existing site
 - a. Show all areas to be modified
 - b. Show all areas in which Contractor will conduct operations or store equipment
 - 2. Weekly photographs
 - a. Minimum of eight (8) views weekly until final acceptance
 - b. Views as designated by the Engineer or Owner

3.3 PHOTOGRAPH REQUIREMENTS FOR PROGRESS SITE PHOTOGRAPHS

- A. Responsibility
 - 1. Site photographs for Owner record of construction progress shall be the responsibility of the Contractor
 - 2. Contractor shall be responsible for site photographs including the existing and progress of Work
- B. Photographs shall include, but not limited to, the following:
 - 1. Existing site: Photographs of existing site conditions before site work commences
 - a. Number of views shall be sufficient to cover the existing site conditions
 - 2. Progress of work: Shall include photographs from clearing throughout construction
 - a. Number of views shall be sufficient to cover progress in Work and shall include a minimum of eight (8) different views
 - 3. After completion of Work: Shall be sufficient to show completed and finished Work
- C. Digital images
 - 1. Provide images in uncompressed JPEG format
 - 2. Minimum resolution: 1500 x 2200
 - 3. Submitted digital images shall not be cropped
- D. Identify each digital image file
 - 1. Name of project
 - 2. Orientation and description of view
 - 3. Date and time of exposure

3.4 ADDITIONAL PHOTOGRAPHS

- A. Contractor shall provide additional photographs upon the request of the Engineer
- B. Additional photographs may include, but not limited to, the following:
 - 1. Publicity photographs
 - 2. Special events at Project site
 - 3. Major phase of Work
 - 4. Substantial Completion
 - 5. Follow-up investigations for on-site events such as construction damage or losses

6. Additional record photographs during final acceptance

3.5 PROJECT RECORD

A. Submit CD of all photos, grouped by date

B. Engineer will distribute, after review

1. One copy of each view to Owner

2. One copy of each view to Engineer's file

3. One copy of each view returned to Contractor for inclusion in Project Record Document

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance/Control of installation
- B. Inspection and testing laboratory services
- C. Qualification of laboratory
- D. Laboratory duties
- E. Limitations of authority of testing laboratory
- F. Contractor's responsibilities
- G. Field testing
- H. Testing and services schedule

1.2 RELATED SECTIONS

- A. Section 01010 - Summary of Work
- B. Section 01340 - Shop Drawings, Product Data, and Samples
- C. Section 01600 - Material and Equipment

1.3 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents
- B. Obtain copies of standards when required by Contract Documents
- C. Where specified reference standards conflict with Contract Documents, request clarification for Engineer before proceeding
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340

- B. Provide copies of written reports for materials, equipment or systems as scheduled at the end of this section. Reference each report by respective section number.
- C. Laboratory Test Reports: Provide written reports of each test and inspection to Engineer. Each report shall include:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name, address and telephone number
 - 4. Name and signature of laboratory inspector
 - 5. Date and time of sampling or inspection
 - 6. Record of temperature and weather conditions
 - 7. Date of test
 - 8. Identification of product and specification section
 - 9. Location of sample or test in the Project
 - 10. Type of inspection or test
 - 11. Results of tests and compliance with Contract Documents
 - 12. Interpretation of test results when requested by Engineer
- D. Shop Test Reports: Provide reports detailing results of tests and certification from manufacturer to verify compliance with specifications
- E. Field Test Reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.5 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality
- B. Comply fully with manufacturer's instructions, including each step in sequence
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship
- E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement
- F. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract
- G. Certification of products: Respective sections of specifications
- H. Laboratory tests required and standards for testing: Respective sections of specifications

1.6 INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner will employ and pay for the services of an independent testing laboratory to perform specified laboratory testing of materials where the technical specifications specifically obligate the Owner to provide the services
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract
 - 3. Contractor shall employ and pay for the services of an independent testing laboratory to perform all specified services and testing not specifically identified in the technical specifications to be provided by Owner related to the design of mixes, products and equipment, to Engineer's review of proposed materials and equipment before, during and after incorporation in the Work and to retest materials and equipment which fail original tests
- B. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price

1.7 QUALIFICATION OF LABORATORY

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories
- B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable
- C. Authorized to operate in the State in which the Project is located

1.8 LABORATORY DUTIES

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice
- B. Perform specified inspections, sampling, and testing of materials and methods of construction
 - 1. Comply with specified standards
 - 2. Ascertain compliance of materials with requirements of Contract Documents
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products

1.9 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory Is Not Authorized To
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents

2. Approve or accept any portion of the Work
3. Owner employed laboratory shall not perform any duties of the Contractor

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory and testing personnel and provide access to Work
- B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other material mixes which require control by the testing laboratory
- D. Furnish copies of product test reports as required
- E. Furnish Incidental Labor and Facilities
 1. To provide access to Work to be tested
 2. To obtain and handle samples at the project site or at the source of the product to be tested
 3. To facilitate inspections and tests
 4. For storage and curing of test samples
- F. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested
 1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel
 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use

1.11 FIELD TESTING

- A. Owner shall pay all costs associated with standard field testing of materials as detailed in these specifications. Contractor shall pay all costs for testing of piping and equipment as detailed in these specifications. Owner's independent firm will take concrete samples, cure and break samples and report results. Owner's independent firm will also provide compaction testing and proctors for backfill operations. Contractor shall pay for all retesting due to tests indicating failed conditions.
- B. Provide all required materials, labor, equipment, water, and power required for testing
- C. Perform all tests in presence of Engineer and provide one copy of field test results to Engineer same day of tests
- D. Repair with no additional compensation all materials and equipment which fail during testing

E. Field testing shall be provided for, but shall not be limited to, the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
03300	Concrete	C
15060	Pipe and Pipe Fittings	C

1.12 TESTING AND SERVICES SCHEDULE

A. Testing laboratory services shall be provided for, but shall not be limited to, the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
03300	Concrete	C

1.13 SHOP TESTING

A. Shop testing shall be provided for the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
Division 11	Refer to individual specifications for SHOP testing requirements by manufacturer	C

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heating, ventilating, telephone service, water and sanitary facilities
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Staging Facilities: Access roads, parking areas, progress cleaning, project signage, storage and temporary buildings.

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01600 – Materials and Equipment
- C. Section 01700 – Contract Closeout
- D. Section 16050 – Basic Electrical Material and Methods

1.3 GENERAL REQUIREMENTS

- A. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems, as work progress requires.
- B. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work
- C. Furnish, install and maintain fences and barriers as required for protection of the public, property and the Work
- D. Contractor may use existing roadways for access and parking only where designated by Owner.
- E. Provide a field office for the use of the Contractor's Superintendent, Owner's Representatives, and Engineer in the designated staging area.
- F. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards

- G. Clean and repair damage caused by temporary installations or use of temporary facilities. Grade and seed all disturbed areas not detailed on the drawings for other treatment
- H. Provide contractor information sign posted at accessible location with contractor name and emergency phone contact information. Provide and post necessary information related to SRLF requirements.

1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. Comply with applicable Federal and State rules and regulations, local codes and ordinances
 - 2. Comply with utility company requirements

1.5 TEMPORARY ELECTRICITY

- A. Arrange for and pay all costs associated with temporary power service either from the local utility or a portable engine-generator
- B. Provide power outlets for construction operations, with branch wiring and distribution boxes located at the site. Provide flexible power cords as required.
- C. Provide main service disconnect and over current protection at convenient location
- D. Pay all costs for installation and removal of temporary electrical service

1.6 TEMPORARY LIGHTING

- A. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes as required
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtailed, and lamps as required
- C. Maintain lighting and provide routine repairs

1.7 TELEPHONE CELLULAR PHONE SERVICE

- A. Provide, maintain and pay for all cellular telephone service for Contractor personnel at time of project mobilization

1.8 TEMPORARY WATER SERVICE

- A. Potable water does exist on the site and will be provided by the City. Contractor shall coordinate all work with the City.
- B. Provide all drinking water required by construction personnel and Owner's representatives. Pay all costs for temporary water service.

1.9 TEMPORARY SANITARY FACILITIES

- A. Contractor shall furnish, install, and maintain sanitary facilities at staging area for use through construction and shall remove upon completion of Work
 - 1. Temporary sanitary facilities shall be as required by laws and regulations
 - 2. Not less than one (1) facility
- B. Service, clean and maintain facilities and enclosures

1.10 TEMPORARY SAFETY AND HEALTH

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety and health precautions and programs in connection with the Work
- B. Contractor shall provide protections necessary in order to prevent injury or loss to Contractor's employees

1.11 TEMPORARY FIRE PROTECTION

- A. Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations"
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire safe locations
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas
 - 4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition
 - 5. Contractor shall instruct Contractor's personnel on proper use of extinguishers
 - 6. Warning signs and instructions shall be posted at each extinguisher location
 - 7. Contractor shall post local Fire Department telephone number

1.12 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work, including but not limited to: scaffolds staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment
- B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner
- C. Completely remove temporary materials, equipment, and services at completion of the Project

- D. Clean, repair damage caused by installation or by use of temporary facilities
 - 1. Remove foundations and underground installations for construction aids
 - 2. Grade the areas for the site affected by temporary installations to required elevations and slopes and clean the area and seed unless specified as shown on the drawings to be different

1.13 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition
- B. Provide suitable barriers as required for public protection of Owner's employees
- C. Protect non-owned vehicular traffic, stored materials, site and structures from damage
- D. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes
- E. Relocate barriers as required by progress of construction
- F. Completely remove barriers, including foundations, when construction has progressed to the point that they are no longer needed
- G. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes and clean the area

1.14 TEMPORARY FENCING

- A. Construction: Commercial grade chain link fence
- B. Provide additional fencing to protect stored materials & products or to insure public safety and the safety of Owner's employees
- C. Provide Owner two (2) keys to lock(s)
- D. The site of the work is fenced

1.15 FUGITIVE DUST PERMIT

- A. Comply with all conditions of CDPHE Fugitive Dust Permit. Contractor responsible for both permit filing and any required reporting.
- B. Contractor to pay for all metered water used in dust abatement

1.16 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections

- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Protect finished driving surfaces, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects
- D. Prohibit construction traffic from entering future landscaped areas after grades have been established and topsoil restored

1.17 SECURITY

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft
- B. Coordinate with Owner's security program

1.18 ACCESS ROADS

- A. Maintain existing roads accessing public thoroughfares to construction staging area
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- C. Provide and maintain access to existing fire hydrants free of obstructions
- D. Provide means of removing mud from vehicle wheels before entering public paved streets as required by SWMP and Owner

1.19 PARKING

- A. Paved and unpaved surfaces adjacent to the staging area can accommodate construction personnel until the designated building staging area has been established
- B. If staging area space is not adequate, provide additional off-site parking at location designated by Owner

1.20 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations. If high winds are experienced at the site, waste removal must be done immediately after it is generated.

1.21 SEPTIC SYSTEM

- A. The existing water treatment plant is served by an existing septic system. The Contractor shall protect this system and is responsible for all costs and damage that occur to the system from their work operations.

1.22 STAGING AREA

- A. The City will provide a staging area for the Contractor's trailer, equipment and material storage onsite. If additional storage area is required it shall be located offsite and at the cost of the Contractor.
- B. The Contractor is responsible for returning the staging area to the pre-existing condition at the completion of all work.

1.23 FIELD OFFICES AND SHEDS

- A. Construction
 1. Structurally sound, weather-tight, with floors raised above ground
 2. Temperature transmission resistance: Compatible with occupancy and storage requirements
 3. At Contractor's option, portable or mobile buildings modified for office use may be used
 4. Fill and grade sites for temporary structures to provide surface drainage
 5. Construct temporary storage sheds on proper foundations
 - a. Secure portable or mobile buildings for winds to 90 mph, exp C, per Section 01600
 - b. Provide steps and landings at entrance door
 6. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment and services
 7. Remove storage sheds when they are no longer needed
 8. Remove foundations and debris; grade the site to required elevations and clean the areas
- B. Contractor's Office and Facilities (Contractor's option)
 1. Size: As required for general use and to provide space for project meetings
 2. Internet: Internet access and email capabilities
 3. Telephone: Wireless phone capabilities
 4. Other furnishings: Contractor's option
 5. One 10-inch outdoor-type thermometer
- C. Existing facilities at the site shall not be utilized for field offices or storage, except the Owner will for construction progress meetings to be held in the conference room at the City of Grand Junction Water Treatment Plant.
- D. Fire protection equipment. Contractor shall provide and maintain fire extinguishers and active fire hydrants where indicated, maintain fire lanes to hydrants, and provide other equipment as necessary for proper fire protection during construction. Such equipment shall be for fire protection only.

1.24 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01550

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching
- B. Work included in this Section
 - 1. Cutting and patching not required to be performed as part of the work of other sections
 - 2. Cutting and patching existing work altered or disturbed to accommodate new construction
 - 3. Cutting and patching existing work damaged or defaced during new construction as required to restore to existing or better condition at the time of award of Contract
 - 4. Cutting and patching required to
 - a. Install or correct non-coordinated work
 - b. Remove and replace defective and non-conforming work
 - c. Remove samples of installed work for testing
- C. Contractor shall be responsible for all cutting, and patching, including attendant excavation and backfill, required to complete the Work or to:
 - 1. Uncover portions of the Work to provide for installation of ill-timed work
 - 2. Remove and replace defective work
 - 3. Remove and replace work not conforming to requirements of Contract Documents
 - 4. Remove samples of installed work as specified for testing

1.2 DEFINITIONS

- A. Cutting includes cutting into nominally completed or existing construction including, but not limited to, the following, in order to provide for the coordination of Work, installation of Work, uncovering of other facilities and structures for access or inspection, or obtaining samples for testing or other similar purposes
 - 1. Concrete
 - 2. Masonry
 - 3. Steel
 - 4. Wood
 - 5. Miscellaneous metal structures
 - 6. Piping and pavement
- B. Patching includes the repair required to restore cut materials to original or better condition
- C. Submittals

1. Submit a proposal describing procedures in advance of the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - a. Extent: For each occurrence, describe the cutting and patching required, show how it will be performed and indicate the reason(s) it cannot be avoided
 - b. In-place construction changes: Describe anticipated results and include changes to structural elements and operating components in addition to changes in building's appearance and other significant visual elements
 - c. Products: List products to be used and firms or entities that will perform the Work
 - d. Dates: Indicate when cutting and patching will be performed
 - e. Utility services and mechanical and electrical systems:
 - i) List services and systems that cutting and patching procedures will disturb or affect
 - ii) List services and systems that will be relocated and that will be temporarily out of service
 - iii) Indicate how long services and systems will be disrupted
 - f. Structural elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure
 - g. Approval by Engineer:
 - i) Obtain approval of cutting and patching proposal before cutting and patching
 - ii) Approval does not waive right to later require removal and replacement of unsatisfactory work

D. Quality Assurance

1. Structural work requirements: Do not cut and patch structural elements in a manner that would reduce their load-carrying or load-deflection ratio
 - a. Obtain Engineer approval of cutting and patching proposal before cutting and patching the following structural elements:
 - i) Bearing and retaining walls, foundation construction, and structural concrete and structural steel
 - ii) Lintels
 - iii) Timber and primary wood framing
 - iv) Structural decking and stair systems
 - v) Equipment supports, piping, ductwork, vessels, and equipment
 - vi) Miscellaneous structural metals
2. Operational limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance or decreased operational life or safety
 - a. Obtain Engineer approval of cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - i) Primary operational systems and equipment
 - ii) Air, smoke, water, moisture, or vapor barriers
 - iii) Membrane and flashings
 - iv) Fire protection, control, communication, or electrical wiring systems
 - v) Noise and vibration control elements and systems

3. Visual requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching
 - a. Retain the original installer or fabricator throughout construction phases to cut and patch the following categories of exposed work, if possible, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
 - i) Concrete finishes
 - ii) Pre-formed metal panels
 - iii) Painting
 - iv) Wall covering
 - v) HVAC enclosures, cabinets, or covers
 - vi) Firestopping

E. Warranty

1. For existing warranties, Contractor shall replace, patch, and repair material and/or surfaces cut and/or damaged by methods and with materials in order to not void any warranties required or existing

PART 2 PRODUCTS

A. Materials

1. Use materials identical to existing materials unless not available
 - a. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials matching existing adjacent surfaces to the fullest extent possible with regard to visual effect
 - b. Before proceeding, Contractor shall obtain approval of the Engineer
 - c. Use materials whose installed performance will equal or surpass that of existing materials

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered
- B. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
- C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions

3.2 PREPARATION

- A. Provide devices and methods to protect other portions of the Project from damage

- B. Provide temporary support of Work to be cut where required
- C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
 - 1. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas
- E. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them
- F. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
- G. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay
- B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition
 - 1. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations
 - a. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use
 - b. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces
 - c. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill
 - d. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting
 - e. Provide fire-safe seals to maintain fire rating at all penetrations
 - 2. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances

- a. Where feasible, inspect and test patched areas to demonstrate integrity of the installation
 - b. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing
 - c. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance
 - d. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat
 - e. Patch, repair or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance
 - f. Replace concrete walkways to nearest construction joint
3. Plaster Installation: Comply with manufacturer's instructions and install thickness and coats as indicated

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements governing Contractor's selection of products for use in Project and for Work including, but not limited to, the following
 - 1. Definitions
 - 2. General Requirements for Materials and Equipment
 - 3. Environmental Conditions
 - 4. Submittals
 - 5. Quality Assurance and Qualifications
 - 6. System Responsibility
 - 7. Transportation and Shipment
 - 8. Delivery, Storage and Handling
 - 9. Maintenance Materials
 - 10. Warranty
 - 11. Product Selection
 - 12. Equipment Identification
 - 13. Preparation and Installation
 - 14. Examination, Installation, Adjusting and Cleaning

1.2 RELATED SECTIONS

- A. Section 00315 – Pre-Purchased Equipment
- B. Section 01010 – Summary of Work
- C. Section 01340 – Shop Drawings, Product Data, and Samples
- D. Section 01400 – Quality Control
- E. Section 01650 – Starting of Systems
- F. Section 01730 – Operation and Maintenance Data
- G. Section 03300 – Concrete
- H. Division 11
- I. Division 15

1.3 REFERENCES

- A. Anti Friction Bearing Manufacturers Association – AFBMA

1. Std 9-90-Load Ratings and Fatigue Life for Ball Bearings
2. Std 11-90-Load Ratings and Fatigue Life for Roller Bearings

B. American Gear Manufacturer Association – AGMA

C. American National Standards Institute – ANSI

1. B1.1-89-Unified Screw Threads
2. B 1.20. 1-83-Pipe Threads, General Purpose (Inch)
3. B16.1-89-Cast Iron Pipe Flanges and Flanged Fittings, Class 125
4. B18.2.1-81-Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Log Screws
5. B18.2.2-87-Square and Hex Nuts

D. Hazardous (Classified) Locations: Conform to requirements of NFPA70 Articles 500 through 504

1.4 DEFINITIONS

- A. Definitions used in this specification section are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finished,” “accessories,” and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
- B. Products: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term “product” includes the terms “material”, “equipment”, “system”, and terms of similar intent
- C. Named products: Items identified by manufacturer’s product name, including make or model number or other designation, shown or listed in the manufacturer’s published product literature that is current as of date of Contract Documents
- D. Foreign products: Distinguished from “domestic products” are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens or, nor living within, the United States and its possessions are also considered to be foreign products
- E. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work
- F. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping
- G. Special tools, instruments, devices, or accessories: Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question or which are not normally kept in stock by local tool suppliers
- H. Responsible manufacturer: Unless otherwise specified, responsible manufacturer shall be

manufacturer of driven equipment. Agents, representatives or other entities who are not a direct component of manufacturing corporation will not be acceptable as a substitute for manufacturer's corporation in meeting this requirement

1.5 GENERAL REQUIREMENTS

- A. The section applies to all equipment provided under this contract
- B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict
- C. Provide all new Equipment and Materials, except as specified or required by testing
- D. Equipment and Materials removed from existing structure: Do not use in completed Work except where specifically indicated or specified
- E. Contractor to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components
- F. Contractor is responsible for all alterations in the Work to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or specifications:
 - 1. The arrangement of equipment shown on the Drawings is based upon information available to the Owner at the time of the design and is not intended to show exact dimensions unique to a specific manufacturer
 - 2. More than one manufacturer has been used for mechanical layout and design to accommodate all named manufacturer's
 - 3. The drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements as provided by the Contractor
 - 4. Structural supports, foundations, connected piping, valves and electrical conduit specified may have to be altered as coordinated by the Contractor during the submittal process to accommodate the actual equipment provided by the Contractor
 - 5. No additional payment will be made to the Contractor for such revisions and alterations
- G. Do not use any material or equipment for any purpose other than that for which is designed or specified
- H. Equipment lists presented in these specifications and as specified on the drawings are included for the convenience of the Engineer and Contractor and are not to be considered as complete listings of all equipment, devices and material to be provided under this contract:
 - 1. Contractor prepare his own material and equipment take-off lists as necessary from the contract drawings, addenda and this project manual to meet the requirements of this project

1.6 ENVIRONMENTAL CONDITIONS

- A. Project is an industrial water treatment facility where dilute concentrations of corrosive or explosive chemicals, gasses, fuels, and others may be expected to be present
- B. Various corrosive or explosive mixtures of liquids including; solvents, grease, gasoline and other hazardous materials may be present
- C. Minimum Design Criteria:
 - 1. Altitude: 4,900 feet above mean sea level
 - 2. Outdoor air temperature: 0 to 105 degrees F
 - 3. Average Relative Humidity:
 - a. Summer time: 30 percent
 - b. Winter time: 70 percent
 - 4. Design Roof Snow Loading: Minimum of 30 psf
 - 5. Wind speed: 90 mph ASD (120 mph ultimate)
 - 6. Wind load: 13 psf
 - 7. Seismic Design Category: Category B

1.7 SUBMITTALS

- A. Provide submittals in accordance with Section 01340
- B. Submittals for products are specified in Section 01340 and in Divisions 2 through 16
- C. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility
- D. Provide a copy of this specification section with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements.
- E. Provide Certificate of System Responsibility
- F. Tanks, ventilation duct and other equipment mounted outdoors with anchorage and mounting product data for reference purposes:
 - 1. Include wind loads
 - 2. Include snow loads
- G. Manufacturer's certified data showing location of critical speeds in relation to operating speeds
- H. Inverter duty motors: Include motor manufacturer's certification that motor is compatible with variable frequency controllers to be used with motor as specified in Section 16472

1.8 QUALITY ASSURANCE AND QUALIFICATIONS

- A. Source limitations and interchangeability: To the fullest extent possible, provide products of the same kind from a single source
- B. Compatibility of options: When Contractor is given the option of selection between two or more products for use on Project, product selected shall be compatible with produces previously selected, even if previously selected products were also options
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplate or trademarks on exposed surface of products that will be exposed to view in occupied spaces or on the exterior
 - 1. Labels: Locate required product labels and stamps on concealed surfaces, or where required for observation after installation, on inconspicuous, accessible surfaces.
 - 2. Equipment nameplates: Provide a permanent nameplate on each item of service – connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. Nameplate shall contain, but not limited to, the following information and other essential operating data:
 - a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings
 - f. Operating and power characteristics
 - g. Labels of tested compliance with codes and standards
 - 3. Refer to additional requirements specified in Divisions 2 through 16
- D. Electronic equipment
 - 1. Contractor warrants that all equipment, devices, items, systems, software, hardware, and firmware provided shall be electronically compliant, meaning that they shall properly, appropriately, and consistently function and accurately process date and time data including without limitation: calculating, comparing, and sequencing. This warranty supersedes anything in the Specifications or other Contract Documents which might be construed inconsistently
 - 2. Warranty is applicable whether the equipment, device, item, system, software, hardware, or firmware is specified with or without reference to a manufacturer's name, make, or model number
- E. Installers Qualifications:
 - 1. Equipment and material: Installed and placed in service by or under guidance of qualified personnel having knowledge and experience necessary for proper results
 - 2. Where Contractor's or subcontractor's employees are not properly qualified, use personnel such as factory authorized field representative of equipment supplier

1.9 SYSTEM RESPONSIBILITY

- A. Equipment systems made up of two or more components shall be provided as a single system by the responsible manufacturer. Unless otherwise specified, the Contractor shall assign system responsibility to, and obtain each system from the manufacturer of the driven equipment. The manufacturer shall design and provide all components of the

system to enhance proper operation, compatibility of all components, ease of construction and efficient maintenance. The responsible manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the performance requirements specified. The Contractor is responsible to the Owner for performance of all systems as provided in the General Conditions and Special Provisions.

- B. Nothing in this provision shall be construed as relieving the Contractor of overall responsibility for the Work of this Contract and the performance of all systems as required under General Condition Article 16

1.10 TRANSPORTATION AND SHIPMENT

- A. Shipment preparation: Contractor shall require manufacturers and suppliers to prepare Equipment and Materials for shipment in a manner to facilitate unloading and handling, and to protect against damage or unnecessary exposure in transit and storage, for contractor supplied equipment. Provisions for protection shall include the following:
 - 1. Crates or other suitable packaging materials
 - 2. Covers and other means to prevent corrosion, moisture damage, mechanical, injury, and accumulation of dirt in motors, electrical equipment, and machinery
 - 3. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel
 - 4. Grease packing or oil lubrication in all bearings and similar items
- B. Marking
 - 1. Each item of Equipment and Material shall be tagged or marked as identified in the delivery schedule or on Submittals
 - 2. Complete packing lists and bills of material shall be included with each shipment.
 - 3. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Delivery
 - 1. Arrange deliveries of Equipment and Materials in accordance with construction schedules, in ample time to facilitate inspection prior to installation and to avoid delay of Work. Coordinate to avoid conflict with work and conditions at the site
 - 2. Deliver products in undamaged condition, in manufacturer's sealed or covered, weather tight, original container or packaging, with identifying labels intact and legible, all in accordance with manufacturer's instructions and recommendations using means and methods that will prevent damage, deterioration, and loss, including theft
 - 3. Control delivery schedules to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss

4. Products delivered to Work site shall be in undamaged condition, in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing
5. Mark deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units
6. Immediately on delivery, inspect shipment to ensure:
 - a. Product complies with requirements of Contract Documents and reviewed Submittals
 - b. Quantities are correct
 - c. Containers and packages are intact and labels are legible
 - d. Equipment and Materials are properly protected and undamaged
7. Include complete packing lists and bills of material with each shipment including Equipment Identification number assigned by Drawings and Specifications of this Contract
8. Deliver anchor bolts together with templates sufficiently early to permit setting when structural concrete is placed

B. Storage

1. There is no interior space available from the Owner for storage of delivered equipment and material at the project site:
 - a. Provide adequate facilities for storage in accordance with Section 01500
 - b. Provide off-site storage and protection when site does not permit on-site storage or protection and if acceptable to Owner in accordance with the General Conditions
2. Submit and maintain insurance for Equipment and Materials at off-site storage
3. Requests for payment of stored Equipment and Materials by the Contractor may be rejected if storage facilities do not conform to these specifications or manufacturer's written recommendations.
4. Store Equipment and Materials immediately on delivery, and protect until completion of the Work. Store in accordance with manufacturer's instructions with seals and labels intact and legible
5. Store Equipment and Materials in a manner that will not endanger the supporting construction
6. Store Equipment and Materials that are subject to damage by elements in weathertight enclosures
7. Maintain temperature and humidity within ranges required by manufacturer
8. Protect motors, electrical equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter
9. Protect electrical equipment, controls, and insulation against moisture, water, and dust damage
10. Immediately after delivery and inspection, connect and operate continuously all space heaters furnished in electrical equipment
11. Protect exposed-machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds
12. Protect bearings and similar items with grease packing or oil lubrication

13. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation
14. Exterior storage:
 - a. Provide substantial platforms, blocking, or skids to support fabricated products aboveground and to prevent soiling or staining. Cover products subject to discoloration or deterioration from exposure to elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation
 - b. Store loose granular materials on solid surface areas to prevent mixing with foreign matter
 - c. Provide surface drainage to prevent flow or ponding of rainwater
15. Equipment and Materials shall not show any pitting, rust, decay or other deleterious effects of storage prior to final acceptance of Work
16. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure products are maintained under specified conditions and free from damage or deterioration
 - a. Prepare stored materials lists with schedules of maintenance activities and frequency of activities required to maintain the quality of the equipment and the warranty from the manufacturer
 - b. List dates and activities of storage requirements such as rotating moveable parts
 - c. Update lists weekly and include in progress meeting agenda
17. Protect painted surfaces against impact, abrasion, discoloration or other damage:
 - a. Repaint any damaged areas with manufacturer provided touch-up paint
18. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation
19. Installed products stored prior to start-up:
 - a. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage when installed in the Work
 - b. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations, dust, dirt, water and paint. Remove when no longer needed.

C. Handling

1. Provide equipment and personnel necessary to unload and handle Equipment and Materials, by methods to prevent damage or soiling to Equipment and Materials or packaging
2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points
3. Provide additional protection to surrounding surfaces as necessary to prevent damage

D. Maintenance of storage

1. Inspect stored Equipment and Materials on a scheduled basis
2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained
3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents

4. For mechanical and electrical equipment in long-term storage, provide manufacturers service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service Equipment on a regularly scheduled basis.

E. Protection after installation

1. Provide substantial coverings as necessary to protect installed Equipment and Materials from damage from subsequent construction operations.
2. Remove when no longer needed or as specified

1.12 MAINTENANCE MATERIALS

A. Spare Parts:

1. Store spare parts, wherever required by detailed technical specification sections, in accordance with the provisions of this paragraph
2. Tag all spare parts with permanent, labeled packings by equipment designation number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate)
3. Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping
4. Unless otherwise specified, spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box:
 - a. Provide box with a hinged wooden cover and locking hasp
 - b. Hinges to be strap type
 - c. Paint the box and identify with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts"
5. Prepare and provide a neatly typed inventory of spare parts taped to the underside of the box cover

1.13 WARRANTY

- A. Warranty all Equipment and Materials against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure
- B. Unless otherwise specified, for all Equipment and Materials provide manufacturer's warranty for a period of 1 year from the date of Substantial Completion
- C. Warranties that begin at the time of shipment, delivery or within a limited time period from date of shipment or delivery or any other qualification that does not conform to the definition of Substantial Completion are not acceptable
- D. Cost of all manufacturer warranties are considered as part of the Bid price

PART 2 PRODUCTS

2.1 MATERIALS

- A. Suitable for the intended service conditions
- B. Structural and miscellaneous fabricated steel in equipment shall conform to AISC standards, except as otherwise specified

2.2 FABRICATION

- A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices
- B. Manufacture parts to standard sizes and gages
- C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable

2.3 EQUIPMENT AND PRODUCT SELECTION

- A. General product requirements: Provide products that comply with the Contract Document, are undamaged, and unless otherwise indicated or specified, are new at time of installation
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect
 2. Standard products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects
 3. Continued availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced product for which the manufacturer has published assurances that the product and its parts shall be available to the Owner at a later date. A reasonable doubt regarding such future availability will be grounds for rejection of products other than named products
 4. As specified in each applicable Specification Sections, Drawings, codes, standards, and regulatory agencies
 5. Manufactured and fabricated products:
 - a. Design, fabricate, and assemble products in accordance with best engineering and shop practices
 - b. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identically made by the same manufacturer
 - c. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing by Owner
 - d. Ensure that material or equipment are not used for any purpose other than that for which it is designed or is specified
 - e. Labels and nameplates shall be provided where required by regulatory agencies or in accordance to state identification and essential operation data
 6. Do not use products for any purpose other than that for which designed
 7. Provide products of the same kind from a single source to the fullest extent possible

2.4 EQUIPMENT AND PRODUCT IDENTIFICATION

- A. Nametags: Identify all valves, instruments, devices, with the equipment tag designation numbers and prefix and suffix letters per City requirements. Identification shall also be in accordance with Section 01080.
- B. Nameplates: Identify all pumps and equipment with the equipment tag designation numbers and prefix and suffix letters as specified:
 - 1. Provide engraved or machine stamped non-corrosive metal nameplate fastened to the pump or equipment base plate with screws or drive pins of the same material
 - 2. Nameplate material shall not corrode or discolor in moist or salt water spray atmosphere
 - 3. Name plates indicate the following:
 - a. Manufacturer
 - b. Date of manufacture
 - c. Name of product
 - d. Model and size
 - e. Serial Number
 - f. Capacity: Rating in gpm or SCFM (if a fan or blower) and feet of head or inches water column
 - g. Impeller or wheel diameter (if a fan)
 - h. Impeller diameter
 - i. Operating and power characteristics
 - j. As specified herein and in Divisions 2 through 16
 - 4. Motor Nameplates:
 - a. All motors for pumps and other equipment having motors shall be identified as specified elsewhere under this Section and in Divisions 2 through 16

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install all equipment, accessories and materials in accordance with the manufacturer's written recommendations unless otherwise specified in the individual equipment detailed technical specifications
- B. Each product shall be securely anchored in place except as required for proper movement and performance
- C. Each product shall be located and aligned with other Work
- D. Manufacturer's Instructions

1. Contractor shall obtain and distribute hard copies and electronic copies of manufacturer's instructions and recommendations to parties involved in installation including a copy to Engineer
2. Maintain one (1) set of complete instructions at job site during installation and until completion
3. Handle, install, connect, clean, condition, and adjust products in accordance with such instructions and in conformity with specified requirements

3.3 ADJUSTING

- A. Perform all required adjustment tests, operation checks, and other startup activities required

3.4 CLEANING

- A. Perform under provisions of Section 01700
- B. Repaint all painted surfaces which are damaged prior to final equipment acceptance to Owner's satisfaction
- C. Clean exposed surfaces and protect as necessary and required to prevent any damage or deterioration at the time of Substantial Completion

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Starting systems
- B. Demonstration, instructions, and training
- C. Testing, adjusting, and balancing

1.2 RELATED SECTIONS

- A. Section 01730 - Operation and Maintenance Data

1.3 STARTING SYSTEMS

- A. Provide Engineer with start-up and training schedule at least 14 days prior to the startup of the equipment
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage
- C. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer
- D. Verify wiring and support components for the equipment are complete and tested
- E. Execute start-up under supervision of responsible manufacturer's representative in accordance with manufacturers' instructions
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and supervise placing equipment or system in operation
- G. Submit a written report certifying that equipment or system has been properly installed and is functioning correctly

1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel within 7 days prior to date of Substantial Completion
- B. Utilize Operation and Maintenance Manuals as basis for instruction. Review contents of

manual with Owner's personnel in detail to explain all aspects of operation, maintenance, and troubleshooting

- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location
- D. Prepare and insert additional data in Operations and Maintenance Manuals when need for additional data becomes apparent during instruction
- E. The amount of time required for instruction on each item of equipment and system is that specified in individual sections
- F. Owner may videotape training sessions. Contractor and manufacturer's trainer to cooperate with videotaping

1.5 TESTING, ADJUSTING, AND BALANCING

- A. Contractor will employ and pay for services of an independent firm to perform testing, adjusting, and balancing as required by individual specification sections or on the Drawings
- B. Reports will be submitted by an independent firm to the Engineer, through the Contractor, indicating observations and results of tests and indicating compliance or non-compliance with specified or regulatory requirements and with the requirements of the contract

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Substantial completion
- B. Final acceptance
- C. Project record documents
- D. Closeout procedures
- E. Final cleaning
- F. Final adjustment of accounts
- G. Final application for payment

1.2 RELATED SECTIONS

- A. Section 00700 – General Conditions
- B. Section 01500 – Construction Facilities and Temporary Controls
- C. Section 01340 – Shop Drawings and Product Data

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Prior to requesting inspection for certification of Substantial Completion, complete the following and list exceptions in the request:
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price
 - b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete. All items remaining outstanding on the Contractor's punch list shall include a projected date of completion and/or correction with an explanation of why such item is not presently completed
 - 2. Advise Owner of pending insurance changeover requirements
 - 3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents

4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases
 5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information
 6. Deliver tools, spare parts, extra stock, and similar items
 7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions
 8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued
1. Engineering will repeat inspection when requested and assured by Contractor that the Work is Substantially Complete.
 2. Results of the completed inspection will form the basis of requirements for final acceptance

1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required
 2. Submit an updated final statement, accounting for final additional changes to the Contract Price
 3. Submit a certified copy of Engineer's final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
 4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work
 5. Submit consent of surety to final payment
 6. Submit evidence of final, continuing insurance coverage complying with insurance requirements
- B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.
1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that

- is incomplete or of obligations that have not been fulfilled but are required for final acceptance
2. If necessary, reinspection will be repeated, but at the expense of the Contractor who will reimburse the Owner for these services by the Engineer

1.5 PROJECT RECORD DOCUMENTS

A. General

1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
2. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - a. Contract Drawings
 - b. Specifications
 - c. Addenda
 - d. Change Orders and other Modifications to the Contract
 - e. Reviewed shop drawings, product data, and samples
 - f. Field test reports
 - g. Construction photographs
3. Store Record Documents and samples separate from documents used for construction
 - a. Provide files and racks for storage of documents
 - b. Provide locked cabinet or secure storage space for samples

B. Record Drawings

1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings
2. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown
3. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings
4. Give particular attention to concealed elements that would be difficult to measure and record at a later date
 - a. Record information concurrently with construction progress
 - b. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "Project Record" in neat, large, printed letters.
 - c. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings
 - d. Note related Change Order numbers where applicable
 - e. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 - f. Upon completion of the Work, submit record drawings to Engineer for Owner's records
5. Contract Drawings and approved Shop Drawings: Legibly mark each item to record actual construction, including:

- a. Measured depths of elements of foundation in relation to finish grade or first floor datum
 - b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvement
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - d. Field changes of dimensions and details
 - e. Changes made by Addenda or Change Order(s), if any
 - f. Details not on original Contract Drawings
 - g. References to related Shop Drawings and Modifications
- C. Record Specifications: Maintain one complete copy of the Project Manual including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction
1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related record drawing information and product data
 4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records
- D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
1. Mark record documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation
 3. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records
 4. Legibly mark and record at each Product section description of actual Products installed, including the following:
 - a. Manufacturer's name, product model, number, trade name and supplies
 - b. Product substitutions or alternates utilized
 - c. Changes made by Addenda, field order or change order
- E. Record Samples Submitted: Immediately prior to Substantial Completion, Contractor shall meet with Engineer and Owner's personnel at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with Owner's instructions regarding packaging, identification, and delivery to Owner.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly

and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records.

1. For electrical refer to Section 16900
- G. Maintenance Manuals: Contractor shall organize operation and maintenance data as specified in Section 01730
- H. Submit documents to Engineer with claim for final Application for Payment
- I. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- J. Make documents and samples available at all times for inspection by Engineer
- K. Label each document "Project Record" in neat, large printed letters

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. General
 1. Comply with requirements stated in the Owner's General Conditions of the Contract and in these specifications for administrative procedures in closing out the Work
 2. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection
 3. Provide submittals to Engineer/Owner that are required by governing or other authorities
 4. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due
- B. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
 1. Maintenance manuals
 2. Record documents
 3. Spare parts, materials and tools
 4. Lubricants and fuels
 5. Identification systems
 6. Control sequences
 7. Hazards, hazardous chemicals data sheets
 8. Cleaning
 9. Warranties and bonds

10. Maintenance agreements and similar continuing commitments

- C. As part of instruction for operating Equipment, demonstrate the following procedures:
 - 1. Startup
 - 2. Shutdown
 - 3. Emergency operations
 - 4. Noise and vibration adjustments
 - 5. Safety procedures
 - 6. Economy and efficiency adjustments
 - 7. Effective energy utilization

3.2 FINAL CLEANING

- A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
 - 1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion
 - a. Remove labels that are not permanent labels
 - b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
 - c. Wipe surfaces of mechanical and electrical Equipment. Remove excess lubrication and other substances.
 - 2. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction
 - 3. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.
 - a. Extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner.

3.3 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Evidence of Payment and Release of Liens: As specified in the General Conditions
- B. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval
- C. At Contract close-out, deliver Record Documents to Engineer for the Owner
- D. Accompany Submittal with Transmittal Letter in Duplicate, Containing
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document

5. Signature of Contractor or his authorized representative

3.4 FINAL ADJUSTMENTS OF ACCOUNTS

- A. Submit a Final Statement of Accounting to Engineer
- B. Statement Shall Reflect All Adjustments to the Contract Sum
 - 1. The original Contract Sum
 - 2. Additions and deductions resulting from
 - a. Previous Change Orders
 - b. Deductions for uncorrected Work
 - c. Deductions for liquidated damages
 - d. Deductions for reinspection payments
 - e. Other adjustments
 - 3. Total Contract Sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due

3.5 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions of the Contract

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals
- B. Format
- C. Content of each volume
- D. Manual for equipment and systems
- E. Instruction of Owner's personnel

1.2 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel
 1. Trained and experienced in maintenance and operation of the described products
 2. Completely familiar with requirements of this section
 3. Skilled as a technical writer to the extent required to communicate essential data
 4. Skilled as a draftsman competent to prepare required drawings
- B. Manuals for equipment systems shall be prepared by the equipment manufacturer or system supplier
- C. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract
- D. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications

1.3 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Manuals for equipment and systems
 1. Submit 3 preliminary copies prior to the date of shipment of the equipment or system
 - a. Engineer will review
 - b. If acceptable, 1 copy will be returned to Contractor, 1 copy sent Owner, and 1 copy retained in Engineer's file

- c. If unacceptable, 2 copies will be returned to Contractor with Engineer's comments for revision and 1 copy retained in Engineer's file. Resubmit 3 revised preliminary copies for Engineer's review
 - d. No partial payments will be made for equipment and systems on hand or installed until preliminary manuals are submitted and acceptable
 - e. See Section 01340 for electronic submittal requirements. For the preliminary copy of the O&M manual an electronic submittal is allowable.
2. Submit 3 final copies no less than 30 days prior to putting the equipment or system in service. If final manuals differ from accepted preliminary manuals, submit 2 copies of any necessary supplemental material with instructions for insertion for conforming Engineer's and Owner's copies of preliminary manuals to final manuals.
- a. Engineer will compare with accepted preliminary manual
 - b. If identical or otherwise acceptable, Contractor will be so notified. Two copies will be transmitted to Contractor, 3 copies will be held for later transmittal to Owner
 - c. If not acceptable, 4 copies will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor at Engineer's option
 - d. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Engineer
 - e. Submit 3 copies of any revisions found desirable during instruction of Owner's personnel with instructions for insertion for revising Owner's and Engineer's copies of manual

C. Manuals for materials and finishes

- 1. Submit 2 preliminary copies 15 days prior to request for final inspection
 - a. Engineer will review
 - b. One copy will be returned to Contractor with comments, 1 retained in Engineer's file
 - c. No final inspection shall be conducted until preliminary manuals are submitted
- 2. Submit 3 final copies, revised in accordance with Engineer's comments, within 10 days after final inspection
 - a. One copy will be transmitted to Contractor and 2 copies retained by Engineer for later transmittal to Owner
 - b. No final payment shall be made until final manuals are submitted
- 3. Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

1.4 FORMAT

- A. Prepare data in the form of an instructional manual for use by Owner's personnel
- B. Presentation of Information
 - 1. Size: 8 ½" by 11"
 - 2. Paper: 20 lb weight minimum, white, for typed pages
 - 3. Text: Manufacturer's printed data or neatly typewritten

4. Drawings
 - a. Provide reinforced punched binder tab, bind in with text
 - b. Reduced to 11" by 17" and folded to 8 ½" by 11"
 - c. Where reduction is impractical, folded and placed in 8 ½" by 11" envelopes bound in text
 - d. Suitably identified on drawings and envelopes
5. Provide flysheets for each separate product or each piece of operating equipment
 - a. Provide typed description of product and major component parts of equipment
 - b. Provide indexed tabs, may be in color
6. Spine and cover: identify each volume with typed or printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" preceded by the word "PRELIMINARY" or "FINAL" as applicable. Final manuals to list information on the cover and the spine. List the following:
 - a. Title of project, reference Owner and project location as applicable
 - b. Identity of separate structure as applicable
 - c. Identity of general subject matter covered in manual and specification section number
7. As much as possible, assemble and bind material in the same order as specified

C. Binders

1. Preliminary manuals: Commercial quality permanent 3-ring or 3 post binders with durable, cleanable, hard plastic covers. GBC bound manual may be accepted upon review by Engineer
2. Final manuals: Commercial quality permanent 3-ring or 3 post binders with durable, cleanable, hard plastic covers with clear plastic cover and spine pockets suitable for title and cover inserts. Manufacturer's pre-printed binder may be accepted upon review by Engineer. "Deluxe Round Ring View Binder" as manufactured by Wilson Jones or accepted substitution
3. Final electronic manual: Provide one copy in digital format, all documents to be in native file format (Word, Excel, AutoCAD, pdf) or converted from native file format into Adobe pdf. Provide one copy on an electronic disk, CD or DVD.

D. Arrange content by systems under section numbers and sequence of table of contents of this Project Manual

E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment

F. Electronic Manual: Compile in an electronic book format with Chapter bookmarks (equal to tabbed fly leafs) and OCR (optical character recognition) to allow for document searches.

1.5 CONTENTS OF EACH VOLUME

- A. Neatly typewritten table of contents for each volume, arranged in a systematic order
 1. Contractor, name of responsible principal, address and telephone number

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

B. Product Data

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

C. Drawings

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

D. Written text, as required to supplement product data for the particular installation

1. Organize in a consistent format under separate headings for different procedures
2. Provide a logical sequence of instructions for each procedures

E. Copy of each warranty, bond and service contract issued

1. Provide information sheet for Owner's personnel, give
 - a. Proper procedures in the event of fracture
 - b. Instances which might affect the validity of warranties or bonds

1.6 MANUALS FOR EQUIPMENT AND SYSTEMS

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

B. Content for each of equipment and system as appropriate

1. Description of unit and component parts
 - a. Function, normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and tests
 - c. Complete nomenclature and commercial number of all replaceable parts
2. Operating procedures
 - a. Startup, break-in, routine and normal operating instructions
 - b. Regulation, control, stopping, shutdown and emergency instructions

- c. Summer and winter operating instructions, as applicable
 - d. Special operating instructions
 - 3. Maintenance procedures
 - a. Routine operations
 - b. Guide to "trouble-shooting"
 - c. Disassembly, repair and reassembly
 - d. Alignment, adjusting and checking
 - 4. Servicing and lubrication schedule
 - a. List of lubricants required
 - 5. Manufacturer's printed operating and maintenance instructions
 - 6. Description of sequence of operation by control manufacturer
 - 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance
 - a. Predicted life of parts subject to wear
 - b. Items recommended to be stocked as spare parts
 - 8. As-installed control diagrams by controls manufacturer
 - 9. Each contractor's coordination drawings
 - a. As-installed color coded piping diagrams
 - 10. Charts of valve tag numbers with the location and function of each valve
 - 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
 - 12. Other data as required under pertinent sections of specifications
- C. Content for each electric and electronic item or system, as appropriate
- 1. Description of system and component parts
 - a. Function, normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and tests
 - c. Complete nomenclature and commercial number of replaceable parts
 - 2. Circuit directories of panelboards
 - a. Electrical service
 - b. Controls
 - c. Communications
 - 3. As-installed color coded wiring diagrams
 - 4. Operating procedures
 - a. Routine and normal operating instructions
 - b. Sequences required
 - c. Special operating instructions
 - 5. Maintenance procedures
 - a. Routine operations
 - b. Guide to "trouble-shooting"
 - c. Adjustment and checking
 - 6. Manufacturer's printed operating and maintenance instructions
 - 7. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
 - 8. Other data as required under pertinent sections of specifications

- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel
- E. Additional requirements for Operation and Maintenance Data: The respective sections of specifications

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and system
- B. Operation and maintenance manual constitutes the basis of instruction
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance

1.8 Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

- A. Equipment and systems Operation and Maintenance manuals shall be prepared for each of the following:

<u>Specification Section</u>	<u>Type of Equipment or System</u>
00315	Pre-purchased Equipment
Division 15	Mechanical
Division 16	Electrical

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes basic electrical requirements for materials and methods applicable to electrical equipment specified under this section and other related sections.
 - 1. Conduit
 - 2. Boxes
 - 3. Wire and Cable
 - 4. Wiring Devices and Device Plates
 - 5. Maintenance Materials
 - 6. Grounding Materials
 - 7. Luminaries
 - 8. Power Panels

- B. Related Sections:
 - 1. Section 01340 – Shop Drawings and Product Data
 - 2. Section 01500 – Construction Facilities and Temporary Controls
 - 3. Section 01600 – Materials and Equipment
 - 4. Section 01730 – Operation & Maintenance Data
 - 5. Section 02300 – Earthwork
 - 6. Section 09900 – Coatings

1.2 REFERENCES

- A. UL – All applicable standards
- B. IEEE – All applicable standards
- C. IPCEA – All applicable standards
- D. NEMA – All applicable standards
- E. ANSI/NFPA 70 – National Electrical Code
- F. ANSI C2 – National Electrical Safety Code
- G. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies
- H. ANSI/NEMA OS 1 – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- I. ANSI/NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

J. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

1.3 SUBMITTALS

- A. Information covering all material that is to be used on this project shall be submitted.
- B. Each sheet of descriptive literature shall be clearly marked to identify the material or equipment for which it pertains.
- C. Equipment on submitted sheets that is not for this project shall be crossed out.
- D. As a minimum the following information shall be submitted:
 - 1. Lamp fixture descriptive sheets identified by the fixture schedule letter
 - 2. Equipment sheets shall identify what the equipment refers to by calling out the name of the equipment on the sheet.
 - 3. Schematics and connection diagrams for all electrical equipment shall be submitted.
 - 4. Submit all types of conduit and cables with manufacturer and sizes as well as all appurtenances.

1.4 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be designed, coordinated, and supplied by a qualified Electrical Contractor who is regularly engaged in the business of building electrical systems for water and wastewater projects. The Electrical Contractor shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.
- B. Coordination
 - 1. The electrical equipment shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
 - 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
 - 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.
 - 4. All service entrance work shall be in accordance with the local utility standards.
 - 5. The electrical contractor shall coordinate all service entrance work with the local utility.
 - 6. The electrical contractor shall NOT pay for the utility's work. That shall be billed directly to the owner.
 - 7. Accurately record actual locations of conduit, duct banks, panels, and accessories.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Electrical: Conform to latest version of NFPA 70.
- C. Coordinate, obtain and pay for all permits, inspections and approvals of authority having jurisdiction.
- D. Comply with local electrical codes in force or in the absence of local electrical code, the latest edition of the National Electrical Code, ANSI C1.

1.6 WARRANTY

- A. The electrical contractor shall warrant the supplied equipment and labor for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. The work for this project is at a functioning wastewater treatment plant. All new work shall be done in a way that allows the existing plant to maintain its operation.
- B. All equipment furnished under this Section shall be selected by the Contractor for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Conduit
 - a. Minimum Size: $\frac{3}{4}$ inch unless otherwise specified, or $\frac{1}{2}$ inch for luminaries pendants.
 - b. Underground Installations:
 - i) Over 100V: More than five feet from foundation wall: Use thick wall nonmetallic conduit.
 - ii) Within five feet from foundation wall: Use rigid steel conduit
 - iii) Under 100V: Use rigid steel conduit
 - iv) Minimum size: 1 inch.
 - c. Outdoor Locations, Above Grade: Use PVC-Coated rigid steel conduit.
 - i) This shall include all conduits in the UV area.
 - d. In chemical rooms: Use PVC-Coated rigid steel conduit.
 - e. In Slab Above Grade:
 - i) Use rigid steel conduit for circuits that are 24V or less.
 - ii) Use rigid thick wall non-metallic conduit for 120V to 480V circuits.
 - iii) Maximum Size Conduit in Slab: 2 inch, 1 inch for conduits that cross over each other, or with structural engineer's approval.
 - iv) Conduits shall not be spaced closer than 3 conduit widths on center.
 - v) Aluminum conduit shall not be embedded in concrete.

- vi) Conduits shall not pass through a structural concrete beam without the structural engineer's approval.
- f. In or under slab on grade:
 - i) Use rigid steel conduit for circuits that are 24V or less.
 - ii) Use rigid thick wall non-metallic conduit.
- g. Wet and damp locations: Use rigid steel conduit or aluminum conduit.
- h. Dry locations:
 - i) Concealed: In walls or above ceilings, use rigid steel or aluminum conduit.
 - ii) Exposed: Use rigid steel conduit or aluminum conduit.
- i. Rigid Steel Conduit.
 - i) Rigid steel conduit shall be heavy wall, hot-dipped galvanized, and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
- j. Rigid Nonmetallic Conduit (PVC).
 - i) PVC conduit shall be heavy wall, schedule 40, shall be UL labeled for aboveground and underground uses.
- k. PVC-Coated Rigid Steel Conduit.
 - i) The conduit shall be rigid steel and before the PVC coating is applied, the hot-dipped galvanized surfaces shall be coated with a primer to ensure a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit at a thickness of at least 40 mils. A two part urethane chemically cured coating shall be applied at a nominal 2 mil thickness to the interior of all conduit and fittings.
 - ii) Manufacturers: Ocal, PermaCote, or Robroy Industries.
- l. Rigid Aluminum Conduit.
 - i) Rigid aluminum conduit shall be heavy wall and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
- m. Flexible connections
 - i) Conduit: Moisture proof vinyl jacketed, liquid-tight, hot-dipped galvanized flexible steel and shall be UL labeled.
 - ii) Connectors: Watertight, Appleton Type ST or STB, Crouse-Hinds Type LT or LTC, or equal.
- 2. Outlet Boxes
 - a. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, Galvanized.
 - i) Luminaries and equipment supporting boxes: rated for weight of equipment supported.
 - ii) Concealed installations.
 - b. Nonmetallic outlet boxes: ANSI/NEMA OS 2.
 - c. Cast Boxes: NEMA FB 1, Type FD, Cast Ferroalloy.
 - i) Provide gasketed cover by box manufacturer.
 - ii) Provide threaded hubs.
 - iii) Models VXF, GRFX as manufactured by Crouse-Hinds.
 - iv) Models SEH, JBDX, with mounting lugs as manufactured by Appleton.
- 3. Pull and Junction
 - a. Sheet Metal Boxes: NEMA OS 1, Galvanized Steel.

- b. Surface-Mounted Cast Metal Box: NEMA 250, Type 4 flat-flanged, surface-mounted junction box.
 - i) Material: Galvanized cast iron Cast aluminum in corrosive areas.
 - ii) Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
 - iii) Model: WCB as manufactured by Crouse-Hinds.
- c. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
 - i) Material: Galvanized cast iron.
 - ii) Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
 - iii) Cover Legend: ELECTRIC.
 - iv) Model: WPD as manufactured by Crouse-Hinds.
- 4. Large Junction Boxes and Wiring Gutters
 - a. Indoor Locations:
 - i) Steel, NEMA 12.
 - b. Outdoors:
 - i) Stainless steel.
 - ii) Weather-tight NEMA 4.
 - c. Construction.
 - i) Provide rigid handles for box covers larger than 9 sq. ft. or heavier than 25 lbs.
 - ii) Provide split covers for covers larger than 12 sq. ft.
 - iii) Aluminum boxes in concrete not allowed.
- 5. Seal Fittings
 - a. Model ESU with Apelco sealing cement and fiber, as manufactured by Appleton.
 - b. Model EZS with Chico X Fiber and Chico A compound as manufactured by Crouse-Hinds.
- 6. Deflection Fittings
 - a. Locations:
 - i) Underground conduit runs.
 - ii) Runs between concrete sections subject to relative movement.
 - b. Material:
 - i) Ferroalloy hubs.
 - ii) Neoprene outer jacket.
 - iii) Stainless steel jacket clamps.
 - iv) Molded plastic inner sleeve.
 - v) Tinned copper braid grounding strap.
 - c. Model XD as Manufactured by Crouse-Hinds.
- 7. Expansion Fittings
 - a. Locations:
 - i) In long conduit runs, to permit linear movement caused by thermal expansion and contraction.
 - ii) In long conduit runs to prevent conduit from buckling.
 - iii) Indoors and outdoors, where conduit expansion occurs or where there is a wide temperature range.
 - iv) At structural expansion joints.
 - b. Material:

- i) End fittings: Ferroalloy.
 - ii) Body: Steel conduit.
 - c. Provide Bonding Strap When Used Outdoors.
 - d. Model XJ, as Manufactured by Appleton and Crouse-Hinds.
- 8. Flexible Sealing Compound
 - a. “Duxseal” as Manufactured by Johns-Manville.
 - b. “Permagum” as Manufactured by In mount.
- 9. Coal Tar Epoxy Paint
- 10. Wire and Cable
 - a. 600 Volt Power Cable
 - i) General Use:
 - a) Conductors: Single, copper, 12 AWG minimum.
 - b) All conductors shall be stranded.
 - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
 - d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
 - e) Or as specified for service entrances.
 - ii) Service entrance and 4 AWG and above:
 - a) Conductors: Single, stranded, copper.
 - b) Insulation: 600V cross-linked polyethylene, UL Type XHHW/USE or THHN.
 - c) Suitability: Wet or dry locations at 75°C and 90° C copper temperature.
 - iii) Terminations
 - a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap standard cable around screw type terminals
 - b. Lighting Circuits
 - i) General Use:
 - a) Conductors: Single, copper, 12 AWG minimum.
 - b) Conductors may be solid or stranded.
 - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
 - d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
 - ii) Terminations:
 - a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap stranded cable around screw type terminals.
 - c. Control circuits
 - i) General Use:
 - a) Conductors: Single, tinned copper, 14 AWG
 - b) All conductors shall be stranded
 - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
 - ii) Millivolt or Milliampere Instrumentation and Control.
 - a) Conductors: 18 AWG stranded copper, 2 or 3 as required.
 - b) Insulation: 15 mils, minimum, 90°C PVC.
 - c) Shield: Mylar aluminum tape with 20 AWG copper drain wire, fully covering conductors.
 - d) Jacket: 20 mils, minimum, 80°C PVC.
 - e) Suitability: Wet or dry steel conduit.
 - iii) Manufacturers: Belden “UL Instrumentation Cable – 1032A”, Samuel Moore “Dekoron ICMX” No. 1852-686 and 1862-686, or equal.

- d. Telephone and Networking
 - i) Cable.
 - a) The cables shall be rated for use in communications circuits.
 - b) The cables shall be rated for riser applications.
 - c) The cables shall be rated for 75 degrees Celsius applications.
 - d) The cables shall be free of defects and splices.
 - e) The cables shall be rated for outdoor applications.
 - f) The cables shall be rated for P-MSHA applications.
 - g) The cables shall pass a -40 degree Celsius cold bend test per UL 1581.
 - h) The cables must be UL third party verified to ANSI/TIA/EIA-586-B.2 Category 5e.
 - i) The cable shall be ROHS compliant.
 - j) The cable shall be CE compliant.
 - k) Conductors
 - 1) The conductors shall be solid, bare copper per ASTM B-3.
 - 2) The conductors shall be #24 AWG (.20 sq mm).
 - l) Insulation
 - 1) The insulation shall be polyolefin.
 - 2) The insulation shall be free of defects and splices.
 - m) Pairs
 - 1) The cable shall contain four pairs.
 - 2) The insulated conductors shall be bonded together down the entire length of the pair.
 - 3) The pairs shall be marked with a permanent, extruded stripe identification of tip and ring insulated conductors.
 - 4) Each pair shall have a unique twist length to minimize pair to pair coupling.
 - n) Shielding
 - 1) Shielding shall be an aluminized foil with the foil facing inward, where required.
 - 2) Unshielded cables shall be acceptable except where shielding is required for the system.
 - o) Jacket.
 - 1) All cables shall have a continuous jacket of Polyvinyl Chloride (PVC).
 - 2) Jacket thickness: The jackets shall be .030" (.75 mm) nominal thickness.
 - 3) The jackets shall be ultraviolet (UV) radiation and sunlight resistant per UL 1581.
 - 4) The jackets shall be oil resistant per UL 1581 Class 43.
 - p) Manufacturer: Belden "Industrial Data Solutions – 7923A" or equal.
 - ii) Arc-Proofing Tape: Irvingon "77 Arc-Proofing Tape", Slipknot No. 50 or Slipknot No. 3, or approved equal.
- e. Fiber-Optic Cabling System
 - i) The optical fiber cabling system should use matched components from a single manufacturer, and the cabling system should be certified to deliver

system performance over the lifetime of the applications for which the cabling system was originally designed to support.

- ii) The optical fiber cabling system should comply with the following standards:
 - a) ANSI/TIA-EIA-568-C.0
 - b) ANSI/TIA-EIA-568-C.1
 - c) ANSI/TIA-EIA-568-C.3
- iii) All cables and termination hardware should be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.0, C.1 and C.3. All fibers of every installed cable should be verified prior to system acceptance. Any defect in the cabling system installation including, but not limited to, cable, patch panels, and connectors should be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
- iv) Cable
 - a) The optical fiber cable should be designed for outdoor applications such as lashed aerial or underground conduit installations as well as for indoor applications.
 - b) The optical fiber cable should have a waterblocking tape to protect from water migration.
 - c) The optical fiber cable should be fully dielectric, with no metallic elements in the cable.
 - d) The optical fiber cable should have fiber tubes that are color coded for easy identification.
 - e) The optical fiber cable shall have an indoor and outdoor operating temperature of -40°C to +70°C.
 - f) The optical fiber cable should be UL/cUL rated type OFNR/OFN FT4 as per the flame resistance standard UL 1666 and a Low Smoke Zero Halogen (LSZH) versions.
 - g) The length of the optical fiber cable shall be determined on site by the contractor.
 - h) The optical fiber cable shall be Multimode OM-1, 62.5 μm, 12 fibers, indoor/outdoor, as manufactured by Belden or approved equal.
- v) Brilliance Fiber Optic Connectors
 - a) Brilliance Optical Fiber Field Installable Connectors shall provide rapid mechanism for the field-connectorization of multimode 62.5/125-micron, fiber horizontal cabling with SC connectors, and a connection point for optical fiber cord assemblies linking to Work Area station equipment.
 - 1) The optical fiber field-installable connector shall be available in SC format, for installation onto either multimode 62.5/125-micron fiber.
 - 2) The optical fiber field-installable connector shall be field installable, without requiring epoxy or polishing.
 - 3) The optical fiber field-installable connector shall be compatible with 900-micron buffered fibers and 250-micron loose-tube fibers with breakout/fanout kit.
 - 4) The optical fiber field-installable connector shall have a minimum Reflectance of -35 dB for multimode and -55 dB for single mode.

- 5) The optical fiber field-installable connector shall have a tensile strength of 1.2 lb. (0.5 kg).
- 6) The optical fiber field-installable connector shall have a durability rating of less than 0.2 dB for multimode and 0.3dB for single mode change after 500 cycles.
- 7) The optical fiber field-installable connector shall be capable of re-termination up to 5 times with no performance degradation.
- 8) The optical fiber field-installable connector shall be capable of re-termination up to 5 times without additional parts or tooling in order to un-terminate the connector.
- 9) The optical fiber field-installable connector shall be part number AX104244-S1 as manufactured by Belden, or approved equal.

11. Wiring Devices

- a. General:
 - i) Industrial Specification grade.
 - ii) White.
- b. Receptacles:
 - i) 120 V duplex outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 5362, or approved equal.
 - ii) 120 V duplex GFCI outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 7899, or approved equal.
 - iii) 240 V duplex outlets: NEMA 6-20R, 3 wire, grounding, 20A, 250 V, Leviton 5462, or approved equal.
 - iv) Welding outlets: 50A, 125/250V, 3 pole, 4 wire, grounding, NEMA 14-50R, Leviton 55050, or approved equal.
- c. Light Switches:
 - i) 277 V lighting circuits: 20 amp, 120/277 V, Leviton 1221-2W to 1224-2W, or approved equal.

12. Device Plates

- a. General:
 - i) Mounting hardware countersunk and finished to match plate.
 - ii) Provide over-sized plates where standard plates do not cover wall opening.
 - iii) Provide engraving as indicated on drawings.
- b. Indoors:
 - i) Surface mounted devices: Galvanized or cadmium-plated steel.
 - ii) Flush mounted devices in other finished areas: Phenolic plastic, white.
 - iii) All other flush mounted devices: Type 302 stainless steel.
- c. Outdoors and Indoors when identified on Drawings as Weatherproof:
 - i) Weatherproof with spring doors for receptacles and with provisions for padlocking switches on and off.
 - ii) Provide an adaptor plate for flush mounted device plates, Crouse-Hinds FS031, or equal.

13. Grounding and Bonding

- a. Provide rod electrodes, exothermic connections and mechanical connections.
- b. Building perimeter ground cable shall be minimum of 4/0 AWG bare copper.
- c. Duct bank ground cable shall be minimum of 4/0 AWG bare copper.
- d. Other ground cable shall be as noted on the drawings.

14. Luminaries
 - a. Furnish products as specified on drawings.
 - b. Install ballasts, lamps, and specified accessories at factory.
 - c. Accessories:
 - i) Provide swivel-type box covers.
 - ii) Provide threaded conduit pendants.
 - d. Provide all lamps and required mounting hardware.
15. Power Panels
 - a. General:
 - i) Circuit breaker panel board.
 - ii) With neutral.
 - iii) Dead front.
 - b. Enclosure:
 - i) NEMA 12, surface in unfinished areas, NEMA 1 flush in finished areas or as indicated on the drawings.
 - ii) Door with latch and lock.
 - iii) Typewritten circuit directory.
 - iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
 - c. Circuit Breakers:
 - i) Molded case thermal magnetic.
 - ii) Multiple pole breakers shall be common trip.
 - iii) Bolt-in.
 - iv) Individually front replaceable.
 - v) Indicating "On", "Off", and "Tripped".
 - vi) RMS symmetrical interrupting capacity shall be as indicated on the drawings.
 - vii) Breakers, trip ratings, and number of poles as indicated on the drawings.
 - d. Buses:
 - i) Three phase and neutral bus insulated from cabinet.
 - ii) Ground bus.
 - a) Connected to cabinet.
 - b) Clamp type lug for supply circuit and each load circuit.
 - c) Removable bond to neutral bus.
 - iii) Copper bussing.
 - iv) Ampere and voltage ratings as indicated on the drawings.
 - v) Bracing coordinated with circuit breakers interrupting capacity.
16. Lighting Panels
 - a. General:
 - i) Circuit breaker panel board.
 - ii) With neutral.
 - iii) Dead front.
 - b. Enclosure:
 - i) NEMA 1 or as indicated on the drawings.
 - ii) Door with latch and lock.
 - iii) Typewritten circuit directory.
 - iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.

- c. Circuit Breakers:
 - i) Molded case thermal magnetic.
 - ii) Multiple pole breakers shall be common trip.
 - iii) Bolt-in or plug-in.
 - iv) Individually front replaceable.
 - v) Indicating “On”, “Off”, and “Tripped”.
 - vi) 10,000 amp RMS symmetrical interrupting capacity at 240 V.
 - vii) Handle clips to prevent casual operation for circuit breakers indicated on drawings.
 - viii) Ground fault interrupting breakers with a sensitivity of 5mA for receptacle branch circuit and where indicated on drawings.
 - ix) Breakers, trip ratings, and number of poles as indicated on the drawings.
 - d. Buses:
 - i) Two phase and neutral bus insulated from cabinet.
 - ii) Ground bus.
 - a) Connected to cabinet.
 - b) Clamp type lug for supply circuit and each load circuit.
 - c) Removable bond to neutral bus.
 - iii) Copper.
 - iv) Ampere and voltage ratings as indicated on the drawings.
 - v) Bracing coordinated with circuit breakers interrupting capacity.
17. Dry-Type Specialty Transformers.
- a. Phase, voltage current ratings as indicated on drawings.
 - b. Two 2½% full capacity taps below normal voltage.
 - c. Dry type, wall floor or MCC mounted as indicated on the drawings, enclosed for wiring in conduit.
 - d. Self air-cooled.
 - e. Suitable for indoor NEMA 4.
 - f. Insulation system and average winding temperature rise for rated KVA as follows:
 - i) 1-15 KVA: Class 185 with 115°C rise.
 - ii) 16-500 KVA: Class 220 with 115°C rise.
 - g. Sound Levels: NEMA ST20.
 - h. Ground core and coil assembly to enclose by means of a visible flexible copper grounding strap.
 - i. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise
18. Control Stations.
- a. Enclosures:
 - i) Indoors: NEMA 4X.
 - ii) Outdoors: NEMA 4X
 - b. Pilot Devices:
 - i) Refer to specification section 16900.
 - c. Nameplates:
 - i) Pilot devices: Laminated plastic nameplates, white surface with a black core, engraved to identify controlled motor or equipment.

- ii) Control station: Laminated plastic nameplates, white surface with a black core, engraved to identify controlled motor or equipment.
19. Equipment Disconnects
- a. General:
 - i) Heavy-duty safety switches.
 - ii) Square D or Cutler-Hammer.
 - b. Enclosure:
 - i) Indoor dry areas: NEMA 12.
 - ii) Outdoor: NEMA 4X.
 - iii) Corrosive Areas: NEMA 4X.
 - iv) Use above guidelines unless otherwise noted on drawings.
 - v) Padlocked external operating handle.
 - c. Switch:
 - i) 25,000 amp symmetrical withstand.
 - ii) Poles to match equipment served.
 - iii) 600 VAC.
 - iv) Continuous current rating not less than the serving branch circuit over current protection.
 - v) Non-fusible except where fusing is required by the served equipment or as noted on the drawings.
20. Surge Protective Device (SPD).
- a. General:
 - i) SPD units shall be installed as shown on the drawings.
 - ii) SPD units shall be appropriate for the voltages indicated on the drawings.
 - iii) Approved manufacturers: Cutler Hammer, Square D, LEA, or equal.
 - iv) SPD units shall comply with UL 1449 and 1283.
 - v) SPD units shall comply with IEEE C62.41 and IEEE C62.45.
 - vi) SPD units shall have a 30 amp disconnect directly before the TVSS unit.
 - vii) SPD units shall have indication for trouble alarms and surge count.
 - viii) For assembled equipment the SPD unit shall be of the same manufacturer as the assembled equipment.
 - b. Ratings:
 - i) Maximum let through voltage shall be:

Mode	120/208	277/480
L-N or L-G	400V	800V
L-L	800V	1800V
 - ii) Minimum total surge current capability:

Location	Per Phase	Per Mode
Switchgear	250 KA	125KA
MCC	160KA	80KA
Panelboards	120KA	60KA

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

B. Inspection

1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors ¼" from wall be corrosion resistant spacer.
 - b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
 - c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
 - d. Electrical work shall conform to the construction schedule and progress of other trades.
 - e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - f. Perform all work in accordance with manufacturer's instructions.
 - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 - g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

D. Identification:

1. Conduit. All conduits shall be provided with identification tags. Tags shall be brass nameplates with 3/8" high lettering and attached to the conduits by means of stainless steel wire. Conduits shall be identified at both ends with the same identification number.
2. Cable. Except for lighting and receptacle circuits, each individual wire in power, control, indication, and instrumentation circuits shall be provided with identification markers at the point of termination. Power wires without individualized identification numbers shall be color coded with electrical tape or colored wire jacket. The wire markers shall be of the heat-shrinkable tube type.

3. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends (“start”, “stop”, etc.) as indicated on the drawings. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.
4. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.

E. Raceways:

1. General:

- a. Except as otherwise indicated on drawings, conduit shall be concealed in finished areas and exposed in unfinished areas.
 - b. Rigid steel conduit and aluminum conduit connections and terminations shall be reamed, de-burred, threaded and provided with bushings.
 - c. Securely fasten conduit connections to sheet metal enclosures with locknuts inside and out. Conduit hubs outdoors and in wet locations.
 - d. Provide deflection fittings across structural joints where structural movement is allowed.
 - e. Keep conduit clear of structural openings and indicated future openings.
 - f. Provide flashing and seal watertight conduits through roofs and metal walls.
 - g. Neatly grout conduit into any opening cut into structure.
 - h. Cap or plug conduits during construction to prevent the entrance of trash, dirt and water.
 - i. Minimum conduit size shall be $\frac{3}{4}$ ”, except $\frac{1}{2}$ ” for luminaries pendants or as noted on drawings.
 - j. Seal conduits with flexible sealing compound forced to a minimum depth equal to the conduit diameter after cable is installed.
 - i) At handholes, manholes, and vaults.
 - ii) Building entrance junction boxes.
 - iii) One inch or larger connections to equipment.
 - iv) All conduits exiting the UV area.
 - v) All conduits exiting chemical rooms.
 - k. Provide flexible conduit where flexible connections are necessary, including each motor without flexible cord.
 - i) Keep length to a minimum, not to exceed 6’ maximum.
 - ii) No sharp bends.
 - l. Provide suitable pull string in each empty or spare conduit.
2. Conduit exposed in structures:
- a. Install parallel to structural members and surface.
 - b. Install conduits of the same general routing parallel with symmetrical bends.
 - c. Arrange supports to prevent misalignment during wiring installation.
 - d. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
 - e. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.

- f. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.
 - g. Provide suitable pull string in each empty conduit except sleeves and nipples.
 - h. Maintain 6" clearance to ducts, piping and flues.
 - i. Support rigidly with galvanized or cadmium-plated hardware and framing materials, including nuts and bolts.
 - j. Provide expansion fittings at 100' centers outdoors, 200' centers indoors; in each conduit run longer than 100' outdoors, 200' indoors.
 - k. Provide galvanized pipe caps on conduit stubs for future use.
 - l. Allow 7' headroom for horizontal conduit runs, except along structures, piping equipment or where not possible.
 - m. Except as otherwise indicated, do not install exposed conduit in water chambers.
 - n. Where allowed, coat conduit exposed in water chambers with 2 coats of coal tar paint with paint injuries repaired or use PVC coated conduit.
3. Conduit concealed in structure:
- a. Install between reinforcing steel in slabs with reinforcing in both faces.
 - b. Install under reinforcing steel in slabs where only a single layer is provided.
 - c. Terminate conduit for future use in equipment or by galvanized couplings and conduit plugs flush with structural surfaces. Seal plugs with self-leveling caulk.
 - d. Maximum of two conduits crossing each other in slab.
4. Underground:
- a. One inch minimum.
 - b. Encased in concrete.
 - i) Two inches between conduits.
 - ii) Three inches over conduit where not reinforced.
 - iii) Three inches over reinforcing.
 - iv) Reinforced at and 5' past portion on disturbed earth or subject to traffic.
 - v) Reinforced within 5' of a structure, manhole or vault.
 - vi) Reinforced for entire length and 2' beyond each adapter to steel conduit if non-metallic is used in duct bank.
 - vii) Where capped underground, reinforce the last 2' and extend steel and conduit 2' past end of duct bank. Paint all un-encased metal with 2 coats of coal tar paint.
 - viii) Continue encasement on outdoor risers to 3" above grade and crown and chamfer top.
 - c. Two foot minimum bend radius at vertical risers, 3 foot elsewhere.
 - d. Install underground conduit so that it does not drain to cable pulling access in buildings; where necessary, provide a handhole or manhole near or adjacent to building.
 - e. Provide 3 foot minimum earth cover.
 - f. Install underground conduits through buildings, manhole, handhole and vault walls in box outs as indicated on the drawings.
 - g. All steel inside manholes, handholes and vaults shall be galvanized with bared spots treated with zinc rich paint.
 - h. Provide ¾" galvanized steel pulling eyes on opposite walls below the centerline of each duct bank.

- i. Provide end bells at wall terminations and adapters for steel conduit continuations for non-metallic duct systems.
- j. Isolate intercommunication and milliamperere level instrumentation circuits from all power wiring raceways, conduits, boxes, vaults, manhole and handhole.
- k. Provide a full-size extension for each underground conduit entering a building.
- l. Rigid nonmetallic conduit (PVC) shall be fastened no less than every 4 feet.
- 5. Junction boxes and wiring gutters:
 - a. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
 - b. Install pull boxes and junction boxes to maintain headroom and to present neat mechanical appearance.
 - c. Install level and plumb.
 - d. Where indicated, provide a removable side opposite underground duct banks.
 - e. At least code size including space for full size continuation of any conduit not originally continued.
 - f. Arrange conduit for maximum space for future conduits.
 - g. Support boxes independently of conduit except cast box that is connected to rigid metal conduits both supported within 12 inches of box.

F. Wire and Cable

- 1. General:
 - a. Protect the cable and avoid kinking conductors, cutting or puncturing jackets, contaminating by oil or grease or damaging in any manner.
 - b. Terminate stranded cable with lugs, cup washers, or pressure type connectors; do not wrap stranded cable around screw type terminals.
 - c. Splice stranded cable with pressure type connectors; do not use wire nut type connectors on stranded cable.
 - d. Splice cables only at readily accessible locations.
 - e. Do not pull cable tight against bushings or press heavily against enclosures.
 - f. Use cable pulling lubricants as recommended by the cable manufacturer.
 - g. Use swab to clean conduits and ducts before pulling cables.
 - h. Install cable and accessories in accordance with manufacturer's instructions.
 - i. Where necessary to prevent heavy loading of cable connectors due to cable weight, support cables in vertical risers with woven cable grips.
 - j. Coil and tape spare cable ends.
 - k. Support each 250 MCM or larger cable, and each conduit group of smaller cables from manholes, handholes or vault walls.
 - l. Use Stranded conductor for feeders and branch circuits.
 - m. Use stranded conductors for control circuits.
 - n. Use conductor not smaller than 12 AWG for power and lighting circuits.
 - o. Use conductor not smaller than 16 AWG for control circuits.
 - p. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 100 feet.
 - q. Pull all conductors into raceway at same time.
 - r. Use suitable wire pulling lubricant for building wire 8 AWG and larger.
 - s. Protect exposed cable from damage.

- t. Neatly train and lace wiring inside boxes, equipment, and panel boards.
 - u. Clean conductor surfaces before installing lugs and connectors.
 - v. Make splices, taps, and terminations to carry full ampacity of conductors.
2. Special cables:
 - a. Isolate networking and milliampere level instrumentation cables from all power circuits.
 - b. Isolate telephone cables from all other circuits.
 3. Conductor identification:
 - a. Color code all service, feeder, and branch circuit conductors, 277/480 VAC and above as follow:
 - i) Phase A: Brown
 - ii) Phase B: Orange
 - iii) Phase C: Yellow
 - iv) Neutral: White
 - v) Ground: Bare or Green
 - b. Color code all feeder, and branch circuit conductors, 120/208 VAC as follows:
 - i) Phase A: Red.
 - ii) Phase B: Black.
 - iii) Phase C: Blue.
 - iv) Neutral: White.
 - v) Ground: Bare or Green.
 - c. Identify single control conductors by color coding orange and by labeling each end of conductors by color coding orange and by labeling each end of conductor with heat shrink-tube type wire markers.
 - d. Identify multi-conductor instrumentation and control cables with heat shrink-tube type wire markers.
 - e. Contractor shall establish a control and instrumentation conductor and cable identification system acceptable to Engineer.
- G. Wiring Devices:
1. Flush mount wiring devices in concealed conduit system.
 2. Surface mount wiring devices in exposed conduit systems.
 3. Provide extension rings to bring outlet boxes flush with finished surface.
 4. Clean debris from outlet boxes.
 5. Install products in accordance with manufacturer's instructions.
 6. Install devices plumb and level.
 7. Install switches with OFF position down.
 8. Install receptacles with grounding pole on bottom.
 9. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
 10. Connect wiring devices by wrapping conductor around screw terminal.
 11. Use jumbo size plates for outlets installed in masonry walls.
 12. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
 13. Install wall switch 48 inches above finished floor.
 14. Install convenience receptacle 24 inches above finished floor.
 15. Inspect each wiring device for defects.

16. Operate each wall switch with circuit energized and verify proper operation.
17. Verify that each receptacle device is energized.
18. Test each receptacle device for proper polarity.
19. Test each GFCI receptacle device for proper operation.
20. Adjust devices and wall plates to be flush and level.

H. Grounding Materials:

1. Coordinate installation with other disciplines.
2. Verify that final backfill and compaction has been completed before driving rod electrodes.
3. Install Products in accordance with manufacturer's instructions.
4. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
5. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.
6. Provide bonding to meet Regulatory Requirements.
7. Install ground cable through building walls within 3' below finish grade and prepare a water stop.
8. Install ground rods and cables as deep in earth as possible and as far from structure as possible, not closer than 6".
9. All branch circuit and feeder circuits to include a copper ground conductor in addition to the conduit ground connection.
10. Connect ground conductors to equipment by ground lugs or clamps.
 - a. If no ground bus or terminal is provided and enclosure is not explosion-proof or submersible provide a clamp type lug under a permanent assembly bolt or by grounding locknuts or bushings.
 - b. If an explosion-proof or submersible enclosure is not provided with grounding means, provide an adjacent junction box with a ground lug.
 - c. Bond grounding system to station piping by connection to the first flange inside the building on either a suction or discharge pipe which will form a good ground connection:
 - i) Drill and tap the flange.
 - ii) Provide a bolted connection.
 - iii) Bond with a copper bar or strap.
 - d. Form ground conductors on equipment to the contours of the equipment.
 - e. Install main ground cables with encased underground conduit banks in earth at least 3" below 1 corner of the duct bank.
 - f. Bond ground cables in underground circuits to main ground cables at each manhole, handhole, and vault.

I. Luminaries

1. Install in the general locations and arrangement indicated on drawings.
2. Align luminaries in rows vertically and horizontally except as otherwise required.
3. Install clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.
4. Adjust luminaries location as required by field conditions.
5. Examine each luminaries to determine suitability for lamps specified.

6. Install in accordance with manufacturer's instructions.
7. Install suspended luminaries using pendants supported from swivel hangers. Provide pendant length required to suspend luminaries at indicated height.
8. Support luminaries larger than 2x4 foot size independent of ceiling framing.
9. Locate recessed ceiling luminaries as indicated on reflected ceiling plan.
10. Install surface mounted luminaries and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
11. Install recessed luminaries to permit removal from below.
12. Install accessories furnished with each luminaire.
13. Bond products and metal accessories to branch circuit equipment grounding conductor.
14. Install specified lamps in each luminaire emergency lighting unit and exit sign.
15. Operate each luminaire after installation and connection. Inspect for proper connection and operation.
16. Aim and adjust luminaries as directed.
17. Relamp luminaries that have failed lamps at Substantial Completion.
18. Clean electrical parts to remove conductive and deleterious materials.
19. Remove dirt and debris from enclosure.
20. Clean photometric control surfaces as recommended by manufacturer.
21. Clean finishes and touch-up damage.

J. Lighting Panel

1. Wall mount in unfinished areas, flush mount in finished areas.
2. Install lighting panel in accordance with NEMA PB 1.1.
3. Install lighting panel plumb. Provide supports. Height: 6 ft. to top of lighting panel; install lighting panel taller than 6 ft. (2M) with bottom no more than 4 in. above floor.
4. Provide filler plates for unused spaces in lighting panels.
5. Provide typed circuit directory for each branch circuit in lighting panel. Revise directory to reflect circuiting changes required to balance phase loads.
6. Measure steady state load currents at each lighting panel feeder; rearrange circuits in the lighting panel to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
7. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

K. Networking – EtherNet/IP cabling

1. Install sufficient networking cable, as shown in the contract drawings, to provide a complete networked system.
2. Terminate all wiring with RJ-45 connectors rated for Cat 5e cable transmissions.
3. Test every communication cable, and provide a testing certificate with the results.

3.2 FIELD QUALITY CONTROL

A. Low Voltage Cable Testing

1. Test 600 V power cables for continuity and freedom from short circuits and ground, except where grounding is intentional immediately after installation.

2. Test all circuits with a 500 V megger or its equivalent.
3. Replace conductors which read less than 1.5 Megohms between conductors and ground.

3.3 PROTECTION AND STORAGE

- A. Protection of equipment during storage:
 1. During construction, all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously. Any means necessary shall be used to protect the equipment at the Contractor's expense.

END OF SECTION

SECTION 16150

VARIABLE FREQUENCY DRIVES AND CONTROL EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of variable frequency drives (VFDs) with all associated labor, material, tools, equipment, appurtenances, and service in accordance with the contract documents.

1.2 SUBMITTALS

- A. Submittals shall be required as noted in Section 16900.

1.3 QUALITY ASSURANCE

- A. VFD Supplier's qualifications
 - 1. Acceptable Manufacturers.
 - a. Hitachi Model L700.
 - b. Square D "Model 71".
 - c. Cutler-Hammer, SVX9000 Series.
 - d. Without exception.
 - e. Where a listed manufacturer's standard product does not meet the requirements of this specification, the standard unit shall be modified to meet all the requirements of this specification.
- B. Coordination
 - 1. Verify all motor sizes and specifications from approved mechanical, process, and instrumentation shop drawings, contract drawings, and contract documents. It is the Contractor's responsibility to fully coordinate the VFDs with the provided driven equipment. All equipment provided under this section shall comply with the requirements of the general project requirements (Materials and Equipment – Section 01600), Section 16050, and Section 16900 of these specifications.
- C. The VFD Supplier shall be the same as the Instrumentation Supplier for the equipment in section 16900.
- D. Warranty
 - 1. The VFD supplier shall warrant the hardware for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the VFD supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Interchangeability. All VFDs shall be products of the same manufacturer and of the same series or product line.

2.2 MATERIALS AND EQUIPMENT

- A. The following specifications shall apply to the VFDs.
 - 1. The variable frequency drives shall consist of a 480 V adjustable frequency inverter with integral control, sequence logic, and self diagnostics as specified herein. The drives shall be of “pulse width modulated inverter” (PWM) type employing semiconductor technology. The VFD shall limit harmonic distortion reflected onto the system to a voltage and current distortion level as defined by the latest version of IEEE 519 for general system application.
 - 2. VFD enclosures:
 - a. The enclosure ratings shall be as noted on the drawings
 - b. All devices noted on the drawings shall be installed in the VFD enclosure.
 - 3. Each VFD of 50 HP or more shall be provided with a line side filter for mitigation of harmonic noise.
 - a. The filter shall be a passive harmonic filter capable of limiting the harmonic distortion from this drive to meet the requirements of IEE-519 1992.
 - b. The filter shall be as manufactured by TCI HG7 Series, Mirrus Filter AUHF, or approved equal.
 - c. The filter shall mount in the VFD enclosure.
 - d. Fans shall be as required for both the VFD and the filter.
 - 4. Each VFD under the size of 50 HP shall be provided with a 5% line side filter.
 - 5. The VFD shall be rated:
 - a. As shown on the drawings
 - b. Constant torque
 - c. 480 V, 3 phase, 60Hz
 - d. Microprocessor based static adjustable frequency controller designed to provide continuous speed adjustment of 3 phase motors
 - e. Provide energy-efficient, low loss speed control in the range from 4 to 70 Hz.
 - f. Provide the Town receipts and required information for all VFDs to enable energy rebate through Delta Montrose Electric Association (DMEA).
 - 6. The VFDs shall operate in an ambient temperature range of 10C to 30C at an altitude of 5,000 feet above sea level.
 - 7. The following microprocessor-based, door-mounted operator controls and status indication shall be provided:
 - a. Run/stop selection with LED indication.
 - b. Speed control selection with LED indication.
 - c. Current limit indication.

- d. Microprocessor fault.
 - e. Reset button.
 - f. Manual speed adjustment.
 - g. Frequency indication.
 - h. Amp-meter.
 - i. Output voltage meter.
 - j. Elapsed time meter.
 - k. Error and Fault log.
8. The following basic control functions and features shall be provided:
- a. Interface for external hand-off-auto switch and control signals as shown on the drawings.
 - b. Interface for external 4-20mA speed reference signal.
 - c. 4-20mA output signal for VFD speed indication.
 - d. Output relays with dry contacts wired to terminals for functions shown on the drawings.
 - e. Control power transformer and power supplies as required.
9. The following standard protective functions shall be provided on the VFDs:
- a. Input AC circuit breaker with an interlocked, padlockable handle mechanism.
 - b. Electronic instantaneous over-current protection.
 - c. DC bus under-voltage protection.
 - d. DC bus over-voltage protection.
 - e. DC bus over-voltage protection.
 - f. Overload warning.
 - g. Controlled over-temperature protection.
 - h. Over-frequency protection.
 - i. Phase loss protection.
 - j. Output terminal short circuit protection.
10. The following standard independent adjustments shall be provided on the VFDs:
- a. Minimum frequency.
 - b. Maximum frequency.
 - c. Four preset speeds initiated by contact closures.
 - d. Adjustable acceleration times.
 - e. Voltage boost.
 - f. Volts-to-hertz ratio.
 - g. Current limit.
 - h. Critical frequency avoidance zones.
 - i. Jog input.
 - j. Selectable auto restart.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

1. It shall be the Supplier's responsibility to ensure that the entire electrical equipment is installed in a satisfactory condition per these specifications and the manufacturer's requirements.

- B. Inspection.
 - 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation.
 - 1. VFDs shall be installed in individual VFD cabinets that shall contain all the devices shown on the drawings as being part of the VFD system.
- D. Adjustment and Cleaning
 - 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
 - 2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

3.2 CUSTOMER TRAINING

- A. The Supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of this equipment. The training sessions shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 2-hour session; the schedule shall be arranged and coordinated with the Engineer.

END OF SECTION

SECTION 16200
ELECTRIC MOTORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section covers single and three phase, alternating current motors rated 500 horsepower and less (NEMA MG1).
- B. Motors shall be designated and coordinated with the driven equipment.
- C. This section covers inverter duty motors for all applications with variable frequency drives.
- D. Submittals
- E. Quality assurance and qualifications
- F. Delivery, storage and handling
- G. Environmental conditions
- H. Factory testing
- I. Warranty
- J. Accessories
- K. Equipment Identification

1.2 RELATED SECTIONS

- A. Section 01600-Materials and Equipment
- B. Section 01400-Quality Control
- C. Section 01650-Starting of Systems
- D. Section 01730-Operating and Maintenance Data

1.3 REFERENCES

- A. NEMA MG1
- B. NEMA MG 10
- C. IEEE 112, Test Method B

1.4 GENERAL REQUIREMENTS

- A. The section covers all motors provided under this contract.
- B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict.
- C. Motors shall be fabricated and assembled in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.
- D. All motor nameplate data shall conform to NEMA MG 1 standards.
- E. Contractor to coordinate equipment with other parts of the Work.

1.5 SUBMITTALS

- A. Provide submittals in accordance with Section 01340
- B. All submittals for each unit shall be compiled and submitted through the Contractor to the Engineer by the responsible manufacturer.
- C. Inverter duty motors: Include motor manufacturer's certification that motor is compatible with variable frequency controllers to be used with motor as specified in Section 16150.
- D. Submittals shall include complete assembly, foundation, installation drawings, and complete engineering data covering the materials used, parts, devices, and accessories forming the complete motor.
- E. The submittal information shall include, but shall not be limited to:
 - 1. Name of manufacturer
 - 2. Type of motor
 - 3. Type of bearing and method of lubrication
 - 4. Type of model of bearing insulation
 - 5. Rated size of motor, hp, and service factor
 - 6. Temperature rise and insulation rating
 - 7. Full load rotative speed
 - 8. Net weight
 - 9. Efficiency at full, $\frac{3}{4}$, and $\frac{1}{2}$ load
 - 10. Full load current
 - 11. Locked rotor current
 - 12. Space heater voltage and wattage, where applicable
 - 13. Motor temperature switch data, where applicable

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance manuals shall be supplied.
- B. Operation and maintenance manuals shall include:

1. Assembly, installation, alignment, adjustment, and checking instructions
2. Lubrication and maintenance instructions
3. Guide to troubleshooting
4. Parts list and predicted life of parts subject to wear
5. Assembly drawings, engineering data, and wiring diagrams
6. Test data and performance curves, where applicable

PART 2 PRODUCTS

2.1 SERVICE CONDITIONS

- A. The site elevation is: 5,000 ft
- B. Ambient temperature is: 40 C
- C. Unless otherwise specified, all motors shall be designed for full voltage starting and to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.
- D. Motors utilizing a reduced voltage solid state starter shall be capable of starting at 50 percent of the specified voltage.
- E. Motors powered by variable frequency drives(VFD), shall be inverter duty and specifically selected for service with a VFD and shall be derated as required to compensate for the harmonic heating effects and the reduced self-cooling capability at lower speeds.

2.2 ACCEPTABLE MANUFACTURER'S

- A. All motors shall be the product of Baldor, US Motors, or engineer approved equal.

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Motor voltage ratings shall be:
 1. 460 V, 3 phase for ½ horsepower and larger
 2. 120V, single phase for smaller than ½ horsepower
- B. Frequency: 60 Hz
- C. Service Factor: 1.15
- D. Enclosure: Totally enclosed fan cooled
- E. Nameplate horsepower shall be equal to or greater than the maximum load imposed by the driven equipment.
- F. All motors shall be self-ventilated. The fan covers of totally enclosed fan cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine.

- G. Motors shall be rated for the starting duty that they will be subject to.
- H. Motors shall be designed for satisfactory operation at any voltage within plus or minus 10 percent of rated voltage.

2.4 TOTALLY ENCLOSED MOTORS

- A. Provided with drain holes and rotating shaft seals

2.5 OUTDOOR MOTORS

- A. Outdoor motors shall be totally enclosed fan cooled
- B. All exposed metal surfaces shall be protected, where practical, with a corrosion resistant polyester coating. Exposed uncoated surfaces shall be of a corrosion resistant metal.
- C. Enclosure exterior and interior surfaces, air gap surfaces, and windings shall be protected with a corrosion resistant polyester, polyurethane, or epoxy coating.

2.6 HAZARDOUS LOCATION MOTORS

- A. Motors for hazardous locations shall be in accordance with the NEC and of the correct type enclosures for the particular service as specified by NEMA MG 1.

2.7 FABRICATION

- A. All motors shall be furnished with a ground connection.
- B. All bearings shall be self-lubricating, shall have provisions for relubrication, and shall be designed to operate in any position or at any angle.
- C. All inverter duty motors rated 50 hp or larger shall be provided with insulated bearing journals on the non-drive end to prevent circulating currents.
- D. All inverter duty motors rated 50 hp or larger shall be provided with a maintenance-free, circumferential, conductive, microfiber shaft grounding ring mounted on the drive end of the motor to discharge any shaft currents to ground.
- E. Two or more items of the same type shall be identical by the same manufacturer and interchangeable.
- F. All motors shall be completely assembled with the driven equipment, lubricated, and ready for operation.

2.8 EFFICIENCY

- A. Motors shall be premium efficiency type and shall have a NEMA nominal efficiency nameplate value equal to or greater than the values indicated in the following table.

MOTOR HP	NOMINAL EFFICIENCY VALUES					
	OPEN DRIP PROOF			TEFC		
	3600 RPM	1800 RPM	1200 RPM	3600 RPM	1800 RPM	1200 RPM
1	83.5	85.0	82.0	76.5	85.0	82.0
1.5	83.5	85.0	82.0	76.5	85.0	82.0
2	85.0	85.0	82.0	76.5	85.0	82.0
3	85.0	85.0	82.0	76.5	85.0	82.0
5	86.0	85.0	82.0	76.5	85.0	82.0
7.5	88.0	85.0	82.0	76.5	85.0	82.0
10	89.0	85.0	82.0	76.5	85.0	82.0
15	90.0	85.0	82.0	76.5	85.0	82.0
20	91.2	85.0	82.0	76.5	85.0	82.0
25	91.9	93.1	92.5	91.5	93.1	92.5
30	92.5	93.6	93.1	91.9	93.1	92.5
40	92.5	93.6	93.6	91.9	93.6	93.6
50	92.5	94.0	93.6	92.5	94.0	93.6
75	93.5	94.5	94.0	93.1	94.5	94.0
100	94.0	94.9	94.5	93.6	94.9	94.5
125	94.0	94.9	94.5	94.5	94.9	94.5
150	94.5	95.3	94.5	94.5	95.3	95.3
200	94.9	95.3	94.9	94.9	95.7	95.3
250	94.5	95.3	94.9	95.3	95.7	95.3
300	94.9	95.3	94.9	95.3	95.7	95.3
350	94.9	95.3	94.9	95.3	95.7	95.3
400	95.3	95.3	95.3	95.3	95.7	95.3
500	95.3	95.7	95.7	95.3	95.7	95.3

B. Contractor shall provide the Town receipts and required information for all premium efficiency motors to enable energy rebate through Delta Montrose Electric Association (DMEA).

2.9 ANTI-REVERSAL HOLDBACK

A. All pumps 5 hp or larger shall be provided with anti-reversal holdback designed to prevent reversal of flow when the pump is not operating:

2.10 ACCESSORIES

A. Special Tools and Accessories:

1. Provide all special tools, instruments and accessories required for proper maintenance
2. Provide all special lifting and handling devices required

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install all equipment, accessories and materials in accordance with the manufacturer's written recommendations unless otherwise specified in the individual equipment detailed technical specifications

3.2 FIELD QUALITY CONTROL

- A. Handle, install, connect, clean, condition, and adjust products in strict accordance with manufacturer's instructions and in conformity with specified requirements:
 - 1. Maintain one set of complete instructions at job site during installation and until completion
 - 2. Perform Work in accordance with manufacturer's instructions.
 - 3. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions
- B. Install all equipment in strict accordance with manufacturers written instructions unless otherwise specified in individual equipment specification sections

3.3 CLEANING

- A. Perform under provisions of Section 01700
- B. Repaint all painted surfaces which are damaged prior to final equipment acceptance to Owner's satisfaction

END OF SECTION

SECTION 16480

MOTOR CONTROL CENTERS AND CONTROL EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of motor control centers (MCC) and all associated equipment.

1.2 SUBMITTALS

- A. Submittals shall be required as noted in section 16900.

1.3 QUALITY ASSURANCE

A. Supplier's qualifications

1. The entire system shall be designed, coordinated, and supplied by a qualified system supplier who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The Contractor's intended instrumentation supplier shall meet the following qualifications.
 - a. The supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
 - b. The supplier shall have the physical plant and fabricating personnel to complete the work specified. The supplier's fabrication capabilities and arrangements shall be acceptable to the Engineer.
 - c. The supplier shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.
 - d. The supplier shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.
2. Coordination
 - a. All equipment provided under this section shall comply with the requirements of the general project requirements (Materials and Equipment – SECTION 01600), section 16050, section 16150, and section 16900 of these specifications.

1.4 WARRANTY

- A. The supplier shall warrant the hardware for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Equipment and materials used shall be subject to review and shall comply with the following requirements. All new MCCs for this project shall be the product of one manufacturer. Different manufacturers for the different new MCCs shall not be allowed.
- B. Acceptable Manufacturers
 - a. The existing MCC that shall have modifications done to it is Allis-Chalmers
- C. MCC physical size
 - 1. The MCC shall be designed and constructed to fit the allotted space in the electrical room.

2.2 MATERIALS AND EQUIPMENT

- A. MCC
 - 1. The MCCs shall be rated for the following service conditions unless otherwise indicated on the drawings:
 - a. 480 VAC, 3 phase, 4 wire, w/ neutral bus, 60 hertz
 - b. Main horizontal bus ratings as indicated on drawings
 - c. Minimum vertical bus ratings of 300A
 - d. Short circuit withstand rating as noted on the drawings
 - e. Provide main horizontal bus in all sections
 - f. Provide full length vertical bus in all sections with horizontal bussing
 - g. Bussing shall be tin-coated copper
 - h. A continuous copper ground bus shall be provided
 - 2. Construction
 - a. The MCC shall be constructed to the following service conditions unless otherwise indicated on the drawings:
 - i) NEMA Class II, Type B
 - ii) NEMA 1 gasketed, free standing
 - iii) Nominally 90 inch tall, 20 inch wide, and 20 inch deep sections
 - iv) All iron and steel surfaces shall be shop painted with the manufacturer's standard coating
 - 3. Circuit Breakers
 - a. MCC disconnects shall be three pole, single throw 600 volt molded case air circuit breakers. Main and feeder circuit breakers shall be thermal-magnetic type only. These breakers shall be manually operated with quick-make, quick-break, trip-free toggle mechanisms. Where a compartment contains a breaker only, the access door of the compartment shall be interlocked with the circuit breaker so that the door cannot be opened with the breaker in the closed position. An interlock override shall permit the door to be opened with the breaker in the closed position

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

1. It shall be the SYSTEM SUPPLIER'S responsibility to ensure that the entire MCC is installed in a satisfactory condition per these specifications and the manufacturer's requirements.

B. Inspection.

1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation.

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - b. Perform all work in accordance with manufacturer's instructions.
 - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.

D. Adjustment and Cleaning

1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

E. Wiring and Miscellaneous Devices

1. All internal control wiring and all devices shall comply with the requirements of specification section 16900.

END OF SECTION

SECTION 16900

INSTRUMENTATION AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers the furnishing and installation of metering and control equipment which shall include the following principal items:
 - 1. Metering and Control Systems. Principal components of the metering and control systems shall be as listed on the “Instrument List” at the end of this section and shall include modification to the existing PLC system.
- B. Related Sections
 - 1. Section 01600 – Materials and Equipment
 - 2. Section 16050 – Basic Electrical Materials & Methods
 - 3. Section 16150 – Variable Frequency Drives
 - 4. Section 16480 – Motor Control Centers
 - 5. Section 16950 - PLCs

1.2 REFERENCES

- A. Codes & Permits
 - 1. All work and materials shall comply with the National Electrical Code, the National Electrical Safety Code, and applicable local regulations and ordinances. All panels shall be listed by Underwriters Laboratories or other testing organizations acceptable to the governing authority. The Contractor shall, at his own expense, arrange for and obtain all necessary permits, inspections, and approval by the proper authorities in local jurisdiction of such work.

1.3 SUBMITTALS

- A. Complete fabrication, assembly, and installation drawings: wiring and schematic diagrams: and details, specifications, and data covering the materials used and the parts, devices, and accessories forming a part of the equipment furnished shall be submitted in accordance with the submittals section. Submittal data shall be grouped and submitted in two separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for review. Instrument tag numbers indicated on the contract drawings shall be referenced where applicable. Submittal data for multifunctional instruments shall include complete descriptions of the intended functions and configurations of the instruments.
 - 1. First-stage Submittal. The first-stage submittal shall include the following items.
 - a. Product catalog cut sheets clearly marked to show the applicable model number, operational features, and intended service of the device.
 - b. A detailed list of any exceptions, functional differences, or discrepancies between the Supplier’s proposed system and the contract requirements.

- c. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.
 - d. System wiring and installation drawings for all interconnecting wiring between components of the systems furnished and for all interconnecting wiring between the related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections.
 - e. If panel terminal designations, interdevice connections, device features and options, or other features are modified as a result of the fabrication process or factory testing, revised drawings shall be resubmitted.
 - f. A total of seven (7) copies for the submittal shall be provided.
2. Second-stage Submittal. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished.
 - a. Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features. A complete set of “as-built” wiring, fabrication, and interconnection drawings, calibration and startup sheets shall be included with the manuals.
 - b. A copy of all final O&M manuals shall be provided in PDF format in a CD-ROM or DVD. All AutoCAD drawings shall be provided in PDF and DWG formats.
 - c. A total of five (5) printed copies, and ten (10) softcopies of final O&M manuals shall be provided.

1.4 QUALITY ASSURANCE

A. Supplier’s qualifications

1. The entire system shall be designed, coordinated, and supplied by a qualified system integrator (Integrator) who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The Contractor’s intended Integrator shall meet the following qualifications.
 - a. The Integrator shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
 - b. The Integrator shall have the physical plant and fabricating personnel to complete the work specified. The Integrator’s fabrication capabilities and arrangements shall be acceptable to the Engineer.
 - c. The Integrator shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.
 - d. The Integrator shall provide a “Statement of Qualifications” indicating that they have successfully provided similar work for at least 5 years.

B. Coordination.

1. Instrument and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under

other sections of these specifications. All instruments and control devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufactured and the manufacturer of related equipment.

2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
3. The Integrator shall provide coordination with other contractors and supervision of installation as required during construction.
4. Coordination shall be provided between the Integrator and the process system supplier.
5. Instrument and control systems shall be designed and coordinated for proper operation with other sections of these specifications. These shall include but not be limited to Materials and Equipment – Section 01600, Electrical – Section 16050, Variable Frequency Drives – Section 16150, and Programmable Logic Controllers – Section 16950.

1.5 WARRANTY

- A. All suppliers shall warrant their hardware for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 1. Power and Instrument Signals. Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 VAC at the locations noted on the one-line and functional diagrams. All transmitted electronic analog instrument signals shall be 4-20 mA DC and shall be linear with the measured variable.
 2. Metering Accuracy. System metering accuracy, as compared to the actual process value, shall be determined from the value read at the principal readout device such as the recorder or totalizer. System requirements shall not preclude any requirements specified herein for individual devices.
 - a. For systems where the primary measuring device, transmitter, and receiver are furnished under this section, the accuracies shall be within the following limits:
 - i) Level: 1.0% percent of measured span.
 - ii) Flow Rate: magnetic or transit time ultrasonic metering: 1.5 percent of full scale between 1.0 and 100 percent of scale.

3. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation requirements shall be furnished and installed as required for proper performance of the equipment.
4. Interchangeability and Appearance. Instruments used for the same types of functions and services shall be of the same brand and model line insofar as possible. Similar components of different instruments shall be from the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished. Recorders, process indicators, control stations, and similar panel-mounted instruments shall be of the same style and shall be products of the same major instrument manufacturer.
5. Programming Devices. A programming or system configuring device shall be provided for systems that contain any equipment which required such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete and in like-new condition and shall be turned over to the Owner at completion of the startup.
6. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the instrument device schedules and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanels, and rack-mounted devices shall have laminated plastic identification tags securely fastened to the device. Hand lettered labels or tape labels will not be acceptable.
7. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

2.2 PANEL FABRICATION

- A. General Fabrication Requirements. All panels furnished hereunder shall conform to the requirements of NEMA ICS-6-1988. The following paragraphs describe general fabrication requirements for the instrument panels, consoles, enclosures, and subpanels:
 1. Wiring.
 - a. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded tinned copper, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90°C.
 - b. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 VAC. Surge protectors shall be of a non-faulting and non-interrupting design, with a response time of not more than 5 nanoseconds. Surge protectors shall be Cutler Hammer AEGIS Powerline Filters, or equal.
 - c. Panels that are over 15 cubic feet in total volume shall have panel lighting above each door of the panel.
 - d. Power distribution wiring on the line side of the panel's protective devices shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 16 AWG. Wiring for control circuits shall be minimum 16 AWG. Electronic analog circuits shall be 18 AWG twisted and shielded pairs rated not less than 300 volts.

Analog circuits shall be separated from ac power circuits. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color coding legend on the system supplier's panel wiring diagrams.

- e. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with a marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 20% percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fused or circuit breakers shall be clearly labeled and located for easy maintenance. Terminal block shall be Phoenix Contact UT 4-MTD series.
 - f. All wiring shall be grouped and firmly supported inside the panel. Wiring shall be routed in nonmetallic slotted wire duct or similar. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables. Wire duct shall be Thomas & Betts Ty Duct or approved equal.
 - g. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams.
 - h. All analog input signals coming from external from the building where the panel is located shall have surge protection.
 - i. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.
 - j. All wires in the panel shall be identified at both ends of the wire. These labels shall agree with the labels shown on the wiring diagrams. The wire labels shall be of the heat-shrink tube type of wire marker as manufactured by Brady thermal labels.
 - k. All instruments that require 120vac power that have the signal from the instrument going to a panel, shall be provided 120vac from that panel. The 120vac circuit to these instruments shall be individually fused.
2. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings, letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified herein under the Device Tag Numbering System paragraph.
 3. Painting. Interior and exterior surfaces of all panels shall be thoroughly cleaned and painted with rust-inhibitive primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils.

4. Factory test. Panels shall be factory tested electrically by the panel fabricator before shipment.

2.3 METERING & CONTROL SYSTEMS

- A. Principal components for the metering and control systems are indicted on the “Instrument List” at the end of this specification.

2.4 MATERIALS & EQUIPMENT

A. Panel Front-Mounted Devices

1. **SELECTOR SWITCHES.** Selector switches shall be a minimum 30 mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 volts ac. Contact configuration shall be as indicated on the drawings or as required for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Cutler-Hammer “Series 10250T”, Square D “Class 9001”, or approved equal.
2. **INDICATING LIGHTS.** Indicating lights shall be a minimum 30 mm, heavy-duty, oil-tight type, Push-to-Test, which uses a low voltage lamp. A built-in transformer shall be used for AC service. Legends shall be engraved on the lens or on a legend faceplate. Lamps shall be easily replaceable from the front of the indicating light. Indicating lights shall be Cutler-Hammer “Series 10250T”, Square D “Class 9001”, or approved equal.
3. **PUSH BUTTONS.** Push buttons shall be a minimum 30 mm, heavy-duty, oil-tight type. Legends shall be engraved on push button faceplate. Contacts shall be rated 10 amperes continuous at 120 VAC. Push buttons shall be Cutler-Hammer “Series 10250T”, Square D “Class 9001”, or approved equal.
4. **RUN TIME METERS.** Run time meters shall have miniature, rectangular, semi-flush counters. The counter shall contain not less than seven digits, with a nameplate plainly engraved on the face of the counter, or below the counter identifying it as a run time meter. Run time meters shall not reset upon power failure. Run time meters shall be as manufactured by Red Lion “CUB7” series or Action Instruments.
5. **DIGITAL PANEL DISPLAYS.** Digital panel displays shall be designed for semi-flush mounting in a panel. The display shall be a 3-1/2 digit LED or gas-discharged type, with digit height of not less than 0.5 inch. The display shall be easily read at a distance of 10 feet in varying control room lighting environments. Operating temperature range shall be 0 to 40 C. Accuracy shall be plus or minus 0.1 percent. The display shall be scaled in engineering units, with the units engraved on the display face or on the associated nameplate. The display shall have selectable decimal point and shall provide red indication. Digital displays shall be as manufactured by Red Lion “PAXP” series or Action Instruments.

B. Panel Interior-Mounted Devices

1. **POWER SUPPLIES.** Regulated DC power supplies for instrument loops shall be provided as needed. Power supplies shall be suitable for input voltage variation of

- plus or minus 10 percent. The DC power supplies shall be Idec "PS5R Slim line", or Phoenix Contact "Quint".
2. RELAYS. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL listed. Relays shall have a minimum rating of 10 amperes at 120 VAC. Time-delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of +/- 2.0 percent of setting. Latching and special purpose relays shall be as required for the specific application. Relays shall have a light to indicate when coil is energized. Relays shall be Idec "RH or RTE Series" or approved equal.
 3. ELECTRONIC SIGNAL BOOSTERS AND ISOLATORS. Electronic Signal Boosters and Isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be +/-0.15 percent of span. Isolators shall be manufactured by Acromag, Moore, or Phoenix Contact.
- C. Flow Instrumentation
1. Magnetic Flow Meters
 - a. The Magnetic Flow Meter shall be a completely obstructionless, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5, Class 150. Meters shall be suitable for the maximum range of working pressures of the adjacent piping. Electrode materials shall be fully compatible with the process fluid and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory calibrated, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.
 - b. The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall be of a splash-proof and drip-proof design
 - c. Power supply to the meter shall be 120 VAC, 60 Hz, single phase.
 - d. Meters shall be Rosemount Type 8750 or approved equal.
 2. Magnetic Flow Meter Signal Converters
 - a. Magnetic Flow Meter Signal Converters shall be separately mounted, microprocessor-based signal converters. They shall be provided for the magnetic flow meters. The signal converters shall include output dampening, self-testing, integral digital indicator, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be +/-1.0 percent of actual flow rate for full-scale settings of 0.3 to 30 fps. The signal cable between the converter and the magnetic flow meter shall be furnished by the meter manufacturer. The signal converter shall be housed in NEMA Type 12 housing and shall be suitable for operation over an ambient temperature range of -30° to +140°F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA DC.
 - b. The signal converter shall have a seven-digit, non-reset totalizer on the face of the enclosure. Local electronic indicators shall be provided. Indicators shall be

mounted on or near the flow meter signal converters in weatherproof NEMA Type 4 housings. Indicators shall be four-digit LCD type and shall read in engineering units.

3. Open Channel Ultrasonic Flowmeters
 - a. Each ultrasonic flowmeter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -20 to +150° F and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. The sensor shall be an explosion-proof design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provide with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.
 - b. The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting.
 - c. The ultrasonic flowmeter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes or momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA DC signal linearly proportional to the measured level range. Where specified, the output shall be characterized to be proportional to the tank volume instead of to the tank level. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be +/-0.5 percent of the flow range.
 - d. The transmitter shall contain a minimum of three (3) independently adjustable alarm contact outputs. Contacts shall be single-pole, double-throw, rated not less than 5 amperes at 120 VAC.
 - e. A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a NEMA Type 12 enclosure suitable for wall mounting and for operating temperatures of -15 to +125°F and a relative humidity of 10 to 100 percent. The signal converter shall be powered from 120 VAC, 60 Hz. The ultrasonic flowmeter shall be Siemens “HydroRanger 200” or approved equal.
 - f. The transducer shall be Siemens “XRS-5”, or equal.
4. Pressure and Level Instrumentation
 - a. Pressure and Pressure Sensing Level Transmitters.
 - i) Transmitters used to measure process pressure, or inferred level from process pressure such as a bubbler system or other source, shall have all solid-state electronic circuitry and shall be of the two-wire type which requires no direct power connection to the transmitter. Transmitters shall have self-diagnostics and electronically adjustable span, zero, and damping. Transmitters shall be

enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0 to 180 F. All transmitter parts shall be of a corrosion-resistant material. Vents shall be provided on the sides of the diaphragm housing body. Transmitter shall have over-range protection to maximum process line pressure. Accuracy shall be plus or minus 0.5 percent of calibrated span, with repeatability of 0.1 percent. Transmitter output shall be 4-20mA dc without the need for external load adjustments and shall have an elevated or suppressed zero as required by the application. Transmitters shall be furnished with integral indicators with 0-100 percent linear scales.

- ii) Differential type transmitters shall be used if required to meet the input range, elevation, or suppression requirements.
 - iii) Each transmitter shall be provided with a process shutoff valve and a bracket for mounting as required. Transmitters shall be factory calibrated to the required range. Transmitters shall be Rosemount "Model 2088" or approved equal.
- b. Hydrostatic Level Transducers
- i) Each transducer shall be a hydrostatic pressure sensor for level measurement of fresh water and wastewater applications. The sensor shall be a permanently sealed submersible probe and cable combination. The transducer shall be a of the two-wire type which requires no direct power connection to the transducer. Transducer output shall be 4-20mA DC. The transducer shall be capable of the ranges and pressures for which the application will require. The sensor shall be mounted as shown on drawings or as required for application. The transducer shall be an Endress-Hauser "WaterpilotFMX167", GE Sensing (Druck) "PDCR/PTX- 1730", or approved equal.
- c. Ultrasonic Level Transmitters
- i) Each ultrasonic level transmitter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -20 to +150⁰ F and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. The sensor shall be an explosion-proof design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provide with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.
 - ii) The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting.
 - iii) The ultrasonic level transmitter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes or momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA dc

- signal linearly proportional to the measured level range. Where specified, the output shall be characterized to be proportional to the tank volume instead of to the tank level. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be +/-0.5 percent of the level range.
- iv) The transmitter shall contain four independently adjustable level alarm contact outputs. Contacts shall be single-pole, double-throw, rated not less than 5 amperes at 120 volts ac.
 - v) A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a NEMA Type 12 enclosure suitable for wall mounting and for operating temperatures of -15 to +125⁰ F and a relative humidity of 10 to 100 percent. The signal converter shall be powered from 120 volts ac, 60 Hz. The ultrasonic level transmitter shall be Siemens "Multiranger", Endress Hauser, or approved equal.
- d. Weighted Float Level Switches
- i) Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amperes AC, sealed and housed in a chemical-resistant polypropylene casing. The switch assembly shall be weighted and suspended on its own cable. The flexible support cable shall be waterproof, three-conductor, synthetic covered cable with 18AWG conductors, and shall be of sufficient length so that no splice or junction box is required in the wetwell. Switches shall be suitable for operation up to 150 volts within an ambient temperature range of 0° to 60° C. Switches shall be suitable for use in a sanitary or wastewater wetwell environment. Installation hardware shall be provided as shown on the drawings or as necessary for application. Switches shall be Flygt "Type EMN-10", Siemens Water Technologies "Model 9G-EF", or approved equal.
- e. Pressure Switches
- i) Pressure switches shall be field adjustable and shall have a trip point repeatability of better than 1 percent of actual pressure. Contact rating shall be 10 amperes at 120 volts ac.
 - ii) Switches shall have over-range protection to maximum process line pressure. Switches shall have NEMA type 4X housings.
 - iii) Switches shall be as manufactured by Ashcroft, Mercoïd, United Electric, or equal.
- f. Conductance Relay Level Switch
- i) Each level switch shall consist of a single-pole, double-throw relay with contacts rated not less than 5 amperes ac at 120 VAC. The relay primary power shall be 120 VAC. The electrodes shall be flexible wire suspension type with shielded stainless steel electrode tips. The electrode holder shall be the manufacturer's standard holder appropriate for the application. Electrodes and conductance relay shall be as manufactured by Gems Sensors (B/W Controls) or Ametek (Warrick Controls), or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system Supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

B. Inspection.

1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation.

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - b. Perform all work in accordance with manufacturer's instructions.
 - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 - c. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.
 - d. Field Piping. Field piping materials and installation shall conform to the requirements of the miscellaneous piping section.
 - e. Field-Mounted Instruments. Instruments shall be mounted so they may be easily read and serviced and all appurtenant devices are easily operated. Installation details for some instruments are indicated on the drawings. Unless otherwise indicated on the drawings, instruments which include local indicators shall be mounted approximately 5 feet above the floor and shall be oriented for ease of viewing. Transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, or bracket mounting.

- #### D. Field Calibration.
- A technical representative of the system supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final tuning adjustment settings. The adjustment of each calibrated instrument shall be sealed or marked, insofar as possible, to discourage tampering. Instruments shall be calibrated before checkout of the operation of the system.

- #### E. Systems Check.
- A technical representative of the system supplier shall participate in the checkout of metering and control systems. If interrelated devices furnished by other

suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the technical representative shall use suitable test equipment to introduce simulated signals to verify or measure signals from such devices as required to locate the source of trouble or malfunction. A written report stating the results of such tests shall be furnished, if requested by the Engineer, to assign responsibility for corrective measures.

1. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by the Contractor for the duration of the testing work. Unless specified otherwise, test equipment will remain the property of the Contractor or the system Supplier.

F. Adjustment and Cleaning

1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

3.2 CUSTOMER TRAINING

- A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner’s personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 4-hour session, and the schedule shall be arranged and coordinated with the Engineer.

3.3 INSTRUMENT LIST

Instrument List

<u>Tag #</u>	<u>Description</u>	<u>Service</u>	<u>Scale</u>	<u>Provided Under Specification</u>
LIT/LE-110	Filter #1 – Left Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-115	Filter #1 – Right Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-120	Filter #2 – Left Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-125	Filter #2 – Right Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-130	Filter #3 – Left Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-135	Filter #3 – Right Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-140	Filter #4 – Left Side Level	Ultrasonic level transmitter	0-10 FT	16900
LIT/LE-145	Filter #4 – Right Side Level	Ultrasonic level transmitter	0-10 FT	16900

END OF SECTION

SECTION 16950

PROGRAMMABLE LOGIC CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
 - 1. Programmable Logic Controllers (PLCs)
 - 2. Communication equipment
 - 3. Programming
 - 4. Spare parts
- B. Related Sections
 - 1. Section 01600 – Materials and Equipment
 - 2. Section 16050 – Basic Electrical Materials & Methods
 - 3. Section 16900 – Instrumentation & Controls

1.2 REFERENCES

- A. ISA 5.1 – Instrumentation Symbols and Identification
- B. NEMA ICS 1 – General Requirements for Industrial Control and Systems
- C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts
- D. DEMA ICS 3 – Industrial Control and Systems: Factory Built Assemblies
- E. NEMA ICS 6 – Industrial Controls and Systems: Enclosures

1.3 DESIGN REQUIREMENTS

- A. Discrete input/output signals shall be allowed to be 24VDC or 120VAC
- B. Analog input/output signals shall all be 4-20mA
- C. Analog signal isolators shall be independently powered units capable of driving two 4-20mA signals
- D. All required buffers, isolators, signal converter, and amplifiers for coordination with other equipment furnished under other sections, and between items of equipment needed for a complete system shall be furnished under this section of the specifications whether indicated on the Drawings or not or detailed in these specifications or not

1.4 SYSTEM DESCRIPTION

- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
 - 1. I/O List. An I/O list is attached at the end of this section

1.5 SUBMITTALS

- A. Submittals shall be required as noted in Section 16900.

1.6 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be designed, coordinated, and supplied by the system integrator supplier.
- B. Coordination
 - 1. The PLCs and PLC system shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
 - 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
 - 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.

1.7 WARRANTY

- A. The Supplier shall warrant the hardware, software, and configuration related to the operational performance of the facility for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Interchangeability. All PLC systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output

hardware, communications modules, and specialty modules shall be interchangeable among all I/O panels and systems.

2. Installed I/O requirements. Each PLC shall have I/O modules installed to accommodate requirements shown on drawings and the I/O List at the end of this section and with a minimum of 20% spares installed.
3. Acceptable Manufacturers.
 - a. PLC - Allen Bradley Compact Logix Series System
 - b. PLC – Modicon M340 Series System
 - c. No or equal
4. Modules shall be added as needed to provide for all the I/O required on the project plus the spares.
5. PLC shall be provided with Ethernet communications installed and functioning.

B. Programmable Logic Controller (PLC)

1. The PLC system components shall be as noted herein:
 - a. Input/Output Modules
 - i) Digital Input Modules – Allen-Bradley
 - a) Number of Inputs: 16
 - b) Voltage Category: 120VAC
 - c) Module shall be Allen Bradley 1769-IA16.
 - ii) Digital Input Modules - Modicon
 - a) Number of Inputs: 16
 - b) Voltage Category: 24VDC
 - c) Module shall be Schneider Electric BMXDDI1602.
 - iii) Digital Output Modules – Allen-Bradley
 - a) Number of Outputs: 16
 - b) Voltage Category: 120VAC
 - c) Module shall be Allen Bradley 1762-OW16.
 - iv) Digital Output Modules – Modicon
 - a) Number of Outputs: 8
 - b) Voltage Category: 120VAC
 - c) Module shall be Schneider Electric BMXDRA0805
 - v) Analog Input Modules – Allen-Bradley
 - a) Number of Inputs: 8
 - b) Signal Range: 4-20mA
 - c) Module shall be Allen Bradley 1769-IF8.
 - vi) Analog Input Modules – Modicon
 - a) Number of Inputs: 8
 - b) Signal Range: 4-20mA
 - c) Module shall be Schneider Electric BMXAMI0810.
 - vii) Analog Output Modules – Allen-Bradley
 - a) Number of Inputs: 4
 - b) Signal Range: 4-20mA
 - c) Module shall be Allen Bradley 1769-OF4.
 - viii) Analog Output Modules – Modicon
 - a) Number of Inputs: 4
 - b) Signal Range: 4-20mA

- c) Module shall be Schneider Electric BMXAMO0410.
 - b. Processors
 - i) Allen-Bradley – 1769-L32E
 - ii) Modicon – BMXP342020
- C. PLC Programming Software
 - 1. The PLC programming software shall be Allen Bradley RSLogix 5000 for the Allen-Bradley or Unity Pro for the Modicon, no or equal.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General Requirements
 - 1. It shall be the Supplier's responsibility to ensure that the entire PLC system and HMI system is installed in a satisfactory condition per these specifications and the manufacturer's requirements.
- B. Inspection
 - 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation
 - 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - b. Perform all work in accordance with manufacturer's instructions.
 - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
- D. Adjustment and Cleaning
 - 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
 - 2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.
- E. PLC Programming.
 - 1. The Contractor shall be responsible for all PLC programming.
- F. Modifications to existing Plant PLCs

1. It is anticipated that the existing Hitachi and Siemens PLCs will not be reprogrammed in any way.
2. If the wiring for the backwash control and the new PLC is done in a way that requires the existing PLCs to need their programming modified, it shall be the system integrators responsibility to provide this programming.

3.2 MODIFICATIONS IN THE EXISTING CONTROL ROOM

- A. All wires are existing into the control room associated with the signals required for this work as noted in the I/O list. The exception is the wire for the new air scour equipment which is to be added under this contract.
- B. It shall be the system integrator's responsibility to verify all wires to be used in this control. Wiring diagrams shall be provided that indicate the wiring that needs to be modified for this work and how the wiring will be done.
- C. Layouts for the new installed equipment shall be provided, both for the front and the back of the control wall.
- D. Sufficient detail shall be provided as to how this will be wired to be able to determine if the new wiring is appropriate and that it will not affect the existing plant operation.

3.3 CUSTOMER TRAINING

1. The system supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training sessions shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of two consecutive 4-hour working days, and the schedule shall be arranged and coordinated with the Engineer.

I/O List

<u>Tag #</u>	<u>Description</u>	<u>DI</u>	<u>DO</u>	<u>AI</u>	<u>AO</u>	<u>Scale</u>	<u>Notes</u>
	Backwash Pump #1 - Auto	1					
	Backwash Pump #1 - Run	1					
	Backwash Pump #1 - Overload	1					
	Backwash Pump #1 - S/S Control		1				
	Backwash Pump #2 – Auto	1					
	Backwash Pump #2 - Run	1					
	Backwash Pump #2 – Overload	1					
	Backwash Pump #2 - S/S Control		1				

	Backwash Flow Control Valve - Setpoint to controller				1		
	Backwash Flow			1			
	Air Scour Blower #1 - Run						Via Ethernet
	Air Scour Blower #1 - Fault						Via Ethernet
	Air Scour Blower #1 - S/S Control						Via Ethernet
	Air Scour Blower #1 - Speed Control						Via Ethernet
	Air Scour Blower #1 – Run Status – running		1				To control panel light
	Air Scour Blower #1 – Run Status - Stopped		1				To control panel light
	Air Scour Blower #2 - Run						Via Ethernet
	Air Scour Blower #2 - Fault						Via Ethernet
	Air Scour Blower #2 - S/S Control						Via Ethernet
	Air Scour Blower #2 - Speed Control						Via Ethernet
	Air Scour Blower #2 – Run Status – running		1				To control panel light
	Air Scour Blower #2 – Run Status - Stopped		1				To control panel light
	Air Blower Vent Valve - Opened	1					
	Air Blower Vent Valve - Closed	1					
	Air Blower Vent Valve - Open Control		1				
	Air Blower Vent Valve - Close Control		1				
	Filter #1 – Left						
LIT-110	Level			1		0-10 Ft	
	Initiate Backwash	1					
	Backwash Valve - Opened	1					
	Backwash Valve - Closed	1					
	Backwash Valve - Open Control		1				
	Backwash Valve - Close Control		1				
	Backwash Waste Valve - Opened	1					
	Backwash Waste Valve - Closed	1					
	Backwash Waste Valve – Open Control		1				
	Backwash Waste Valve – Close Control		1				

	Air Scour Valve - Opened	1				
	Air Scour Valve - Closed	1				
	Air Scour Valve – Open Control		1			
	Air Scour Valve – Closed Control		1			
	Filter-to-Rinse Valve - Opened	1				
	Filter-to-Rinse Valve – Closed	1				
	Filter-to-Rinse Valve – Open Control		1			
	Filter-to-Rinse Valve – Closed Control		1			
	Filter #1 – Right					
LIT-115	Level			1		0-10 Ft
	Initiate Backwash	1				
	Backwash Valve - Opened	1				
	Backwash Valve - Closed	1				
	Backwash Valve - Open Control		1			
	Backwash Valve - Close Control		1			
	Backwash Waste Valve - Opened	1				
	Backwash Waste Valve - Closed	1				
	Backwash Waste Valve – Open Control		1			
	Backwash Waste Valve – Close Control		1			
	Air Scour Valve - Opened	1				
	Air Scour Valve - Closed	1				
	Air Scour Valve – Open Control		1			
	Air Scour Valve – Closed Control		1			
	Filter-to-Rinse Valve - Opened	1				
	Filter-to-Rinse Valve – Closed	1				
	Filter-to-Rinse Valve – Open Control		1			
	Filter-to-Rinse Valve – Closed Control		1			
	Filter #2 – Left					
LIT-120	Level			1		0-10 Ft

	Initiate Backwash	1					
	Backwash Valve - Opened	1					
	Backwash Valve - Closed	1					
	Backwash Valve - Open Control		1				
	Backwash Valve - Close Control		1				
	Backwash Waste Valve - Opened	1					
	Backwash Waste Valve - Closed	1					
	Backwash Waste Valve – Open Control		1				
	Backwash Waste Valve – Close Control		1				
	Air Scour Valve - Opened	1					
	Air Scour Valve - Closed	1					
	Air Scour Valve – Open Control		1				
	Air Scour Valve – Closed Control		1				
	Filter-to-Rinse Valve - Opened	1					
	Filter-to-Rinse Valve – Closed	1					
	Filter-to-Rinse Valve – Open Control		1				
	Filter-to-Rinse Valve – Closed Control		1				
	Filter #2 – Right						
LIT-125	Level			1		0-10 Ft	
	Initiate Backwash	1					
	Backwash Valve - Opened	1					
	Backwash Valve - Closed	1					
	Backwash Valve - Open Control		1				
	Backwash Valve - Close Control		1				
	Backwash Waste Valve - Opened	1					
	Backwash Waste Valve - Closed	1					
	Backwash Waste Valve – Open Control		1				
	Backwash Waste Valve – Close Control		1				
	Air Scour Valve - Opened	1					
	Air Scour Valve - Closed	1					

	Air Scour Valve – Open Control		1			
	Air Scour Valve – Closed Control		1			
	Filter-to-Rinse Valve - Opened	1				
	Filter-to-Rinse Valve – Closed	1				
	Filter-to-Rinse Valve – Open Control		1			
	Filter-to-Rinse Valve – Closed Control		1			
	Filter #3 – Left					
LIT-130	Level			1		0-10 Ft
	Initiate Backwash	1				
	Backwash Valve - Opened	1				
	Backwash Valve - Closed	1				
	Backwash Valve - Open Control		1			
	Backwash Valve - Close Control		1			
	Backwash Waste Valve - Opened	1				
	Backwash Waste Valve - Closed	1				
	Backwash Waste Valve – Open Control		1			
	Backwash Waste Valve – Close Control		1			
	Air Scour Valve - Opened	1				
	Air Scour Valve - Closed	1				
	Air Scour Valve – Open Control		1			
	Air Scour Valve – Closed Control		1			
	Filter-to-Rinse Valve - Opened	1				
	Filter-to-Rinse Valve – Closed	1				
	Filter-to-Rinse Valve – Open Control		1			
	Filter-to-Rinse Valve – Closed Control		1			
	Filter #3 – Right					
LIT-135	Level			1		0-10 Ft
	Initiate Backwash	1				
	Backwash Valve - Opened	1				

	Backwash Valve - Closed	1				
	Backwash Valve - Open Control		1			
	Backwash Valve - Close Control		1			
	Backwash Waste Valve - Opened	1				
	Backwash Waste Valve - Closed	1				
	Backwash Waste Valve – Open Control		1			
	Backwash Waste Valve – Close Control		1			
	Air Scour Valve - Opened	1				
	Air Scour Valve - Closed	1				
	Air Scour Valve – Open Control		1			
	Air Scour Valve – Closed Control		1			
	Filter-to-Rinse Valve - Opened	1				
	Filter-to-Rinse Valve – Closed	1				
	Filter-to-Rinse Valve – Open Control		1			
	Filter-to-Rinse Valve – Closed Control		1			
	Filter #4 – Left					
LIT-140	Level			1		0-10 Ft
	Initiate Backwash	1				
	Backwash Valve - Opened	1				
	Backwash Valve - Closed	1				
	Backwash Valve - Open Control		1			
	Backwash Valve - Close Control		1			
	Backwash Waste Valve - Opened	1				
	Backwash Waste Valve - Closed	1				
	Backwash Waste Valve – Open Control		1			
	Backwash Waste Valve – Close Control		1			
	Air Scour Valve - Opened	1				
	Air Scour Valve - Closed	1				
	Air Scour Valve – Open Control		1			

	Air Scour Valve – Closed Control		1				
	Filter-to-Rinse Valve - Opened	1					
	Filter-to-Rinse Valve – Closed	1					
	Filter-to-Rinse Valve – Open Control		1				
	Filter-to-Rinse Valve – Closed Control		1				
	Filter #4 – Right						
LIT-145	Level			1		0-10 Ft	
	Initiate Backwash	1					
	Backwash Valve - Opened	1					
	Backwash Valve - Closed	1					
	Backwash Valve - Open Control		1				
	Backwash Valve - Close Control		1				
	Backwash Waste Valve - Opened	1					
	Backwash Waste Valve - Closed	1					
	Backwash Waste Valve – Open Control		1				
	Backwash Waste Valve – Close Control		1				
	Air Scour Valve - Opened	1					
	Air Scour Valve - Closed	1					
	Air Scour Valve – Open Control		1				
	Air Scour Valve – Closed Control		1				
	Filter-to-Rinse Valve - Opened	1					
	Filter-to-Rinse Valve – Closed	1					
	Filter-to-Rinse Valve – Open Control		1				
	Filter-to-Rinse Valve – Closed Control		1				
	I/O Totals	80	72	9	1		

END OF SECTION

SECTION 16951

CONTROL DESCRIPTIONS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
 - 1. General Programming Requirements
 - 2. PLC Programming
- B. Related Sections
 - 1. Section 16900
 - 2. Section 16950
 - 3. I/O list
- C. PLC programming services shall be provided by a single firm with sufficient experience to complete this scope of work.
- D. Scope of work shall also include, but is not limited to:
 - 1. Review of vendor supplied control panels for coordination with PLC and HMI programming.
 - 2. Develop and test new PLC program based on control descriptions provided in this specification section.
 - 3. Develop and test HMI screens
 - 4. Loop test all PLC input and output points for proper operation. The electrical contractor will terminate I/O points based on control panel drawings.
 - 5. Verify new instrument setup and calibration.
 - 6. Verify Ethernet communication between PLC and VFDs.
 - 7. Provide training to the City of Grand Junction personnel on new system.

1.2 REFERENCES

- A. ISA 5.1 – Instrumentation Symbols and Identification
- B. NEMA ICS 1 – General Requirements for Industrial Control and Systems
- C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts

1.3 SYSTEM DESCRIPTION

- A. All the programming performed under this section shall be done in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the software manufacturer, unless exceptions are noted by engineer.

1.4 SUBMITTALS

- A. Submittals shall be required as noted in section 16900.

1.5 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be programmed under this agreement
 - 2. These control descriptions are provided for informational purposes and for coordination between the system supplier and the programmer.

PART 2 EXECUTION

2.1 SYSTEM DESCRIPTION

- A. The network diagram found in the drawings shall provide a basic overall description of the PLC system.

2.2 GENERAL PROGRAMMING REQUIREMENTS

- A. Tag database structure and configuration.
 - 1. The process control system tag naming convention shall include the definition of all devices, derived and soft tags, and the required alarm processing and data logging definitions for each tag.
 - 2. Tag naming convention.
 - a. The tag naming convention shall be:
 - i) Tag numbers shall be grouped as follows:
 - a) 100's –
 - b) 200's –
 - c) 300's –
 - d) 400's – Blowers
 - e) 500's –
 - f) 600's –
 - g) 700's –
 - ii) Tag names shall minimally consist of two distinct components. The leading component shall be an abbreviated description of the associated process variable or the function of the tag it represents. The trailing component shall be the tag equipment number.
 - 3. All logic and control shall be done in the PLC
- B. PLC Programming standards.
 - 1. General Considerations
 - a. Program Documentation
 - i) Documentation for all PLC programs shall include comments, tag/register descriptions, or any other programming tags. All PLC programs shall be documented with comments provided for each subroutine, function and/or section. Use of abbreviations in comments and subroutine/section titles should be avoided. At the completion of the project, copies of programming,

I/O list, memory map and communications map shall be provided in both printed and electronic format.

b. Motors

- i) All motors shall have runtime totalizers and start counters. Both values shall be totalized regardless of whether the motors are in auto and manual control modes.
- ii) Every motor that has PLC control shall have a manual or automatic operation for the motor. If manual is selected then the operator shall be able to start or stop the motor. If the motor is controlled from a VFD then the operator shall be able to enter a speed set point for the VFD. In automatic operation the control logic shall start and stop the motor as well as control the speed.
- iii) The following signals shall be determined for all motors.
 - a) HOA switch in Auto
 - b) Run Indication
 - c) Fault Indication.
 - d) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec. if the motor is in auto.
 - e) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec. if the motor is in auto.

c. Analog signals

- i) All analog inputs shall be scaled in Engineering units to be used in the logic.
- ii) A low level and high level alarm shall be generated for each analog signal. Each alarm shall have separate alarm and reset set points that shall be operator programmable from the HMI screen.

2.3 SPECIFIC DEVICE CONTROL CRITERIA

A. PROJECT OVERVIEW

1. This project will rehabilitate the four existing (dual cell) mixed media filters at the existing facility. The existing surface wash system will be removed and a new air scour system will be installed. It will include two new positive displacement blowers, variable frequency drives, etc. Each filter cell will have one new air scour supply line with an electrically actuated butterfly valve. The existing filter underdrains and media will be removed and replaced as well and new ultrasonic level sensors will be installed in each cell for backwash control.
2. In addition to treatment process and equipment improvements, control system improvements, including modifications to the plant's existing control system, will be required. Identified system changes primarily target integration of controls for new/improved treatment processes and equipment. Modifications to the plant's motor control center are also part of this project.
3. No attempt was made herein to fully describe the precise and full functionality of the City of Grand Junction's existing control system. It is the responsibility of the I/C Subcontractor, in preparation of its bid, to make an assessment of the modifications that will be required to achieve any new or improved required functionality described in these Specifications. In most cases, the control loop descriptions herein describe control system functionality required by the completion of this project.

B. FILTRATION – ON-LINE CONTROL DESCRIPTION

1. The existing filters are controlled through the plant's existing Control System. There are no local control panels for each filter. No changes will be made to the control sequencing for the On-Line mode. The filters will operate in the same manner as they do now. An operator adjustable setpoint for the minimum water level in each filter will be controlled using the existing ultrasonic level sensor in the sedimentation basin.

C. FILTRATION – BACKWASH CYCLE CONTROL DESCRIPTION

1. Each filter has two cells, but only one cell is backwashed at a time.
2. There will be two filter wash (control) sequences during the improvement project. Those filters which have not been taken off-line for demo shall continue to be controlled using the existing backwash sequencing. The filters that have been taken offline for rehabilitation shall have their control sequencing changed/updated as described below. As a precaution all electrically and/or pneumatically controlled valves associated with a filter offline for rehabilitation work shall be manually closed.
3. Once a backwash cycle is initiated in the plant's Control System (for a rehabilitated filter) the control sequence shall be as described below.
 - a. Select filter and cell to be washed. This shall be initiated by the operator by a pushbutton on the main control panel for each filter.
 - b. Closes the filter's influent valve(s).
 - c. Influent flow is then evenly divided between the remaining filters online.
 - d. Allows the filter's effluent valves to continue operating until the water level is lowered to an operator-adjustable elevation setpoint (about 6" above the media surface) as confirmed through the ultrasonic level signal.
 - e. Closes the filter's effluent valves.
 - f. Confirms that there are no other filters in a BACKWASH operational state. If there are, the Control System delays continuation of the backwash sequence until this filter remains as the only one in a BACKWASH state. The Control System shall not backwash more than one filter cell at a time.
 - g. Confirms that there is sufficient water volume in the wet well using the existing pressure transducer to supply backwash water to execute a backwash. This is performed by checking the wet well's water level against an operator-adjustable setpoint. If not, the Control System delays continuation of the backwash sequence until the wet wells water level exceeds the setpoint.
 - h. The Control System generates a Backwash Standby alarm (visual indication) for any filter for which the Control System is interrupting the backwash sequence waiting for resources. The Control System clears the alarm automatically once the constraint is removed.
 - i. Opens the filter's backwash waste valve.
 - j. Opens the blower vent (to atmosphere) valve
 - k. Once the blower vent valve is proven open, starts the blower with the filter cell's air supply isolation valve closed.
 - l. Opens a filter cell's air supply isolation valve.
 - i) If the blower fails to start, blower air vent valve fails to open or the filter air isolation valve fails to open when called during the backwash sequence, the Control System shall: initiate an alarm to alert the operator and begin a countdown with an operator-adjustable duration; once the

countdown has concluded, move onto the hydraulic wash only step of the backwash sequence, shutting the blower down (if required) and keeping the air vent and filter cell's air isolation valve closed.

- m. Closes the blower vent valve to deliver design air flow rate to the filter.
- n. Scours filter for an operator-adjustable "Air scour only duration" setpoint at a target rate of 4 scfm/sf of filter. The air scour rate shall be operator adjustable between 2 and 4 scfm/sf of filter. The Controls shall display the air supply flow rate from the blower's speed monitoring equipment.
- o. Opens the backwash supply flow control valve to an operator-adjustable "initial % open" setpoint.
- p. Starts backwash pump.
- q. Opens the filter cell's backwash water supply isolation valve to begin the concurrent air-water wash phase.
- r. Modulates the position of the backwash supply flow control valve to achieve an operator-adjustable concurrent air-water wash backwash water supply flow rate setpoint at the main backwash supply flow meter. The Control System shall modulate the valve's position until it achieves a flow meter reading within an operator-adjustable tolerance (1 to 2%) amount of the flow set point. Note that if the Control System is unable to modulate the flow control valve's position to achieve a flow rate that is within the specified tolerance range within an operator-adjustable time period, the Control System will generate a visual alarm.
- s. When the rising water level in the filter reaches the bottom of the filter cell's wash troughs, as verified via ultrasonic level signal, the Control System shall simultaneously open the blower air vent valve and close the filter's air supply isolation valve. This shall be done slowly - over a minimum of 60 seconds.
- t. Turns the blower off.
- u. Closes the blower air vent valve.
- v. When the filter cell's air supply isolation valve proves closed, modulates the position of the backwash supply flow control valve to achieve an operator-adjustable (high rate) backwash water supply flow rate setpoint at the main backwash supply flow meter over an operator-adjustable time period (approx. 60 seconds). The Control System shall modulate the valve's position until it achieves a flow meter reading within an operator-adjustable tolerance (1 to 2%) amount of the flow set point. Note that if the Control System is unable to modulate the flow control valve's position to achieve a flow rate that is within the specified tolerance range within an operator-adjustable time period, the Control System will generate a visual alarm.
- w. Backwashes the filter with water only at the higher rate for an operator-adjustable time period (typically 1.5 to 2.0 bed volumes). This time period shall commence once the filter cell's backwash water supply reaches the flow set point.
- x. Gradually closes the main backwash water supply control valve over an operator-adjustable time period (min. 60 seconds).
- y. Turns off backwash pump.
- z. Closes the filter cell's backwash water supply isolation valve.
- aa. Closes the filter cell's backwash waste valve.

- bb. Once the wash procedure is over the operator will need to reopen the Backwash Valve and the Drain Valve to prepare to refill the filter as both these valves close automatically after the backwash is done
- cc. Follow the Filter-To-Rinse SOP to refill filter with clean water
- dd. Repeat all steps to backwash the remaining filter cell
- ee. Both filter cells can then be brought back online

When a filter is in the Air Scour Only phase of the backwash cycle, valves shall be opened, closed or modulating as depicted in the table below.

Valve(s) (actuator service condition)	Open	Closed	Modulating
Filter Cell Flow Control/FE (modulating)		X	
Main BWS (modulating)		X	
Filter Cell BWS (open/close)		X	
Filter BWW (open/close)	X		
Filter Cell Air Supply (open/close)	X		

When a filter is in the Concurrent Air-Water Wash phase of the backwash cycle, valves shall be opened, closed or modulating as depicted in the table below.

Valve(s) (actuator service condition)	Open	Closed	Modulating
Filter Cell Flow Control/FE (modulating)		X	
Main BWS (modulating)			X (chasing flow setpt.)
Filter Cell BWS (open/close)	X		
Filter BWW (open/close)	X		
Filter Cell Air Supply (open/close)	X		

When a filter is in the Hydraulic Wash Only phase of the backwash cycle, valves shall be opened, closed or modulating as depicted in the table below.

Valve(s) (actuator service condition)	Open	Closed	Modulating
Filter Cell Flow Control/FE (modulating)		X	
Main BWS (modulating)			X (chasing flow setpt.)
Filter Cell BWS (open/close)	X		
Filter BWW (open/close)	X		

Filter Cell Air Supply (open/close)		X	
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D. Monitoring and Control:

Equipment	Local Controller	Remote Controller	Motor Controller
Air Scour Supply Blower	VFD in Blower Bldg	Control System	VFD in Blower Bldg
Backwash Water Supply Flow Meter	Upstairs on control panel	Control System	N/A
Backwash Supply Flow Control Valve	None – valve actuator	Control System	N/A
Filter Valves	None – valve actuator	Control System	N/A

1. Local Control:

- a. For backwashing, the main backwash supply flow control valve can be manually modulated at the control station on the Main Control Panel. The backwash isolation valves can be operated manually with selector switches on the Main Control Panel. The blower can be operated manually at its VFD and the isolation valves at their actuators.

2. Computer Manual Control:

- a. No additional backwash-specific computer manual control functions are envisioned beyond the current Control System manual controls and backwash initiation(s).

3. Control System generated alarms and indications (not covered in previous Part):

Alarm / Indication	Prior-ity	Comment
Backwash air supply flow rate	-	SCFM
Blower run failure alarm	-	The vent and filter air isolation valves shall remain closed until operator acknowledges.
Blower vent valve status	-	open/closed/required
Blower run status	-	on/off/required
Blower motor high temperature alarm	-	Shutoff blower. All filter valves shall remain closed until operator acknowledges. If operator-adjustable acknowledgment countdown period expires, filter proceeds to hydraulic backwash
Blower stage high temperature alarm	-	
Blower vent valve failure (open/close) alarm	-	
Blower VFD alarms	-	
Backwash air supply flow rate – out of range alarm	-	Visual indication alarm only

<i>For Each Filter</i>		
Filter cell air supply valve status	-	open/closed/required

4. Set points/data to be entered by the operator in the Control System:

Set point	Allow. Range / Typ. Value
Filter water level for air scour – <i>target 6" above media</i>	4820.75 to 4821.00 / 4820.75 ft. el.
Backwash air supply – low flow alarm	0 to 1,300 / 1,000 SCFM
Backwash air supply – high flow alarm	0 to 1,300 / 1,250 SCFM
Air scour only - duration	0 to 10 / 2 min
Concurrent air/water wash - backwash water supply flow rate setpoint – <i>target 5 GPM/SF</i>	0 to 2,000 / 1,400 GPM
Concurrent air/water wash – air shut-off water level trigger – <i>target trough bottom</i>	4821.85 to 4822.15 / 4821.85 ft. el.

5. Historical Database and Trends (not included in previous Part):

Description	Trend	Historical Database
Backwash air flow rate	Yes	Yes
Blower VFD frequency (Hz)	Yes	Yes
Blower run time (hour meter)	No	Yes
Valve run times (hour meters)	No	Yes

E. FILTRATION – FILTER TO RINSE CONTROL DESCRIPTION

1. The existing filter to rinse is controlled through the plant's master control system. No changes will be made to the control sequencing for the Filter-to-Rinse mode.

END SECTION

SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Demolition, removal, salvage and disposal of equipment, piping, structures and materials where indicated on the drawings and as specified in this section
- B. Demolition and removal of concrete wheeler block underdrain support system

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01500 – Construction Facilities and Temporary Controls
- C. Division 11

1.3 SUBMITTALS

- A. Permits and Certificates
 - 1. Permits and notices authorizing building demolition
 - 2. Certificates of severance of utility service
 - 3. Permit for transport and disposal of debris

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1 specifications
- B. Accurately record actual locations of capped utilities and subsurface obstructions

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, and disposal
- B. Obtain required permits from authorities having jurisdiction
- C. Notify affected utility companies before starting work and comply with their requirements
- D. Do not close or obstruct roadways, sidewalks, or hydrants without written permission from Owner

- E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials

1.6 SCHEDULING

- A. Schedule and submit under provisions of Division 1 specifications
- B. Provide detailed descriptions for demolition and removal procedures
- C. Notify Engineer and Owner of any demolition work one (1) week prior to commencement
- D. Coordinate all demolition work with Engineer and Owner

PART 2 PRODUCTS

2.1 SALVAGE OF MATERIALS

- A. Remove and return to Owner the following Equipment and Materials:
 - 1. Surface wash control valves located outside of each filter
 - 2. Pressure sensor on the surface wash drop pipe of filter 1 (north cell)
- B. All existing construction and items not salvaged to Owner shall be considered waste and shall become the property of Contractor for off-site disposal
- C. Remove the following Equipment and Materials as indicated on Drawings and described herein:
 - 1. Surface wash equipment, piping, supports, beams, and spray nozzles
 - 2. Filter media (sand, anthracite, and gravel)
 - 3. Wheeler underdrains
 - 4. Concrete underdrain supports
- D. Filter media (sand, anthracite and gravel) and concrete to be disposed of onsite at direction of the City. Fill existing sedimentation basin that is within 150 yards of the existing filters.

2.2 HANDLING AND STORAGE

- A. Contractor shall carefully disassemble Equipment and Materials that are to be reused and returned to Owner in such a way to avoid any damage. Contractor shall store such Equipment and Materials in such a way to avoid any damage, corrosion, or staining.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify areas to be demolished are unoccupied and discontinued in use
- B. Do not commence work until conditions are acceptable to Engineer and Owner
- C. Existing conditions of Equipment and Materials, structures, surfaces, or properties that could be misinterpreted as damaged as a result of demolition work shall be photographed and filed with Owner and Engineer prior to commencement of Work

3.2 PREPARATION

- A. Provide, erect, and maintain temporary barriers, enclosures, security fences and shoring at demolition locations in accordance with Division 1 and other related specifications to protect personnel and water quality
- B. Ensure that the filter processes left in operation during demolition will not be negatively affected by the demolition by separating construction work zones enclosed in buildings from other areas that are occupied or in operation with an industrial air tight dust curtain, location approved by the Owner.
- C. An effective dust control method must be utilized throughout concrete removal operations and any other operation that could negatively affect water quality. Methods include, but are not limited to, local exhaust ventilation, wet dust suppression, and vacuum dust collection. Maintain all dust control measures per equipment manufacturer.
- D. Extra care should be taken during the removal of filter media to avoid contamination of active water filtration processes. Barriers should be erected to effectively contain dust and filter media.
- E. Protect existing structures and utilities which are not to be demolished
- F. Provide temporary wiring and connections to maintain existing telephone, electrical, instrumentation and control systems in service during construction
- G. Protect existing electrical and controls equipment and cabinets from dust and debris intrusion. Set up temporary barriers to preclude dust from being introduced into cabinets and equipment. Additionally seal all doors, windows, cabinets and equipment while demolition is occurring. Control and or turn off existing heating and ventilation systems that will introduce or distribute dust and debris from the demolition operations
- H. Mark location of existing utilities

3.3 GENERAL REQUIREMENTS

- A. Sprinkle Work with water to minimize dust where applicable. Provide hoses and water connections for this purpose
- B. Do not use water to extent causing flooding, contaminated runoff, or icing
- C. Remove demolished material from the site
- D. Repair damage to adjacent structures
- E. Remove existing exposed piping and electrical wiring and conduit to be abandoned to structural surface, cut flush, and finish to match existing surfaces

3.4 DISPOSAL

- A. Do not store or burn waste materials on-site
- B. Transport demolition debris to designated off-site disposal area
- C. If hazardous materials are encountered during demolition work, Contractor shall comply with applicable regulations and laws regarding the removal, handling, and protection of environment and human health

3.5 CONNECTION TO EXISTING CONSTRUCTION

- A. Cut and remove portions of existing construction as necessary to allow for proper installation of new construction Equipment and Materials
- B. Shore and brace existing structures to maintain safe structure conditions and until permanent structures and supports are completed
 - 1. Contractor shall repair all damage in result of installation of shoring and bracing
- C. Cap, seal or abandon pipe and cable as indicated on Drawings and specified herein

3.6 CLEANUP AND REPAIR

- A. Contractor shall remove tools, equipment and demolished materials from Site upon completion of demolition work
 - 1. Remove protections
 - 2. Interior areas shall be broom clean
 - 3. Inspect and clean all electrical control cabinets, interior and exterior, exposed to dust and debris during the demolition process
- B. Contractor shall repair demolition performed in excess of that required or indicated
 - 1. Surfaces and structures to remain shall be repaired to the existing conditions prior to commencement of demolition work

3.7 ELECTRICAL DEMOLITION

A. General:

1. Remove, relocate and extend existing installation to accommodate new construction

END OF SECTION

SECTION 02676

DISINFECTION OF WATER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Disinfection of potable water piping, potable water storage facilities, treatment unit equipment and piping, pumping equipment and piping; testing and reporting results

1.2 RELATED SECTIONS

- A. Section 00315 – Pre-Purchased Equipment
- B. Section 03300 – Concrete
- C. Section 11361 – Filter Underdrains and Media (Installation Only)
- D. Section 15060 – Pipe and Pipe Fittings
- E. Section 15100 – Valves, Cocks and Hydrants

1.3 REFERENCES

- A. American Water Works Association (AWWA)
 - 1. B300 – Standard for Hypochlorites
 - 2. B301 – Standard for Liquid Chlorine
 - 3. B302 – Standard for Ammonium Sulfate
 - 4. B303 – Standard for Sodium Chlorite
 - 5. C651 – Disinfecting Water Mains
 - 6. C652 – Disinfection of Water Storage Facilities
 - 7. C653 – Disinfection of Water Treatment Plants
- B. National Sanitation Foundation (NSF)
 - 1. Standard 60 – Drinking Water Treatment Chemicals - Health Effects

1.4 SUBMITTALS

- A. Submit under provisions of 01340
- B. Complete listing of all materials to be used including preparation requirements and recommended application techniques. Include material safety data sheets.
- C. Test Reports: Indicate results comparative to specified requirements

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700
- B. Disinfection report; record:
 - 1. Type and form of disinfectant used
 - 2. Date and time of disinfectant injection start and time of completion
 - 3. Test locations
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in parts per million (ppm) or milligram per liter (mg/L) for each outlet tested
 - 5. Date and time of flushing start and completion
 - 6. Disinfectant residual after flushing in ppm for each outlet tested
- C. Bacteriological report; record:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number
 - 2. Time and date of water sample collection
 - 3. Name of person collecting samples
 - 4. Test locations
 - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested
 - 6. Coliform bacteria test results for each outlet tested
 - 7. Bacteriologist's signature and authority

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA C651, C652, C653, and the Colorado Department of Public Health and Environment (CDPHE)

1.7 REGULATORY REQUIREMENTS

- A. Conform to AWWA C651, C652, C653, as appropriate, and the Colorado Department of Public Health and Environment regulations for performing the work of this Section

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. The forms of chlorine that may be used in the disinfecting operations are liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules or tablets.
 - 1. *Liquid Chlorine.* Liquid chlorine contains 100% available chlorine. Liquid chlorine shall be used only: (1) in combination with appropriate gas-flow chlorinators and injectors to provide a solution feed of controlled concentration to the water to be chlorinated, (2) under the direct supervision of a person familiar with chlorine's physiological, chemical, and physical properties, and who is trained and equipped to handle any emergency that may arise, and (3) when appropriate safety practices are observed to protect working personnel and the public.

2. *Sodium hypochlorite.* Sodium hypochlorite is available in liquid form in glass, rubber-lined, or plastic containers typically ranging in size from 1 pint to 5 gallons; containers of 30-gallon or larger size may be available in some areas. Sodium hypochlorite contains approximately from 5% to 15% available chlorine, when purchased. The strength of the sodium hypochlorite solution will deteriorate, and chlorate will be formed over time. The rate of deterioration is strongly affected by storage conditions.
 3. *Calcium hypochlorite.* Calcium hypochlorite is available in granular form or in small tablets, and contains approximately 65% available chlorine by weight. The material should be stored in a cool, dry and dark environment to minimize its deterioration. The precautions listed on the container should be carefully noted.
- B. Calcium and sodium hypochlorite shall conform to AWWA B300 and B301
- C. Store hypochlorite in a cool, dark place away from flammable materials

PART 3 REQUIREMENTS

3.1 SUMMARY

- A. Work under this Section shall include preparations, materials, disinfectant application procedures and microbiological sampling/testing procedures for the disinfection of water treatment units and piping. The interior of all new, modified, repaired, or otherwise potentially-contaminated elements at the treatment plant that are downstream of the filter influent (or of the first point of disinfectant application if disinfectant is applied upstream of the filters) shall be disinfected before they are placed in service. This includes such elements that are taken out of service for inspection, repairing, modification, cleaning or other activity, which might lead to contamination of water.
- B. For this project, at a minimum, the treatment process segments to be disinfected are:
1. All filter basins
 2. All filter effluent piping between filters and clearwell if it becomes contaminated through the Contractor's construction practices
 3. Clearwell if it becomes contaminated through the Contractor's construction practices

3.2 CLEANING

- A. The newly installed filter basins and underdrains (including treatment units and piping not requiring disinfection under this specification) shall be thoroughly cleaned before new facilities are disinfected and placed in service. All existing treatment units and piping temporarily taken out of service for inspection, maintenance, repair, or any other activity that might lead to contamination of the process water shall be thoroughly cleaned before being disinfected and returned to service. Cleaning agents used shall not contain

hazardous substances or deleterious compounds that would cause a violation of water quality health-effects standards if subsequently introduced into the water supply during disinfection and filling operations.

- B. All scaffolding, planks, tools, rags, and any other material not part of the structural or operating facilities of the treatment unit shall be removed. Once the materials are removed, the surfaces of the walls, floors, and attached structures shall be thoroughly cleaned with a high-pressure water jet, or by sweeping, scrubbing, or other equally effective means. All water, paint flakes, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the unit.

3.3 UNITS REQUIRING DISINFECTION

- A. Disinfection is required for all elements of the treatment plant that are in contact with disinfected water under normal plant operations. All treatment units and piping located downstream from the filtrate discharge header including, but not limited to, filtrate discharge piping downstream of chlorination point, clearwells, and all associated piping and appurtenances shall be disinfected as described in this specification before being placed in service.
- B. PLANT PIPING
 - 1. All plant piping downstream of the filter influent shall be disinfected using one of three alternative methods described in ANSI/AWWA C651, including application methods, chlorine solutions strengths, retention times, disposal of highly chlorinated water, and bacteriological sampling and testing.
- C. FILTER BASINS
 - 1. All filter basins, and similar receptacles shall be disinfected per ANSI/AWWA C652, including application methods, chlorine solution strengths, retention times, disposal of highly chlorinated water, and bacteriological sampling and testing.

3.4 CHLORINATED DISCHARGE

- A. If there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize the residual chlorine. Federal, state, or local environmental regulations may require special provisions or permits prior to disposal of highly chlorinated water.

PART 4 EXECUTION

4.1 CLEANING

- A. Verify that piping and filtration system has been cleaned and inspected
- B. Verify that piping has been successfully pressure tested and flushed

- C. Perform scheduling and disinfection activity with start-up, testing, adjusting, demonstration procedures, including coordination with related systems

4.2 DISINFECTION

- A. *General.* Flush and disinfect potable water lines in accordance with the procedure set forth in AWWA C651, Disinfecting Water Mains, latest edition. The Contractor shall provide and attach all temporary blow-offs, pumps, chlorination equipment, chlorine and all other necessary apparatus required to perform the work of this Section.
 - 1. Pipe Cleaning. If any pipe contains dirt or heavy encrusted matter that, in the opinion of the Engineer, will not be removed during the flushing operation, the Contractor shall clean and swab the interior of the pipe with a five percent (50,000 ppm) chlorine solution.
 - a. Preliminary Flushing. Flush pipeline prior to disinfection, except when the tablet method is used, to remove all remaining foreign material. The flushing operation shall develop a minimum velocity of 2.5 feet per second.
 - 2. Chlorine Application. In general, chlorine shall be applied using the continuous feed method. However, on large diameter lines where this would not be practical, the slug method may be used. The tablet method may be used on short extensions (up to 2500 feet) of small diameter mains (12 inches and smaller). Tablet, continuous, or slug disinfection may be followed in accordance with AWWA C651.
 - a. Continuous Feed Method (preferred). Inject treatment disinfectant, free chlorine in liquid form into piping system to obtain 50 to 80 ppm residual. Bleed water from outlets to ensure distribution and test for disinfectant residual. Maintain the chlorinated water in the pipeline for a minimum of 24 hours. If final disinfectant residual tests less than 25 ppm of chlorine throughout the entire length, repeat treatment. Flush, circulate and clean until residual equal to that of incoming potable water or 1.0 ppm is achieved.
 - b. Slug Method. Introduce water with a minimum chlorine concentration of 100 mg/l at a constant measured rate into the pipeline. Apply column or slug of chlorinated water that will, as it passes along the line, expose all interior surfaces for a period of three hours. Check the application at the upstream end of the line.
 - c. Tablet Method. This method shall not be used if trench water or foreign material has entered the line or if the water is below 5°C (41°F). Because preliminary flushing cannot be used, this method shall only be used when scrupulous cleanliness has been exercised.
 - 1 Place tablets in each section of pipe in sufficient number to produce a dose of 25 mg/l. Refer to Table 2 of AWWA C651, latest edition, for the required minimum number of tablets. All tablets within the main must be attached at the top of the pipe. Introduce water into the pipeline at a rate no

greater than 1 ft./sec. and retain the water in the pipeline for a period of 24 hours after which period the treated water shall show a detectable chlorine residual at each sampling point.

- B. Replace permanent system devices removed for disinfection

4.3 FINAL FLUSHING

- A. Maintain a flushing velocity of 2.5 feet per second in piping
- B. Collect chlorinated water for proper disposal and/or dechlorinate to less than 0.1 ppm free chlorine prior to discharge in accordance with State, County, and local regulations

4.4 FIELD QUALITY CONTROL

- A. After final flush, and before main or equipment is placed in service, collect water samples from representative points along the main or from the equipment and field test for chlorine residual
- B. Chlorine residual shall be within 50 percent of the chlorine residual prevailing in the source
- C. If initial disinfection fails to provide satisfactory samples, repeat disinfection until satisfactory samples have been obtained

4.5 TESTING, VERIFICATION AND ACCEPTANCE

- A. Bacteriological sampling and testing
 - 1. After the chlorination procedure is completed, and before the treatment unit of facility is placed in service, two or more samples shall be taken from the unit or facility not less than 30 min apart and shall be tested for the presence of coliform in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater. If none of the samples show the presence of coliform, one of the following procedures shall be followed before placing the unit or facility in service.
 - a. Take repeat samples at least 24 hr apart until consecutive samples do not show the presence of coliform
 - b. Chlorinate the unit or facility in accordance with Section 4.2 and resample
 - 2. If any portion of the piping or equipment or tanks fails Bacteriological testing, the Contractor is responsible for repeating disinfection procedures until passing Bacteriological test is obtained
- B. Record of Compliance

1. The record of compliance shall be the report of bacteriological test results certifying that the water held in the affected portions of the treatment plant is free of coliform bacteria. A copy of this shall be provided to the Owner, or his designated representative, prior to putting new facilities into operation.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cast-in-place concrete
- B. Reinforcing steel
- C. Forms
- D. Concrete accessories

1.2 RELATED SECTIONS

- A. 03600 - Grout

1.3 REFERENCE STANDARDS AND GUIDES

- A. Comply with the following except as modified by supplementary requirements of this Project Specification.
- B. American Concrete Institute – ACI:
 - 1. 117 – Standard Specifications for Tolerances for Concrete Construction and Materials
 - 2. 214 – Recommended Practice for Evaluating Compression Test Results of Field Concrete
 - 3. 301 – Specifications for Structural Concrete
 - 4. 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete
 - 5. 305 – Hot Weather Concreting
 - 6. 306 – Cold Weather Concreting
 - 7. 308.1 – Guide to Curing Concrete
 - 8. 309 – Guide for Consolidation of Concrete
 - 9. 315 – Details and Detailing of Concrete Reinforcement
 - 10. 318 – Building Code Requirements for Structural Concrete
 - 11. 347 – Guide to Formwork for Concrete
 - 12. 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary
- C. American Standards and Testing Materials (ASTM)
 - 1. A615 – Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
 - 2. C31 – Practice for Making and Curing Concrete Test Specimens in the Field
 - 3. C33 – Concrete Aggregates
 - 4. C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 5. C94 – Specification for Ready-Mixed Concrete

6. C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
7. C150 – Specification for Portland Cement
8. C173 or C231 – Test Methods for Air Content of Freshly Mixed Concrete
9. C260 – Air Entraining Admixtures for Concrete
10. C309 – Liquid Membrane-Forming Compounds for Curing Concrete
11. C452 – Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate
12. C494 – Chemical Admixtures for Concrete
13. C618 – Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral admixture in Portland Cement Concrete
14. D1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D. Concrete Reinforcing Steel Institute (CRSI)

1. DA4 – Manual of Standard Practice
2. P1 – Placing Reinforcing Bars

E. National Institute of Standards and Technology (NIST)

1. PS 1 – Structural Plywood

1.4 PERFORMANCE TOLERANCES

- A. Confirm to ACI 117, ACI 301, ACI 347 and ACI 350 as modified herein. In case of conflict, ACI 117 governs. ACI 350 governs where ACI 117 does not apply.

1.5 SUBMITTALS

- A. Submit under provisions of Division 1 specifications

B. Shop Drawings: Reinforcing bar lists, fabrication and placement drawings

1. Indicated bar sizes, spacing, locations, and quantities of reinforcing steel. Bending and cutting schedules shall be included in all shop drawings.
2. Indicate pertinent dimensions, materials, bracing, arrangement of joints and ties, and exact location of openings, framing, and special conditions affecting work
3. All shop drawings shall be original drawings produced by the supplier and shall not be reproductions of the Contract Documents

C. Product Data: Provide sufficient information on products specified to verify compliance with specifications. Provide data on

1. Joint devices
2. Attachment accessories
3. Admixtures and mixes
4. Curing Compounds
5. Sealers
6. Waterstops
 - a. Product data for all waterstop to be used, including preformed intersections
 - b. Product data for waterstop splicing iron, showing compliance with manufacturer's recommendations

- c. Installation procedures to be followed, showing compliance with manufacturer's recommendations
- D. Test Reports
1. Submit reports of tentative concrete mix designs and testing prior to placing any concrete, including
 - a. Slump range on which the design is based
 - b. Total gal of water per cu yd
 - c. Brand, type, composition, and quantity of cement with manufacturer and plant location identified
 - d. Brand, type, composition and quantity of fly ash
 - e. Specific gravity and gradation of each aggregate
 - f. Ratio of fine to total aggregates
 - g. Surface-dry weight of each aggregate per cu yd
 - h. Brand, type ASTM designation, active chemical ingredients and quantity of each admixture
 - i. Air content and tolerance
 - j. Water/cementitious material ratio and tolerance
 - k. Compressive strength based at 7- and 28-day compression tests
 - l. Submit reports of field quality control testing
 - m. Time of initial set
 2. Submit suppliers certified fly ash test reports for each shipment delivered to concrete supplier
 - a. Physical and chemical characteristics
 - b. Certification of compliance with the specifications
 - c. Signed by Contractor and concrete supplier
 3. Existing data on proposed design mixes are acceptable if certified and complete
- E. Construction Joint Locations: Submit all proposed construction joint locations in slabs and walls to Engineer two (2) weeks prior to placing any concrete.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301 and ACI 350. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305 when concreting in hot weather.
- C. Follow recommendations of ACI 306 when concreting in cold weather.
- D. Acquire cement and aggregate from same source for all work

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle materials under provisions of Division 1 Specifications
- B. Cement and fly ash: Store in moisture proof enclosures, do not use if caked or lumpy

- C. Aggregate: Store to prevent segregation and inclusion of foreign materials, do not use the bottom 6-inch of piles in contact with the ground
- D. Reinforcing steel
 - 1. Store on supports 6" minimum off of ground, which will keep it from contact with ground and protected from oil or other materials detrimental to steel or bonding capability. Cover to prevent unacceptable surface corrosion and contamination.
 - 2. Tag bundles of reinforcing bars and wire spirals with metal tag showing specification, grade, size, quantity and suitable identification to permit checking, sorting and placing.
 - 3. Tag bundles of flat sheets and rolls of welded wire fabric similar to reinforcing bars.
- E. Rubber and plastic materials: Store in a cool place, do not expose to direct sunlight
- F. Prepare a delivery ticket for each load of ready-mixed concrete
- G. Truck operator shall hand ticket to Geotechnical Engineer or Third Party Inspector at the time of delivery with ticket to show:
 - 1. Quantity delivered
 - 2. Actual quantity of each material in batch
 - 3. Outdoor temp in the shade
 - 4. Time at which cement was added
 - 5. Numerical sequence of the delivery
 - 6. Quantity of water that can be added in the field based on mix design
 - 7. Free moisture in fine and coarse aggregate in percent by weight
 - 8. Temperature of batch

PART 2 PRODUCTS

2.1 FORMS

- A. Prefabricated: Symons "Steel-Ply" or accepted substitution
- B. Plywood: PS 1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete Grade B or better
- C. Lumber: Straight, uniform width and thickness; free from knots, offsets, holes, dents, and other surface defects
- D. Chamfer strips: Clear, white pine, surface against concrete planed
- E. Form coating: Colorless biodegradable oil or water based release agent that will not stain concrete and is VOC compliant. Acceptable products: Nox-Crete "Nox-Crete Form Coating", L & M "Debond", or accepted substitution
- F. Form ties: Removable end, permanently embedded body types with waterstops not requiring auxiliary spreaders, with cones on both ends, embedded portion 1-inch

minimum back from concrete face. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.

2.2 REINFORCING STEEL

- A. Bars: ASTM A615, Grade 60
- B. Beam Stirrups and column ties: ASTM A615, grade 40
- C. Bar supports: CRSI Class 1, fabricated from galvanized wire having PVC coated legs
- D. Tie wire: 16 ½ gage or heavier, black annealed wire
- E. Form and fabricate reinforcing steel in accordance with ACI 315 and 318 and CRSI DA4 except as specified or indicated on Drawings, free from rust, scale and contaminants which will reduce bond.
- F. Dowel Adhesive: Hilti "HIT RE 500", Powers "PE 1000+", Simpson "SET-XP", or accepted substitution.

2.3 CONCRETE

- A. Cement: ASTM C150, Type I/II modified cement tested to meet type V for sulfate resistance per ASTM C150 Table 4 and ASTM C452. Cement should have a tricalcium aluminate content of not more than 8 percent.
- B. Fly ash: ASTM C618, Class F
- C. Fine aggregate: Clean, natural sand, ASTM C33; no manufactured or artificial sand
- D. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material, ASTM C33 except clay and shale particles no more than 1%. Free of all materials deleteriously reactive with alkalis in the cement in an amount to cause excessive expansion of concrete.
- E. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel.
- F. Admixtures
 - 1. Air entraining agent: ASTM C260; Grace "Darex AEA", Master Builders "MB-VR", Sika Chemical "AEA", or accepted substitution
 - 2. Chemical Admixtures: ASTM C494, non-corrosive and chloride free.

2.4 WATERSTOPS

- A. Expansion and contraction joints: Elastic
 - 1. PVC: Ribbed or serrated,
 - a. 6 inch wide by 3/8 inch thick, Vynylex "R6-38," Greenstreak "679", or accepted substitution

- b. For concrete section less than 8 inch thick or as indicated on the drawings: 4 inches wide by 3/16 inch thick ribbed or serrated
 - c. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field
 - d. Provide hog rings or grommets spaced at 12 inches on center along length of waterstop
 - e. Provide Teflon coated waterstop splicing irons approved by manufacturer for field butt splices.
2. Between existing and new concrete: Install hydrophilic swellable strip

2.5 ACCESSORIES

- A. Membrane Forming Curing Compound: ASTM C309, L&M Construction Materials "Dress & Seal WB30", BASF "MasterKure CC 200WB", Euclid "Super Diamond Clear VOX", or accepted substitution.
- B. Epoxy Bonding Agent: ASTM C881, Sika "Sikadur 32 Hi-Mod", Dayton Superior "Sure Bond J58", L&M Construction Materials "Epobond", or accepted substitution. Use when joining new to existing concrete.
- C. Non-Epoxy Bonding Agent: ASTM C1059 Type II, Larson Products "Weld-Crete", BASF "MasterEmaco A 660", L&M Construction Materials "Everbond", or accepted substitution. Use when joining new to existing concrete when bonding agent cannot be placed immediately prior to placement of new concrete.
- D. Patching Mortar: Sika "Sikatop", L&M Construction Materials "Durapatch VOH", or accepted substitution.

2.6 CONCRETE MIX DESIGN

- A. Concrete Mix: Measure and combine cement, aggregate, water, and admixtures in accordance with ASTM C94 and ACI 211.1.
 1. Cement: When used in exposed concrete shall be one brand from one source. Do not mix different cements in same element of Work.
 2. Water-Cement Ratio (if fly ash used, water-cement plus fly ash ratio): 0.45 maximum for 4000 psi or 4500 psi concrete, 0.52 maximum for 3000 psi concrete.
 3. Air-Entrainment: Air-entrain concrete exposed to exterior or exposed to liquids.
 4. Chemical Admixtures: Use is optional to aid concrete properties and allow for efficient placement. Manner of use and amount shall be in accordance with manufacturer's written recommendations and as approved by Engineer. Do not use admixtures that increase early shrinkage or negatively affect finishing.
 5. Fly Ash: Use is optional unless otherwise noted. Combine fly ash with cement at a rate of 1 pound fly ash for each pound reduction of cement. Amount of fly ash shall not be less than 15% or more than 25% of weight of cement plus fly ash. When fly ash used, minimum amount of cement designated may be proportionately reduced.
 6. Use no admixtures other than specified, unless approved by Engineer.
- B. Class of Concrete:

1. Furnish in accordance with table. Cement contents listed are minimum values and shall be increased as required to attain other specified characteristics.
2. Slumps listed are maximum, except when high range water reducer is used. Maximum slump when high-range water reducer is used, 10 inches.
3. Chloride ion content shall not exceed values listed in ACI 318, Table 4.3.1.

Use	28-Day Compressive Strength (psi)	Coarse Aggregate (size no.)	Minimum Cement Content (bags/cu yd)	Air Content (%)	Slump (in.)
Interior Slabs	4000	67	6.0	2±1	3±1
Interior Equipment Pads	3000	67	4.75	2±1	3±1
psi = pounds per square inch cu yd = cubic yard in. = inch max = maximum					

2.7 FABRICATION

- A. Reinforcing Steel: Accurately formed, fabricated in accordance with ACI 315 and 318 and CRSI DA4 except as specified or indicated on drawings, free from rust, scale and contaminants which will reduce bond

2.8 SOURCE QUALITY CONTROL

- A. Test the proposed concrete mix for each size and gradation of aggregates and each consistency intended for use in the project
- B. Aggregates
 1. Sample and test according to ASTM C33
 2. Determine bulk specific gravity in accordance with ASTM C127 and C128
- C. Compression tests
 1. Prepare 2 sets of compression test cylinders from each proposed concrete mix, 4 cylinders per set
 2. Test 1 set of 4 cylinders at 7 days, the other at 28 days
 3. Make, cure and store in accordance with ASTM C192
 4. Test in accordance with ASTM C39
- D. Slump test: ASTM C143
- E. Total air content: ASTM C231
- F. Fly Ash: Supplier's chemical composition and physical analysis test
- G. Initial set test
 1. In accordance with ASTM C403

2. Test at 70 degrees F and 90 degrees ambient
3. Test at 70 degrees F on mix including specific plasticizing and entraining admixtures
4. Test at 90 degrees F on mix including specified retarding and air entraining admixtures
5. Fly ash: Supplier's chemical composition and physical analysis test

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions in field or under provisions of Division 1 Specifications
- B. Verify requirements for concrete cover over reinforcement
- C. Verify that anchors, seats, plates, reinforcement and other items to be case into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions
- B. Remove standing water, ice, mud, and foreign matter before placing concrete
- C. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels with dowel adhesive system.

3.3 FORMS

- A. Formwork design, detailing, and installation shall be Contractor's responsibility and shall conform to ACI 347R.
- B. Type of forms used is Contractor's option, except as otherwise indicated or shown. Plywood and other wood forms shall have smooth level surfaces treated with form oil or sealer to produce clean release of concrete from forms.
 1. Where wall remain exposed use plywood, prefabricated metal or wood forms; do not use boards. Lay forms out in a uniform pattern with the long dimension of the form placed vertically and joints aligned.
 2. Provide $\frac{3}{4}$ inch chamfer on external corners of exposed concrete walls, beams, columns, equipment bases and exposed edges of construction joints. Do not chamfer edges flush with masonry walls.
- C. Coat plywood and wood forms with non-staining form release agent. Apply release agent before reinforcement is placed.
- D. Clean, patch, and repair form material before reuse.

- E. Formwork shall prevent leakage of mortar, shall not deflect under weight of concrete and workmen, and shall withstand fluid pressure of concrete. Maximum deviation from a true plane: 1/8 inch within 6 feet
- F. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement
- G. Design to produce hardened concrete to the shape, lines, and dimensions indicated on the drawings
- H. Plywood or lined forms are not required for surface normally submerged or not normally exposed to view
- I. Other type of forms may be used for surfaces not restricted to plywood or lined forms as backing for form lining
- J. Flat segmental forms, 2 foot maximum width, may be used for curved surfaces 25 feet minimum diameter
- K. Provide polyethylene film to protect concrete from water loss when placing concrete against gravel or crushed rock not containing 25 percent minimum material passing a No. 4 sieve, lap joint 4 inches
- L. When placing concrete against rock, remove all loose pieces of rock and clean exposed surface with high pressure hose
- M. Size and space wailers, studs, internal ties and other form supports so proper working stresses are not exceeded
- N. Locations to be finished to a specified elevation, slope, or contour, bring form to true line and grade and provide a wooden guide strip at the proper location in the forms for finishing the top surface with a screed or template
- O. At horizontal construction joints in walls, stop the forms on one side not more than 2 feet above the joint
- P. Provide temporary opening at the bottom of columns and wall forms and wherever necessary for cleaning and inspection
- Q. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads
- R. Leave shoring beneath beams and slabs in place and reinforce as required for construction equipment and materials
- S. Maintain forms in place for a minimum of 40 hours for length of curing time in accordance with ACI 306/306R when temperature is 45 deg F and below

- T. Remove forms carefully to prevent surface gouging, corner or edge breakage and other damage

3.4 REINFORCING STEEL

- A. Accurately position reinforcing steel on supports, spacers, hangers, or other reinforcing steel at maximum intervals of 4 feet on center
- B. Secure with wire ties or suitable clips. Tie 50 percent of all reinforcement and reinforcement at intersections for wall and floor construction
- C. Except at contact splices, minimum clear distances between bars, the greater of
 1. Nominal diameter of bars
 2. 1.5 times max size of coarse aggregate
- D. Splices
 1. As specified or indicated on the drawings
 2. Splices at other locations will be acceptable, if approved by the Engineer
 3. Do not weld or tack weld reinforcing steel.
 4. Remove and replace steel upon which any unauthorized welding has been performed

3.5 EMBEDMENTS

- A. Accurately position and securely anchor in forms, anchor bolts, steel shapes, conduit, sleeves, masonry anchorages, and other materials to be embedded in concrete
- B. Cast pipe and other embedded items into concrete as placement progresses. Do not provide blockouts.
- C. Do not place ducts, conduit, and pipes in slabs on grade. Place minimum 4 inches below slab
- D. Place items constructed of dissimilar metals to avoid physical contact with reinforcing. Secure item and reinforcing to ensure they will not shift and come into contact during concrete placement. Contact between reinforcing steel and other metal, other than bare, coated, or plated carbon steel not permitted.
- E. Following restrictions shall be adhered to, unless otherwise noted
 1. No duct, conduit, pipe, or fitting placed vertically shall be larger in cross-sectional area than 4% oc column into which it is placed.
 2. Duct, conduit, pipe, and fittings, when placed within slabs or walls
 - a. Shall not be larger than 1/3 thickness of slab or wall
 - b. Shall be placed within the middle 1/3 of slab or wall where possible
 - c. Shall not be placed closer than 3 outside diameters clear from each other when parallel
 - d. Shall cross each other at right angles
 - e. Shall be secured to prevent shifting of “floating” during concrete placement
 - f. Multiple conduits shall not cross each other at the same location

- g. Except for conduits that must run up a column, keep conduits a minimum of 2 to 3 feet away from columns
 - h. Where conditions require conduit to be tied to the inside face of the reinforcing mat, the conduit shall be galvanized steel or PVC, shall be placed 3 outside diameter clear away from the parallel reinforcement bar.
3. Reinforcing steel shall be in place before embedded items placed and reinforcing cut or removed shall be replaced with additional reinforcing as indicated.
 4. Do not pass sleeves through columns or beams without Engineer's approval.

F. Anchor bolts

1. Unless installed in pipe sleeves, provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template
2. Install a second nut on the other side of the form or template
3. Adjust the nuts to hold the bolt rigidly in the proper position

G. Clean embedments before installation

3.6 TRANSPORTING MIXED CONCRETE

- A. Transporting of mixed concrete shall conform to ACI 304R.
- B. Maximum delivery time from batch plant is 90 minutes
- C. Do not exceed manufacturer's guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.
- D. Do not incorporate additional mixing water into the concrete during hauling or after arrival at the delivery point, unless ordered by the Engineer. If additional water is to be incorporated into the concrete, revolve the drum not less than 30 revolutions at mixing speed after the water is added and before placing concrete.
- E. Notify Special Inspector of any water added to the concrete mixture
- F. Furnish a water measuring device in good working condition, mounted on each transit mix truck, for measuring the water added to the mix on the site by the Engineer
- G. Provide delivery ticket to Special Inspector or Owner and comply with delivery requirements of this section

3.7 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304, ACI 301, and ACI 318
- B. Schedule and attend pre-pour meeting with Owner at least 7 days before first pour to review requirements of this specification
- C. Notify Engineer and Owner not less than 48 hours in advance of the times and places at which contractor intends to place concrete

- D. Predetermine limits at each pour and place all concrete within limits of pour in one continuous operation
- E. Construction joint locations shall be approved by the Engineer
- F. Rigidly secure forms, reinforcing steel, embedment, and anchor bolts in proper position
- G. Remove all mud, water, ice, snow, frozen material, and debris from space to be occupied by concrete
- H. Clean surfaces encrusted with dried concrete from previous concrete operations
- I. Convey to the point of final deposit by methods which will prevent separation or loss of ingredients
- J. Place concrete in final position without being moved laterally more than 5 feet
- K. Place concrete in horizontal layers not more than 2 feet of depth to allow for proper consolidation
- L. Place subsequent layer while the preceding layer is still plastic
- M. Top finish concrete when thoroughly settled
- N. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping or other effective means
- O. Provide vertical construction joints as required to comply with these requirements
- P. Limit portions of columns and walls poured monolithically with floor or roof slabs to 6 feet of vertical height
- Q. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete.

3.8 BONDING TO HARDENED CONCRETE

- A. Place new concrete on rough, clean, damp faces of existing concrete
- B. Roughen concrete to be bonded to future concrete to 1/4 inch amplitude
- C. Remove surface mortar of smooth surfaces to expose aggregate
- D. Clean hardened concrete of all foreign substances, including curing compound, washed with clean water, and keep saturated for 24 hrs preceding placement of fresh concrete
- E. Apply epoxy bonding agent for bonding to hardened concrete

3.9 CONSOLIDATION

- A. Thoroughly consolidate concrete during and immediately after placement
- B. Work concrete around all reinforcements and embedments and into the corners of the forms
- C. Use mechanical vibrators which will maintain 9,000 cycles per minutes when immersed in the concrete, 1 ½ hp motor minimum

3.10 COLD WEATHER CONCRETING

- A. Conform to ACI 306, except as modified herein
- B. Minimum concrete temp at the time of mixing

<u>Outdoor Temp at Placement (in shade)</u>	<u>Concrete Temp at Mixing</u>
Below 30°F	70°F
Between 30°F & 45°F	60°F
Above 45°F	45°F

- C. Do not place heated concrete which is warmer than 80 degrees F
- D. If freezing temp are expected during curing, maintain the concrete temp at or above 50 deg F for 5 days or 70 deg F for 3 days with forms in place
- E. Do not allow concrete to cool suddenly

3.11 HOT WEATHER CONCRETING

- A. Conform to ACI 305, except as modified herein
- B. At air temp of 90 degrees F and above keep concrete as cool as possible during placement and curing
- C. Do not allow concrete temperature to exceed 80 deg F at placement
- D. Prevent plastic shrinkage cracking due to rapid evaporation of moisture
- E. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs per sq ft per hr as determined from ACI 305, Fig 2.1.5

3.12 CONSTRUCTION JOINTS

- A. Unless otherwise noted, construction joints shown are optional. Joints not shown on Drawings shall be approved by Engineer. Locate to miss splices in reinforcement.
- B. Limit size on concrete pours. Maximum length of wall and slab pours shall not exceed 60 feet.

- C. Before concrete placed, construction joints shall be cleaned, laitance removed, and surface wetted. Remove standing water.
- D. Locate construction joints in floors within middle third of span. Construction joints in floors supported by walls may be located at center of wall.
- E. Construction joints shall have keys or roughened surfaces. Where roughened surfaces are used, surface shall have amplitude of ¼ inch minimum.
- F. Make control joints in slabs on grade of preformed control joint strips set flush with finished surface, by construction joint, by tooled joint, or cut ¼ inch wide joints with diamond saw within 12 hours after placement.
 - 1. Cut alternate reinforcing bars or wires crossing joint.
 - 2. Control joints shall be minimum ¼ depth of slab.
 - 3. Fill construction joint, tooled joint, and sawed control joints with epoxy joint filler.
 - 4. Unless otherwise indicated, spacing of control joints shall not exceed //10// feet in each direction.
- G. Install construction joints in slabs perpendicular to the planes of their surfaces

3.13 WATERTIGHT JOINTS

- A. Provide waterstop in construction joints at the following locations:
 - 1. Walls and slabs separating dry interior from earth or liquid.
 - 2. Exterior walls and slabs of liquid holding tanks.
 - 3. Slabs above occupied areas
 - 4. Other locations shown on Drawings.
- B. PVC Waterstops
 - 1. Follow all manufacturer's recommendations and instructions for installation.
 - 2. Protect and maintain clean and free of dirt and coatings which would weaken the bond with concrete. Sandblast or power-wash waterstop prior to placing concrete if any dirt, concrete, cement paste, or other deleterious material is found or remains from previous concrete placements.
 - 3. Provide continuous through the length of the construction joint
 - 4. Any waterstop punctured or damaged shall be repaired or replaced
 - 5. Do not wrap waterstop around corners. Use factory-formed joints at all changes of direction, intersections, and transitions.
 - 6. Field butt splices shall be heat fused welded using a Teflon coated waterstop splicing iron approved by waterstop manufacturer. Follow manufacturer recommendations for splicing procedures. Lapping of waterstop, use of adhesives, or solvents shall not be allowed
 - 7. Center waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 12 inches on center along the length of the waterstop and wire tie to adjacent reinforcing steel. Protect and maintain in proper position until surrounding concrete is deposited and compacted.
 - 8. Waterstop splicing defects which are unacceptable include, but are not limited to the following: Tensile strength less than 80 percent of parent section; misalignment of

ribs greater than 1/16 inch; bond failure at joint deeper than 1/16 inch or 15 percent of material thickness; misalignment that reduces waterstop cross section more than 15 percent; visible porosity in the weld; bubbles or inadequate bonding; visible signs of splice separation when cooled splice is bent by hand at a sharp angle; charred or burnt material.

3.14 FINISHING SLABS AND FLATWORK

A. Slab Finishes:

Description	Concrete Finish
Surfaces to Receive Grout or Topping	Float
Submerged and Buried Slabs	Float

B. After placement, screed concrete with straightedges, power strike-offs or vibrating screeds.

C. After screeding, bull float or darby surfaces to eliminate ridges and to fill in voids left by screeding.

D. Float:

1. Use magnesium or aluminum hand floats or power floats with slip on float shoes.
2. Float finish shall result in uniform smooth granular texture.

E. Tolerances:

1. Concrete slabs shall be within 3/16 inch of 10 foot straightedge in all directions except where slabs are dished for drains. Deviations from elevation indicated shall not exceed 3/4 inch.
2. Pitch floor to floor drains minimum 1/8 inch per foot or as shown. Pitch bottom of slab or beam to match top slope to maintain thickness or depth indicated. As an alternate, bottom of slab or beam may be placed level provided that min thickness or depth is maintained.

3.15 FINISHING FORMED SURFACES

A. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed

B. Use a power grinder, if necessary, to remove projections and provide a flush surface

C. Remove fins and fill all tie holes on surfaces exposed to view

1. Clean, dry and fill plastic cone snap tie holes with Patching Mortar. Fill taper tie through-bolt form tie holes with Non-Shrink Grout.
2. Finish flush to match the texture of adjacent concrete

D. Grout smooth all exposed surfaces under provisions of Chapter 10, ACI 301 unless indicated otherwise

1. Grout clean surfaces exposed to view to produce a smooth uniform surface free of marks, voids, surface glaze and cement dust

2. Use non-shrink grout mix with bonding agent. Dampen surface and apply with cork or rubber float

3.16 CURING AND PROTECTION

- A. Protect concrete from frost and keep moist for min curing period of 7 days after placement in accordance with ACI 308.
 1. Formed Surfaces:
 - a. Wet cure by spraying surfaces as frequently as drying conditions may require to keep concrete surfaces moist.
 - b. Surfaces may be cured by leaving forms in-place. For vertical surfaces, apply water to run down inside of forms, if necessary, to keep concrete moist.
 - c. After forms are removed, wet cure for remainder of curing period or apply curing compound.
 - d. Do not use curing compound where mortar, grout, concrete, or other coatings or adhesives will be applied.
- B. Flatwork:
 1. Cure using curing compound or wet cure.
 2. Do not use curing compound where mortar, grout, concrete, or other coatings or adhesives will be applied.
- C. Curing Compound:
 1. Apply curing compound at uniform rate sufficient to comply with requirements for water retention as specified and as measured in accordance with ASTM C156.
 2. Cover areas subjected to direct sunlight with ambient temperature expected to exceed 80°F with white pigmented compound, other surfaces may be covered with fugitive dye compound.
- D. Water curing
 1. Begin water saturation as quickly as possible after initial set
 2. Regulate water application to provide complete surface coverage with minimum runoff
 3. Interrupt the application of water to walls for grout cleaning only over the area being cleaned at the time and do not permit the surface to become dry during such an interruption
- E. Protect from damaging mechanical disturbances, load stresses, heavy shock, and excessive vibration.
- F. Protect finished concrete surfaces from damage caused by construction equipment, materials, and methods, and from rain or running water.
- G. Do not load self-supporting structures to overstress concrete.

3.17 REMOVAL OF FORMING AND SHORING

- A. Do not remove forming or shoring until member supported has acquired sufficient strength to safely support own weight and any imposed loads. Forming shall remain in place for at least min time recommended by ACI 347R. In addition, forming for horizontal members shall remain in place minimum 7 days. In no case shall forming for horizontal members be removed before concrete has reached 70% of specified design strength.
- B. Reshore areas as required to carry additional imposed loads.

3.18 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. General:
 - 1. Prior to starting repair work, obtain Engineer's approval of proposed repair techniques and materials.
 - 2. Method of repair shall not adversely affect the appearance of the finished structure.
 - 3. Develop repair techniques on portion of as-cast surface selected by Engineer. Surface of repair remaining exposed to view shall match color and texture of adjacent surfaces.
 - 4. Prepare surfaces, apply and install materials, and cure as recommended by material manufacturers.
- C. Defective Areas:
 - 1. Remove honeycombing, stone packets, spalls, and other defective concrete down to sound concrete. If chipping required, make edges perpendicular to surface. Do not feather edges.
 - 2. Fill defective area with patching mortar
- D. Leaks or wet spots:
 - 1. Inject, patch and repair areas where leaks or wet spots have occurred inside dry structures.
 - 2. Inject, patch and repair areas where leaks or wet spots have occurred in wet wells, basins, tanks, and other structures which are to hold water and exceed the allowable leakage rate specified in this section.

3.19 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with ACI 301 under provisions of Section 01400
- B. Owner's geotechnical consultant provide field and compressive strength tests to determine compliance of concrete materials in accordance with the specifications except as indicated otherwise under provisions of Section 01400

- C. The Owner shall pay for compressive strength tests to determine compliance of concrete material in accordance with the specifications
- D. Field Control Test
 - 1. Tests by ACI certified technician
 - 2. Provide all equipment, supplies, and the services of one or more employees, as required
 - 3. The test frequencies specified are minimum. Additional tests may be performed as required by the job conditions
- E. Slump: Provide a sample from each truck load in accordance with ASTM C143 if requested by Engineer and when making test cylinders
- F. Air Content: Provide a sample from each truck load if requested by Engineer and when making test cylinders
- G. Compression Tests
 - 1. Provide one set of 6 cylinders each day when up to 50 cu yds have been placed
 - 2. Make one additional set of 6 cylinders for each additional 50 cu yds or each major pour placed in one day
 - 3. Test two cylinders in each set at 7 days
 - 4. Test two cylinders in each set at 28 days
 - 5. The other two cylinders to be used as directed by Engineer at any time
 - 6. Engineer will evaluate in accordance with ACI 214 and 318
 - 7. Make, cure, store, and deliver cylinders in accordance with ASTM C31
 - 8. Test in accordance with ASTM C39
 - 9. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump
- H. Storage Facilities for Concrete Test Cylinders
 - 1. Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM C31
- I. Failure of Test Cylinder Results: Evaluation of concrete structures where laboratory-cured cylinders fail to meet 28-day concrete strength requirements of the contract documents will be subject to, but not limited to, the following measures.
 - 1. Upon failure of 28-day test cylinder results, the Engineer may require the Contractor, at his expense, to obtain and test at least three 4-inch diameter cored samples from area in question
 - 2. Concrete will be considered adequate if average of three core tests is at least 85 percent of, and if no single core is less than 75 percent of, the specified 28-day strength
 - 3. In the event an area is found to be structurally unsound, the Engineer may order removal and replacement of concrete as required. The cost of the core tests and removal and replacement of defective concrete shall be borne by the Contractor
 - 4. Fill all core holes as specified for repairing defective concrete

5. Additional measures may be required at the direction of the Engineer in accordance with ACI 350

3.20 LEAKAGE TESTING OF WATER HOLDING STRUCTURES

- A. Structures shall be subjected to leakage tests after concrete has obtained specified design strength, and before backfilling or other Work which will cover faces of walls is begun
- B. Tanks laterally restrained or supported by cross-walls, beams or slabs shall not be tested until such restraining or supporting construction is placed and has obtained its specified design strength
- C. Fill structure with water to elevation given in the Table 1. After structure has been full for 24 hrs, it will be assumed for purposes of test that absorption of moisture by concrete in structure is complete. Measure change in water level after 24-hr has elapsed.
- D. If drop in water level, adjusted for evaporation in 24-hr period, exceeds 1/32 of an inch leakage shall be considered excessive
- E. During test period, examine structure and mark visible leaks or damp spots
- F. Drain structure to 2-ft minimum below leaks and damp spots and repair. Method of repair shall be Contractor's option, subject to requirements of these Contract Documents and review by Engineer.
- G. If leakage was determined to be excessive, refill structure to specified level and retest
- H. Continue this process until drop in water level in 24-hr period is less than 1/32 of an inch
- I. Repairs and additional tests shall be made by Contractor, in acceptable manner, at no additional cost to Owner

TABLE 1 LEAKAGE TEST ELEVATIONS		
<u>Structure No. and Name</u>	<u>Tank Designation</u>	<u>Test Elevation</u>
Filter Basins	1, 2, 3 and 4	4825.00

END OF SECTION

SECTION 03600
NONSHRINK GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Cement based grout for setting equipment base plates and for use in other areas as noted.

1.2 REFERENCES

- A. ASTM: American Society for Testing and Materials

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's literature.
- B. Submit in accordance with Section 01330.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Five Star NBEC by Five Star Products, Inc.
 - 2. SET Grout by BASF.
 - 3. Duragrout by L&M Construction Chemicals, Inc.
 - 4. SikaGrout 212 by Sika Corp.
 - 5. Moderate fluidity.
 - 6. 5000 pounds per square inch minimum compressive strength.
- B. Water: Potable.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean grout contact surfaces of oil, grease, scale, and other foreign matter.
- B. Chip away unsound concrete leaving surface rough but level.
- C. Clean base plates, rails, anchors, bolts, etc. in contact with grout of oil, grease, dirt, and coatings.

3.2 MIXING AND PLACING

- A. Mix and place in accordance with manufacturer's written instructions.
- B. Provide forming materials where necessary to retain grout until hardened.
- C. Work grout from one side. Avoid trapping air under base plate.
- D. Do not load grout until it has reached a minimum of 3000 pounds per square inch compressive strength.

3.3 CURING

- A. Cure as recommended by grout manufacturer.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and field application of primer and finish coatings for all new surfaces

1.2 RELATED SECTIONS

- A. Section 01080 – Identification Systems
- B. Division 11 – Equipment
- C. Section 15060 – Pipe and Pipe Fittings
- D. Section 16050 – Basic Electrical Materials and Methods

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D16 – Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
- B. NACE (National Association of Corrosion Engineers)
 - 1. Industrial Maintenance Painting
- C. NPCA (National Paint and Coatings Association)
 - 1. Guide to U.S. Government Paint Specifications
- D. National Science Foundation (NSF) – 61 Drinking Water System Components – Health Effects
- E. PDCA (Painting and Decoration Contractors of America)
 - 1. Painting – Architectural Specifications Manual
- F. SSPC (Steel Structures Painting Council)
 - 1. Steel Structures Painting Manual

1.4 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in the Section

1.5 SUBMITTALS

- A. Submit under provisions of Section 01340

- B. Product data: Provide data on all finishing products. Clearly identify paint type and intended use as outlined by schedules at the end of this section. Include material safety data sheets (MSDS).
- C. Color samples
 - 1. Furnish color chips or color card for color selection by Owner
 - 2. Contractor will provide pipe colors in accordance with color Schedule herein
- D. Manufacturer's instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention
- E. Maintenance data: Provide in Materials and Finishes Manual under provisions of Division 1 specifications

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years experience
- B. Applicator: Company specializing in performing the work of this section with minimum three years experience and approved by manufacturer for surface preparation and application of similar coating systems

1.7 REGULATORY REQUIREMENTS

- A. Comply with all health and fire regulations of agencies having jurisdiction for storage of materials
- B. Comply with current state requirements for air quality control permit and OSHA standards for sandblasting
- C. Comply with current state requirements for Volatile Organic Compounds (VOC's) of less than 3.5 pounds per gallon for all coatings

1.8 PRE-APPLICATION CONFERENCE

- A. Coating Manufacturer or Manufacturer's representative will attend a site coordination meeting to establish specific surface preparation procedures acceptable to Engineer and application and protection procedures of finished surfaces
- B. Contractor will coordinate meeting 7 days prior to the start of work in this section

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability. Maintain labels legible and intact.

- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, Federal specification number, and instructions for mixing and reducing and VOC content
- D. Store only acceptable project materials on project site
- E. Store coating materials at minimum ambient temperature of 45°F and a maximum of 90°F, in ventilated area, and as required by manufacturer's instructions and acceptable to Engineer
- F. Restrict storage area to paint materials and related equipment

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Comply with manufacturer's instructions as to environmental conditions under which coatings and coating systems can be applied
- B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the coating manufacturer's instructions and acceptable to Engineer
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating manufacturer's instructions and acceptable to Engineer
- D. Do not apply finish in areas where dust is being generated
- E. Minimum application temperatures for epoxy paints: 50°F surface temperature for interiors, surface to be dry and at least 5°F above the dew point; 50°F surface temperature for exterior, surface to be dry and at least 5°F above the dew point; unless permitted otherwise by manufacturer's instructions and acceptable to Engineer
- F. Relative humidity: 86 percent maximum
- G. Maintain temperatures of painted surfaces to effect curing times recommended by paint manufacturer and the product applied
- H. Provide lighting level of 80 ft-candles measured mid-height at substrate surface
- I. Provide a designated area with adequate spill control for paint storage, mixing, and thinning

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Polyamide epoxy: Tnemec Series 20 Pota-Pox

- B. Polyamidoamine epoxy: Tnemec Series N140/V140 Pota-Pox Plus
- C. Thin film epoxy flooring with non-skid:
 1. Primer: Series 201 Epoxoprime, two-component, moisture tolerant, penetrating modified polyamine cured epoxy primer with 211-211 Fumed silica additive for enhanced filling/surfacing capability's
 2. Intermediate Coat: Series 280 Tneme-Glaze, 100 % solids, two component, modified polyamide cured pigmented epoxy coating
 3. Topcoat: Series 291 CRU, two-component, chemical resistant, aliphatic polyester polyurethane finish
 4. Texture: Series 211 glass beads incorporated into the 291 CRU for enhance slip resistance
- D. Galvanized surface repair where directed by Engineer
 1. ZRC (Zinc Rich Compound) Cold Galvanizing Compound
 2. Tnemec Series 90G-1K97 Tneme-Zinc
 3. Brite Products – Brite Zinc Galvanizing Compound
 4. Or accepted substitution
- E. Aluminum paint: Tnemec – Series 43-36 Chrome Aluminum
- F. Products manufactured by Tnemec are indicated to establish level of quality. Other manufacturers will be considered

2.2 MATERIALS

- A. Use product of single manufacturer for coating systems for each type of surface
- B. Use paint compatible with shop coating or primer for field coating of shop painted or primed surfaces
- C. Use only mercury-free, fume-proof paint for intermediate and finish coats.
- D. Use only lead-free paint or paint that does not cause discoloration in water treatment plant atmosphere
- E. NSF 61 certified paint, primer, and thinners to be used if to be in contact with water being treated or potable water
- F. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags
- G. Accessory materials: Linseed oil, turpentine, paint thinners, methyl ethyl ketone (MEK), and other materials not specifically indicated but required to achieve the finishes specified, or commercial quality

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish schedule

- B. Use paint by same manufacturer for successive field coats
- C. Field coats to be compatible with shop applied undercoats

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and substrate conditions are ready to receive work as instructed by product manufacturer
- B. Examine surfaces scheduled to be finished that will adversely affect execution, permanence, or quality of work and which will not allow preparatory work outlined in preparation of surfaces. Report any condition that may potentially affect proper application prior to commencement of work
- C. Do not proceed with surface preparation or coating application until conditions are suitable
- D. Test shop-applied primer for compatibility with subsequent cover material
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Masonry, concrete, and concrete unit masonry: 8 percent
 - 2. Concrete floors: 8 percent or as specified by manufacturer, whichever is more stringent

3.2 SANDBLASTING PROCEDURES

- A. Steel. Structural, pipe, angles, beams, equipment, wall plates, pipe hangers, rods, pipe supports, stairs, platforms, handrails, plus steel accessories
 - 1. Non-submerged: SSPC-SP6
 - 2. Submerged or partially submerged (all interior tank surfaces): SSPC-SP10
 - 3. High temp surfaces to 1200°F: SSPC-SP10
- B. Ductile iron, cast iron: Pipe, equipment, fittings, plus miscellaneous items
 - 1. Non-submerged: SSPC-SP6
 - 2. Submerged or partially submerged (all interior tank surfaces): SSPC-SP10
- C. Mill coated steel pipe
 - 1. Exterior non-submerged: SSPC-SP6
 - 2. Exterior submerged or partially submerged: SSPC-SP10
- D. Concrete: Floor, wall, channels and troughs
 - 1. Submerged or partially submerged: SSPC-SP13, to create ICRI CSP-3.
- E. Profile of sandblasted surface: 2 mils
- F. Do not allow surfaces to become wet after blasting and before painting

- G. Apply primer same day as blasting
- H. Air free of water and oil
- I. Confine sandblast to area being prepared
- J. Protect nameplates, valve stems, rotating equipment, motors and other damageable items
- K. Do no reuse sand
- L. Plug pipe, holes, or openings before sandblasting. Keep covered until sand is removed

3.3 PREPARATION OF SURFACES

- A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing
- B. Correct defects and clean surfaces of new and existing materials
- C. Seal with shellac and seal marks which may bleed through surface finishes
- D. Impervious surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Aluminum surfaces scheduled for paint finish: Remove surface contamination by steam or high-pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- F. Insulated coverings: Remove dirt, grease, and oil from canvas and cotton
- G. Concrete floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Copper surfaces schedule for a paint finish: Remove contamination by steam, high-pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning
- I. Copper surfaces scheduled for a natural oxidized finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.
- J. Galvanized surfaces: SSPC-SP1; Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- K. Exterior uncoated steel and iron surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by power tool wire brushing or sandblasting where directed by Engineer; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

- L. Shop-primed steel surfaces: Sand and scrape to remove loose primer and rust by power tool wire brushing or sandblasting where directed by Engineer. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Reprime bare steel surfaces.

3.4 MIXING AND TINTING

- A. Deliver paints and enamels ready-mixed to job site
- B. Mix only in mixing pails, suitably sized, non-ferrous or oxide metal pans
- C. Use tinting colors recommended by manufacturer for specific type of finish
- D. Do not add any adulterants or unauthorized thinners
- E. Thoroughly mix each time paint is withdrawn from container
- F. Keep containers closed tightly except while paint is withdrawn
- G. All paint factory mixed
- H. Thinning only permitted to obtain recommended coverage at lower application temperatures
- I. Complete all mixing, thinning, and cleanup in a designated location with proper spill control. Do not mix paints inside of treatment filter building

3.5 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply initial coating until moisture content of surface is within moisture limitations recommended by manufacturer's instructions and acceptable to Engineer
- C. Do not apply finishes to surfaces that are not dry. Comply with recommendation of manufacturer for drying time between succeeding coats
- D. Apply each coat to uniform finish free of visible brush marks, streaks, laps, and missed areas
- E. Vary slightly the color of successive coats. Apply each coat of paint slightly darker than preceding coat unless otherwise approved
- F. Apply coating with suitable brushes, rollers, or spraying equipment
 - 1. Do not exceed rate of application recommended by manufacturer for the type of surface involved
 - 2. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminants, and suitable for the finish required
 - 3. When painting the waste gullet, the following procedures shall be used:

- a. The primer and intermediate coat shall be sprayed and back-rolled into the surface with a minimum 1" large nap roller. The topcoat may be applied without back-rolling.
4. When painting the floors, the following procedures shall be used:
 - a. Primer: The primer shall be mechanically mixed, applied and cured in strict accordance with manufacturer's printed instructions. Apply uniformly at a film thickness of 6 to 8 dry mils. The use of 211-211 Fumed Silica will increase the film thickness – to include filling small voids, spalls, etc – decreasing spread rate and increasing film thickness
 - b. Intermediate Coat: The 100% solids, epoxy-polyamide coat shall be mechanically mixed, applied and cured in strict accordance with the manufacturer's printed instructions. Apply uniformly at a film thickness of 6 to 12 dry mils
 - c. Topcoat and Texture: The chemically resistant finish coat shall be mechanically mixed, applied and cured in strict accordance with the manufacturer's printed instructions. Apply uniformly at a film thickness of 2 to 3 dry mils. Add Series 211 Glass Beads incorporated directly into coating to desired skid-resistance per data sheet
- G. Sand metal lightly between coats to remove defects, to achieve smooth uniform finish acceptable to Engineer
- H. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- I. Allow applied coat to dry and cure before next coat is applied
- J. Provide tie coats where recommended by manufacturer's instructions and acceptable to Engineer
- K. Do not apply additional coats until completed coat has been inspected by the Engineer
 1. Only inspected coats of paint will be considered in determining number of coats applied
- L. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping
- M. Rate of application
 1. Coverage not greater than value recommended by manufacturer's instructions
 2. Use of paint thinner not allowed as a means of extending coverage of paint
- N. Refinish whole wall where portion of finish has been damaged or is not acceptable
- O. Surfaces to be painted with water-thinned paint: Spot prime exposed nails and other ferrous metals with aluminum paint
- P. Remove all dents from doors and frames and apply one coat of finish paint before installing hardware

3.6 PIPING COLOR SCHEDULE

- A. Refer to Section 01080 for schedule of pipes and corresponding paint colors.

3.7 FIELD QUALITY CONTROL

- A. Comply with inspection and film thickness testing requirements of this section, SSPC-Volume 1, Chapter 6 and SSPC-PA 2. Provide results under provisions of Section 01400.

- B. General inspection sequence as follows:

1. Pre-surface preparation observation
2. Measurement of ambient conditions
3. Evaluation of compressor (air cleanliness) and surface preparation equipment
4. Determination of surface preparation cleanliness and profile
5. Review of application equipment
6. Witnessing of coating mixing
7. Observing coating application
8. Determination of wet film thickness (non-metallic substrates)
9. Determination of dry film thickness (metallic or non-ferrous metal substrates)
10. Pinhole and holiday testing of shop coatings as required
11. Adhesion testing as required
12. Evaluation cure

- C. Wet film thickness (WFT) testing:

1. Standard “notch” configuration or circular dial gauges
2. Use for concrete, wood or other non-metallic substrates
3. Determine dry film thickness per the following:

$$\text{WFT} = \frac{\text{specified dry film thickness}}{\% \text{ solids by volume}}$$

4. Decrease % solids by volume if coating is thinned per the following:

$$\text{WFT} = \frac{\text{specified dry film thickness}}{\% \text{ solids by volume} / (100\% + \% \text{ thinner added})}$$

5. Calibrate gauge per manufacturer’s instructions acceptable to Engineer

- D. Dry film thickness (DFT) testing:

1. Type 1: Magnetic pull-off type gauge
2. Type 2: Fixed probe magnetic flux gauge with microprocessor
3. Calibrate gauge per manufacturer’s instructions and SSPC-PA 2 acceptable to Engineer
4. Use eddy current type gauge or probe attachment for non-ferrous metal substrates
5. Gauge accuracy: $\pm 10\%$

- E. Number of measurements and minimum thickness in accordance with SSPC-PA 2:

1. Make five (5) separate spot measurements (average three readings for each spot measurement) spaced evenly over each 100 square feet (9 square meters) of area to be measured
 2. The average of five spot measurements for each such 100 square foot area shall not be less than the specified thickness
 3. No single spot measurement in any 100 square foot area shall be less than 80% of the specified thickness
 4. Any one of three readings which are averaged to produce each spot measurement may under-run by a greater amount
 5. The five spot measurements shall be made for each 100 square feet of area as follows:
 - a. For structures not exceeding 300 square feet in area, each 100 square foot area shall be measured
 - b. For structures not exceeding 1,000 square feet in area, three 100 square foot areas shall be randomly selected and measured
 - c. For structures exceeding 1,000 square feet in area, the first 1,000 square feet shall be measured as stated above and for each additional 1,000 square feet of area or increment thereof, one 100 square foot area shall be randomly selected and measured
 6. If the dry film thickness for any 100 square foot area is not in compliance with the requirements above, then each 100 square foot area shall be measured. Contractor shall reimburse Owner for additional time required to inspect each 100 square foot area in addition to the above spot measurement requirements. An additional coat may be applied in lieu of additional testing.
- F. Other size areas or number of spot measurements may be adjusted as appropriate for the size and shape of the structure to be measured as determined by the Engineer

3.8 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint shop-primed equipment
- B. Paint exposed conduit and electrical equipment occurring in finished office areas

3.9 CLEANING

- A. Collect waste material which may constitute a fire hazard, place in close metal containers and remove daily from site.
- B. Remove spilled or splattered paint from all finished surfaces
- C. Do not mar or scratch surface finish of items being cleaned

3.10 PROTECTION OF FINISHED WORK

- A. Use drop cloths, masking tape, and other measures to protect all surfaces from accidental spraying, spattering, or spilling of paint
- B. Prepare surface and re-coat surfaces damaged during delivery and installation or by construction activity

- C. Repair all damage caused by coating other items of work
 - 1. Immediately remove paint deposited on surfaces not to be coated
- D. Protect galvanized steel finishes. Repair damaged surfaces as follows:
 - 1. Power tool clean foreign matter, rust, slag residue, weld splatter from both damaged and contiguous undamaged area
 - 2. Clean with phosphoric acid base
 - 3. Brush apply two coats of cold galvanizing compound and overlap at least two inches onto contiguous undamaged area

3.11 SURFACES NOT TO BE PAINTED

- A. Except as otherwise required or directed, do not paint the following surfaces:
 - 1. Any PVC piping and conduit
 - 2. Exposed surfaces of aluminum, except where in contact with concrete
 - 3. Polished or finished stainless steels. Unfinished or dull stainless steel shall be painted.
 - 4. Nickel or chromium
 - 5. Exposed galvanized surfaces, except submerged or buried piping, structural conduit, duct work, and other items specifically noted
 - 6. Rubber and plastics that flex
 - 7. Copper instrument or pressure gauge tubing
 - 8. Surfaces specified to be factory finished only

3.12 PIPING AND ACCESSORIES

- A. Provide painted stenciled lettering (3-inch height, typical) and flow arrows on painted piping. Where PVC piping is exposed in buildings, provide stick-on labels (white background, black letters, 3-inch letter height, typical) to indicate service type and flow direction.
- B. Coat all exposed piping and piping in accessible place in accordance with color schedule listed above
- C. Coat any piping not scheduled to be color-coded according to the Ten State Standards with concurrence by the Engineer, include appropriate identification and flow direction arrows
- D. Locate lettering and flow direction arrows near equipment served, adjacent to valves, both sides of walls and floor where pipe passes through, at each branch or tee and at intervals of approximately 25 feet in straight runs of pipe acceptable to Engineer
- E. Provide metal tags instead of lettering for all pipes with outside diameter or pipe covering diameter 1-inch or smaller. Tags are to be of stainless steel or aluminum with identifying lettering stamped in and fastened to pipe with suitable chains

3.13 FINISH SCHEDULE – METAL SURFACES

- A. All non-submerged surfaces of structural and miscellaneous steel exposed in interior locations including conduit and supports. This includes all DIP in the main filter building and blower room. All valves will be factory coated as well as field coated.
 - 1. Primer: One coat epoxy primer – 6 mils
 - 2. Second Coat: Once coat epoxy – 2 mils
 - 3. Total dry film thickness: 8 mils

3.14 FINISH SCHEDULE – CONCRETE

- A. All concrete walls.
 - 1. Primer: One coat epoxy primer – 6 mils
 - 2. Second Coat: Once coat epoxy – 2 mils
 - 3. Total dry film thickness: 8 mils
- B. Floor and walls of the filter waste gullet
 - 1. Primer: One coat primer – 6 mils
 - 2. Intermediate Coat: One coat – 2 mils
 - 3. Top Coat: One coat – 2 mils
 - 4. Total dry film thickness: 10 mils
- C. All concrete floors in the filter gallery
 - 1. Primer: One coat primer – 6-8 mils
 - 2. Intermediate Coat: One coat – 6-12 mils
 - 3. Top Coat and Texture: One coat – 2-3 mils
 - 4. Minimum total dry film thickness: 18 mils

3.15 FINISH SCHEDULE – OTHER MISCELLANEOUS SURFACES

- A. PVC – Do not paint. See Section 3.11 and 3.12 for special conditions

END OF SECTION

SECTION 11140

FILTER UNDERDRAINS AND MEDIA (INSTALLATION ONLY)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Filter underdrains equipment and media to be installed in the filter basins. Equipment to include, but is not limited to, all valves, piping, supports, hardware, filter media (silica and anthracite), operations equipment, and other necessary appurtenances for a complete and fully operational underdrain system as described herein.
- B. This Specification is for equipment installation only, not for filter underdrains or media equipment.

1.2 RELATED SECTIONS

- A. Section 00315 – Pre-Purchased Equipment
- B. Section 09900 – Coatings
- C. Section 15060 – Pipe and Pipe Fittings
- D. Section 15100 – Valves, Cocks and Hydrants

1.3 SUBMITTALS

- A. Shop Drawings and Submittals consistent with Section 01340
- B. Filter Underdrains and Media:
 - 1. Per Section 00315 – Pre-Purchased Equipment

1.4 OPERATION AND MAINTENANCE DATA

- A. Consistent with Section 00315, Section 01340 and Section 01600
- B. Delivery, Storage, and Handling
 - 1. Deliver, store, protect, and handle products to the site under provisions of Section 01600. Coordinate shipping, handling, storage, and protection with contractor/owner.

1.5 QUALITY ASSURANCE

- A. Per Section 00315 – Pre-Purchased Equipment
- B. Per Section 01400 – Quality Control

1.6 MAINTENANCE MATERIALS

- A. Per Section 00315 – Pre-Purchased Equipment

PART 2 PRODUCTS

2.1 FILER UNDERDRAINS AND MEDIA EQUIPMENT

- A. Equipment specified in Section 00315 – Pre-Purchased Equipment

2.2 GROUT

- A. Cement: Cement shall be standard brand Portland cement conforming to ASTM C150, Type II, for general use. Cement that has become “lumpy” shall not be used.
- B. Water: Water for mixing and curing shall be clean and clear potable water. The water shall be considered potable if it meets the requirements of the local government agencies. Water with a total dissolved solids of 1000 mg/l or higher or greater than 10 NTU shall not be used.
- C. Sand: Sand shall be clean and washed masonry sand. When tested in accordance with ASTM D2419, the sand equivalency shall not be less than 90% for an average of three samples, or less than 85% for any individual sample. 100% of sand particles shall pass No. 4 sieve and not more than 4% of sand particles shall pass No. 200 sieve.
- D. Chemical Admixtures: No chemical admixture is needed in most of the applications. The grout can be mixed in a small batch and used immediately.
- E. Strength: The grout used in installing the blocks shall have a minimum compressive strength of 3000 psi after 30 days of curing. Normally, use a grout with one part Portland cement and two parts clean silica sand properly mixed and wetted with a maximum water-cement ratio by weight equal to 0.50 to 0.55 for the base grout and 0.61 to 0.67 for the fill grout.

PART 3 EXECUTION

3.1 VISUAL INSPECTION OF FILTER BASINS

- A. After the existing filter media, wheeler blocks, and underdrains are removed from each filter basin, an inspection shall take place by the Engineer and Owner prior to installing the Leopold underdrain system.
- B. Engineer will inspect all concrete surfaces within the filter basins to ensure quality standards are met. Any areas that require patching, repair, or coatings shall be improved to the Engineer and Owner standards prior to installing the Leopold underdrain system.
- C. Contractor is required to create level filter basin floor surface within the tolerances of the underdrain manufacturer prior to installing the Leopold underdrain system.

3.2 INSTALLATION

A. General Underdrain System Equipment

1. Install in accordance with Manufacturer's instructions

B. Air Piping

1. Installing Contractor to supply all air piping between the blower and the connection to the manufacturer provided air header. Contractor shall supply all air piping and other necessary appurtenances for a complete and fully operational air scour and underdrain system as described herein and in the construction documents.
2. Inlet and discharge piping outside the boundaries of the filter basins, including through the wall connections, shall be provided by the installing contractor

C. Filter Underdrains and Air Header

1. The CONTRACTOR shall install the filter underdrain system in strict accordance with: (1) the manufacturer's written instructions and recommendations and the manufacturer's installation drawings; (2) the oral and written directions provided by the manufacturer's technical representative who is supervising and observing the WORK; and (3) any additional requirements specified herein.
2. Floor Preparation
 - a. Care shall be exercised in preparing the filter floor slab and in setting the anchors to assure proper alignment and elevation. Steel anchor rods shall be furnished by the filter manufacturer and set in the floor slab on both sides of the distribution flume in accordance with the drawing provided. The floor slab shall be screeded into a flat level plane and be free of protrusions and depressions, but have a rough, broom finish. Do not trowel or finish the floor to a smooth finish.
 - b. DO NOT PAINT the floor or wall area where it will come in contact with the grout surrounding the underdrain. The filter floor and filter wall extending sixteen (16) inches up from the filter floor is not to be painted.
3. Underdrain Lateral Installation
 - a. The underdrain laterals shall be set in relatively level rows on a bed of grout over the filter floor slab. Plates for closing the ends of each row of blocks shall be furnished by the filter manufacturer and installed by the CONTRACTOR. After joining, aligning and setting the blocks, and the bed grout is set-up, as soon as possible, all spaces between the rows of blocks and walls shall be filled with grout so that the entire bed is totally sealed and held firmly in place. Once all grouting is complete, the grout shall be allowed to cure for at least 3 full days before any functional testing.

- b. Anchor rods, if required as shown in the contract drawings, shall be supplied by the underdrain MANUFACTURER and installed by the CONTRACTOR. Installation of the anchor rods shall be in accordance with the MANUFACTURER'S approved installation drawings and instruction manual.
 - c. After the anchor rods have been installed and the epoxy has cured, a non-destructive vertical pull test shall be performed. Testing shall be performed on 100% of the anchor rods. The pull test shall be performed by the underdrain MANUFACTURER in accordance with the MANUFACTURER'S instruction manual.
4. Cleaning and Protection During Installation, Testing, and Startup
- a. The CONTRACTOR shall take all precautions recommended by the underdrain manufacturer or specified herein to ensure that the filter underdrain system and any piping communicating therewith is completely clean and free of any debris, dirt, or other foreign materials which could clog the underdrain system or interfere with flow. Backwash air and water piping shall be thoroughly flushed clean. All loose debris and dirt within the filter cell and flume shall be removed by brooming down and vacuuming. Care shall be taken to keep grout from being deposited anywhere where it could interfere with flow. Any grout so deposited shall be removed. As installation progresses, partially completed portions of the WORK shall be protected with heavy plastic sheeting or other suitable material to maintain the cleanliness of the underdrain system. Such protection shall be maintained until the support gravel is installed.
 - b. Any time the underdrain laterals are to be used as a work surface, the underdrain block shall be overlaid with ½ inch minimum plywood sheeting where necessary, to distribute the load of yard buckets, wheel barrows, ladders, scaffolds, etc., to prevent damage to the underdrain.

D. Media

1. Marks shall be placed on the side of the filter designating the top elevation of each layer.
2. Carefully place each layer so as not to disturb the previous layers.
3. Complete the installation of each layer before the next layer above is started. Do not stand or walk directly upon the filter materials. Workers must stand or walk on boards that will sustain their weight without displacing the gravel and media.
4. Measure depth of each layer of media after it has been backwashed and skimmed as recommended by the filter equipment manufacturer.
5. Clean the filter tanks before any media is placed and keep them clean throughout the placing operation.

6. Filter Sand: Place the filter sand in the bed in the order of their respective specific gravities. Place and level the filter sand first. Then backwash the bed a minimum of three times, and remove the surface fines by scraping as required to the correct elevation.
7. Filter Anthracite: Place the filter Anthracite and backwash the bed three times, and remove the surface fines by scraping as required to the correct elevation.

3.3 FIELD TESTING

A. Underdrain Lateral Flow Distribution Test

1. The filter underdrain system in each filter cell shall be given a series of visual, qualitative, flow distribution tests to verify that I.M.S.® 200 slots are not clogged with debris and that flow distribution is uniform. These tests shall be performed before the filter media is placed.
2. During each test, the underdrain laterals shall be visually inspected for uniform distribution of air and water and for any signs of quiescent zones and excessive surface turbulence.

3.4 MANUFACTURER'S CERTIFICATE

- A. A certificate of satisfactory installation from the manufacturer is required prior to starting up the equipment by the installing contractor

3.5 SYSTEM INSPECTION AND START-UP

- A. In accordance with Section 00315 and Section 01650. Contractor to coordinate all manufacturer's field services.
- B. The contractor shall provide the services of the filtration equipment suppliers technical representative for not less than 12 working days (8 hours per day) to inspect and supervise the installation and testing of the filter underdrain and air scour system in four trips. Any additional time required for the filtration equipment supplier's on-site technical representative outside those listed above shall be the responsibility of the contractor.
- C. Notify the Owner, Engineer, and Manufacturer when the installation is ready for inspection
- D. Notification must be a minimum of 10 days prior to inspection date
- E. Do not put any water into filter basins or start-up any mechanical equipment until Manufacturer and/or Owner has inspected and approved specific installation for start-up
- F. After inspection, perform any necessary correction identified by Manufacturer, Owner, and/or Engineer
- G. With Manufacturer representative, perform start-up, check-out, and test of filter system

H. Repair all leaks and make adjustments and correction detailed by Manufacturer, Owner, and/or Engineer

END OF SECTION

SECTION 11376

PD ROTARY LOBE BLOWERS (INSTALLATION ONLY)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. PD Rotary Lobe Blower (Blower) system equipment to be installed in the Blower Room. Equipment to include, but is not limited to, all blowers with belt-driven motors, blower inlet filters and silencers, discharge silencers, flexible connections and expansion joints, check valves, pressure relief valves, instrumentation and controls; pressure, flow and temperature monitoring devices; and other necessary appurtenances for a complete and fully operational blower system as described herein.
- B. This Specification is for equipment installation only, not for blower system equipment

1.2 RELATED SECTIONS

- A. Section 00315 – Pre-Purchased Equipment
- B. Division One
- C. Section 15060 – Pipe and Pipe Fittings
- D. Section 15100 – Valves, Cocks and Hydrants

1.3 SUBMITTALS

- A. Shop Drawings and Submittals consistent with Section 01340
- B. Blower System Equipment:
 - 1. Per Section 00315 – Pre-Purchased Equipment

1.4 OPERATION AND MAINTENANCE DATA

- A. Consistent with Section 00315, Section 01340 and Section 01600
- B. Delivery, Storage, and Handling
 - 1. Deliver, store, protect, and handle products to the site under provisions of Section 01600. Coordinate shipping, handling, storage, and protection with contractor/owner.

1.5 QUALITY ASSURANCE

- A. Per Section 00315 – Pre-Purchased Equipment
- B. Per Section 01400 – Quality Control

1.6 MAINTENANCE MATERIALS

- A. Per Section 00315 – Pre-Purchased Equipment

PART 2 PRODUCTS

2.1 BLOWER SYSTEM EQUIPMENT

- A. Equipment specified in Section 00315 – Pre-Purchased Equipment

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all blower equipment in accordance with manufacturer's instructions
- B. Piping
 1. Installing Contractor to supply all air piping between the blower isolation valves and the connection to the manufacturer provided underdrain air header. Contractor shall supply all air piping and other necessary appurtenances for a complete and fully operational blower and air scour system as described herein. Further specifications for the air scour system can be found in Section 11361A – Underdrains Installation.
 2. Inlet and discharge piping outside the boundaries of the blower room, including through the wall connections, shall be provided by the installing contractor
- C. Blowers
 1. Anchor bolts: manufacturer's standards
 2. Eliminate any strain between blower and attached air piping
 3. Set blower base on vibration isolators
 4. Correct any misalignment, noisy operation, or other signs of improper setting
- D. Provide all necessary lubrication for initial start-up, testing and final acceptance

3.2 MANUFACTURER'S FIELD SERVICES

- A. Provide under provisions of Sections 01400 and 01700
- B. Provide all necessary lubrication for initial start-up, testing and final acceptance
- C. Prior to start-up
 1. Test all valves, switches and gages for proper settings an operation
 2. Check completion of all electrical connections
 3. Check assembly alignment
 4. Check to ensure all rotational parts are properly lubricated
 5. Bump motors to check direction or rotation
 6. Direct Contractor in necessarily corrections for start-up
 7. Provide written approval for start-up when system is satisfactory

8. All aeration diffusers shall be installed and basin filled with water prior to start-up of blowers

D. Start-up

1. Check equipment vibration for conformance with specification
2. Test blower controls for proper operation
3. Provide written directions to Contractor detailing adjustments and corrections as necessary
4. Provide preliminary instruction to plant personnel on operation and maintenance of blowers
5. Manufacturer will provide two 8-hour days on-site for start-up, as well as an additional day if needed for training at no additional cost
 - a. Manufacturer's local sales representative is not acceptable

E. Schedule

1. Above services to be provided in at least 1 separate trip
 - a. Prestart-up and start-up as requested by Contractor
 - b. Follow-up approximately one month after start-up as requested by Owner

3.3 PERFORMANCE TESTS

A. Field Tests

1. Operational
 - a. Prior to start-up, all blowers shall be inspected for proper alignment, function and connection
2. Performance
 - a. Contractor shall perform tests to demonstrate that the blowers conform to specifications to the satisfaction of Engineer
 - b. Performance shall be documented by obtaining concurrent readings indicating supply voltage, blower speed/inlet pressure/outlet pressure/inlet temperature/outlet temperature, and motor amperage
 - c. Each blower motor lead shall be inspected for proper current balance
3. Blowers shall operate at rated capacity for 4 continuous hours
4. Blowers shall be run for 30 minutes at full capacity and 10 minutes off for a total of 4 hours
5. Blowers that fail to meet specifications to the Engineer's satisfaction shall be corrected and re-tested by Contractor
6. If upon failing a second test, the blower will be rejected and the Contractor shall furnish a blower that will perform as specified herein
7. A test log shall be submitted to Engineer and Owner upon completion of each test. Tests shall record the following:
 - a. Blower model number and facility tag ID
 - b. Serial number
 - c. Date of testing with time of testing on that day (start and end)
 - d. Motor hp and speed
 - e. All other performance documentation parameters specified herein

END OF SECTION

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Equipment installation requirements common to equipment sections

1.2 RELATED SECTIONS

- A. Division 15 Sections

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels
- B. Exposed, Interior Installations: Exposed to view indoors, examples include finished occupied spaces and mechanical equipment rooms
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions, examples include rooftop locations
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants, examples include above ceilings and chases
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures, examples include installations within unheated shelters

1.4 QUALITY ASSURANCE

- A. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIRMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope

3.1 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 09 Sections for interior painting and exterior painting
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish

3.2 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment
- B. Field Welding: Comply with AWS D1.1

END OF SECTION

SECTION 15060

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping complete with all fittings, jointing materials, expansion joints, hangers, supports anchors and necessary appurtenances for interior installations:
 - 1. Air piping
- B. Work under this Section shall include all labor, equipment, plant and materials necessary to furnish and install all exposed (including submerged) plant process piping and miscellaneous appurtenances. Major valves are covered in separate Sections (see Part 1.2 below). Exposed process piping in this project includes but is not limited to:
 - Air piping (unlined DIP) – low pressure, high temperature

1.2 RELATED SECTIONS

- A. Section 02676 – Disinfection of Water Systems
- B. Section 03300 – Concrete
- C. Section 03600 – Grout
- D. Section 09900 - Coatings
- E. Section 15090 – Supports and Anchors
- F. Section 15100 – Valves, Cocks, and Hydrants

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. B1.1 – Unified Inch Screw Threads
 - 2. B16.1 – Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 250
 - 3. B16.5 – Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch
 - 4. B16.24 – Cast Copper Alloy Pipe Flanges and Flanges Fittings
 - 5. B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes
 - 6. B18.2 – Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
 - 7. B31.1 – Power and Process Piping
- B. American Society of Mechanical Engineers (ASME)
 - 1. B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings
 - 2. B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
 - 3. B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes

- C. American Standards Associations (ASA)
- D. American Society of Testing and Materials (ASTM)
 - 1. A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 2. A134 – Standard Specification for Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over)
 - 3. A135 – Standard Specification for Electric-Resistance-Welded Steel Pipe
 - 4. A139 – Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
 - 5. A181 – Standard Specification for Carbon Steel Forgings for General-Purpose Piping
 - 6. A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
 - 7. A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
 - 8. A234 – Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
 - 9. A283 – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
 - 10. A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - 11. A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - 12. B32 – Standard Specification for Solder Metal
 - 13. B75 – Standard Specification for Seamless Copper Tube
 - 14. B88 – Standard Specification for Seamless Copper Water Tube
 - 15. D1785 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 16. D2464 – Standard Specification for Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
 - 17. D2467 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
 - 18. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- E. American Water Works Association (AWWA)
 - 1. C200 – Standard for Steel Water Pipe 6 Inch and Larger
 - 2. C203 – Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied
 - 3. C206 – Standard for Field Welding of Steel Water Pipe
 - 4. C207 – Standard for Steel Pipe Flanges for Waterworks Service – Sizes 4 Inch Through 144 Inch
 - 5. C209 – Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
 - 6. C220 – Standard for Stainless Steel Pipe ½ Inch and Larger
 - 7. C900 – Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water Transmission and Distribution
 - 8. C950 – Standard for Fiberglass Pressure Pipe

9. M11 – Steel Pipe: A Guide for Design and Installation

F. Commercial Standards (CS), Department of Commerce

G. National Science Foundation (NSF)

1. 61 – Drinking Water System Components – Health Effects

H. National Fire Protection Association (NFPA)

I. International Plumbing Code (IPC)

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Descriptive literature and catalog cuts in sufficient detail to define material types, operating characteristics and dimensioning details

C. Shop Drawings:

1. Provide piping layout fabrication and assembly Drawings with fittings dimensions. Provide sufficient information to verify compliance with specification including, but not limited to, the following:

- a. Layout of pipe Drawings
- b. Pipe and joint details
- c. Specials, fittings, and coupling details
- d. Specification data sheets
- e. Certificates of compliance with applicable standard and specification and testing certificates
- f. For steel pipe show weld locations and installation of pipe, fittings, specials and connections
 - i) Complete data of materials proposed
 - ii) Do not manufacture until approved
 - iii) Show where each numbered pipe fitting or special is to be installed
 - iv) Numbers correspond to those painted on pipe

2. Provide additional detailed information including elevations, fittings, specialty materials or fabrications for special or custom features, structures, junctions and/or pipes

3. Specifications, data sheets and affidavits of compliance for coatings and linings

4. Provide pipe-laying and installation schedule

D. Product Data: Provide sufficient data on features, pipe, joints, gasket material, lubricant and accessories to verify compliance with specifications

E. Manufacturers Certificate and affidavits:

1. Furnish the following prior to fabrication

- a. Details: Pipe, joint, special, fitting and coupling
- b. Shop coating
- c. Shop coatings and linings: specifications, data sheets, and compliance affidavits

2. Furnish the following prior to shipment

- a. Compliance affidavit for applicable standards
 - b. Test certificates
- F. Test Reports: Submit all shop and field test reports in accordance with Division 1 Specifications as Product Data

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1 Specifications
- B. Accurately record actual locations of piping, valves, connections, centerline of pressure pipe elevations, and top of gravity pipe elevations
- C. Identify and describe unexpected variations to building conditions or discovery of unknown utilities

1.6 REGULATORY REQUIREMENTS

- A. In accordance with all municipal and county codes and ordinances, laws and regulations of the State
- B. In case of apparent conflict, State and local requirements govern over these specifications
- C. In absence of State and local regulations, International Plumbing Code applies

1.7 DELIVERY, STORAGE AND HANDLING

- A. Descriptive literature and catalog cuts in sufficient detail to define material types, operating characteristics and dimensioning details
- B. For all other pipe
 - 1. Deliver, store, protect and handle products to site under provisions of Division 1 Specifications
 - 2. Delivery
 - a. Ship rubber gaskets in cartons and store in a clean area away from grease, oil, ozone producing electric motors, heat and the direct sunlight
 - 3. Storage
 - a. Store pipe, fittings and gaskets in clean locations protected from environmental conditions such as: direct sunlight, mud, etc.
 - b. Do not use pipe and fittings stored in direct sunlight for periods in excess of 18 months
 - c. Store pipe on a flat surface which provides even support for the barrel with bell ends overhanging
 - d. Do not stack pipe higher than 5 feet
 - 4. Storage: Use the following precautions for valves, during storage:
 - a. Do not remove end protectors unless necessary for inspection; then reinstall for storage
 - i) Protect valves from weather by storing indoors or support valves off ground and pavement in watertight enclosures when outdoor storage is necessary

5. Handling
 - a. Handle so as to insure installation in sound undamaged condition
 - b. Use equipment, tools and methods for unloading, reloading, hauling and laying that do not damage pipe or cause an impact. Damaged pipe will be cause for rejection
 - c. Use hooks or straps with broad, well padded contact surfaces for lifting sections of pipe
6. Preparation for Transport:
 - a. Prepare valves, for shipping as follows:
 - i) Ensure that valves and pilotry are drained and dry and internally protected against rust and corrosion. Protect valves against damage to threaded ends, flange faces, and weld ends. Set valves in best position for handling. Set valves closed to prevent rattling
7. Deliver and store valves and accessories in shipping containers with labeling in place in accordance with AWWA C500
8. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation
9. Seal pipe and fittings to prevent entry of foreign materials into pipe and fittings
10. During loading, transporting and unloading, exercise care to prevent damage to material
 - a. Use nylon slings only
 - b. Do not drop pipe or fittings
 - c. Do not roll or skid against pipe already on ground
 - d. Repair any damage done to coating or lining
 - e. Handle per manufacturer's recommendations
 - f. Store rubber gaskets in cool dark location
 - g. Store all material on wood pallets or timbers
11. Adequately tag or otherwise mark all piping and fittings as to size

1.8 PIPE MARKINGS

- A. See Section 09900

PART 2 PROCESS PIPING PRODUCTS & MATERIALS

2.1 PIPE MATERIALS

- A. Steel pipe and fittings shall be provided in accordance with ASTM A53/A53M, ASTM A106, or AWWA C200 as specified

2.2 DUCTILE IRON PIPE (DIP)

- A. Ductile-iron pipe shall conform to AWWA C115, C150, C151, and ANSI 21.51 except as otherwise specified
- B. Contractor shall submit complete process piping drawings and shall include all location and dimensions of piping, fitting, valves, and couplings

- C. Acceptable Manufacturers
 - 1. U.S. Pipe
 - 2. Tyler Pipe
 - 3. Griffin Pipe Products Company
 - 4. Or accepted substitutions

- D. Pipe
 - 1. ANSI A21.51/AWWA C151: As listed below except as otherwise specified or indicated on Drawings
 - 2. Thickness: Class 52
 - 3. Pressure Rating: 250 psi

- E. Joints/Fittings
 - 1. Fittings shall be ductile iron and conform to AWWA C110/ANSI A21.10
 - 2. Above grade: Flanged
 - 3. Where connecting to existing pipe: Field-verify existing joint/flange type and match or provide adapters as required
 - 4. Fittings shall have a pressure rating no less than that of adjoining pipe
 - 5. Comply with requirements for restrained fittings as indicated on Drawings

- F. Gaskets
 - 1. Only high temperature gaskets suitable for air shall be used

- G. Coatings
 - 1. Exposed pipe: Paint pipe in accordance with Section 09900

- H. Linings
 - 1. The interior of all air piping shall be unlined

- 2.3 COPPER PIPE – NOT APPLICABLE
- 2.4 POLYETHYLENE PIPE – NOT APPLICABLE
- 2.5 PVC PIPE – NOT APPLICABLE
- 2.6 STEEL PIPE – NOT APPLICABLE
- 2.7 TUBING – NOT APPLICABLE
- 2.8 PIPE SLEEVING
 - A. Schedule 409 steel or cast iron for floor penetrations, foundation walls, and load bearing walls
 - B. 16 gauge sheet metal or Schedule 40 PVC in non-bearing walls
 - C. Use “Link-Seal” between wall sleeve or pipe penetration and carrier pipe unless indicated differently on Drawings

- D. Manufacturers:
 - 1. Watertight and dust-tight pipe sleeves:
 - a. O-Z Electrical Manufacturing Company
 - b. Thruwall and Floor Seals
 - c. Or accepted substitution
 - 2. Modular, rubber, sealing elements:
 - a. Thunder Line Corporation "Link Seal"
 - b. Or accepted substitution

2.9 ACCESSORIES

- A. Thread tape: Teflon
 - 1. John Crane "Thread Tape"
 - 2. Garlock "Plasti-Thread"
 - 3. Hoke "EZ Seal"
 - 4. Or accepted substitution
- B. Sealant: Silicone sealant as specified in caulking section
- C. Pulsation Snubbers:
 - 1. Operating and Maintenance Specialties "Ray Pressure Snubbers"
 - 2. Ashcroft "Snubber Series 25-255"
 - 3. Or accepted substitution
- D. Gauge cocks: Bronze, tee handle
 - 1. Lunkenheimer 1178
 - 2. Powell 915
 - 3. Or accepted substitution
- E. Concrete for supports and other locations as shown on Drawings: Concrete type specified in Section 03300

2.10 PRESSURE GAUGES

- A. Provide 4-1/2 inch diameter pressure gauges that are bottom connected with white laminated dials and black graduations. Accuracy of pressure gauges shall be within 1/2 percent
- B. Gauges shall include a blowout disc and safety glass that is encased in phenolic, steel or cast iron
- C. Stainless steel bourbon tube with welded, stress-relieved joints shall be provided for the measuring element
- D. Socket shall have wrench flats
- E. Pressure gauge movement shall be rotary geared and stainless steel material

- F. All provided pressure gauges shall be provided with a pulsation snubber constructed of 316 stainless steel and an isolation valve.
- G. Manufacturers:
 - 1. Ashcroft "1279"
 - 2. Ametek "Series 1900 SOLFRUNT"
 - 3. Or accepted substitution

2.11 FINISHING

- A. Paint pipe in accordance with Section 09900

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install as specified and shown on Drawings. Where no locations are shown, run piping symmetrical to adjacent walls, ceilings and floors. Precise location shall be field determined by Engineer and Contractor.
- B. All cutting or fabricating in the field shall be done according to printed recommendations of the pipe manufacturer or associated pipe manufacturer organizations. All finished piping shall present a neat and finished appearance with all burrs, rough edges and irregularities removed. Piping shall be cleaned to the extent required for further coatings.
- C. Remove dirt, rocks, debris, and other foreign materials from all pipelines
- D. Keep interior of pipe and fittings thoroughly clean before installation and until work is accepted
- E. Take precautions to prevent entrance of foreign material during jointing, lining repair, and inspection operation
- F. Seal open end of line with watertight plug if pipe laying is stopped
- G. Provide a shutoff valve and union at the water and air supply connections to each fixture and unit of equipment, whether shown on the Drawings or not
- H. Do not install piping to obstruct openings and passageways
- I. Cut pipe to measurement taken at the site, not from the Drawings
- J. Layout piping to provide for expansion and contraction
- K. Provide taps for pressure gauge connections with a nipple, snubber, and gauge cock
- L. Securely anchor piping at the midpoints between expansion joints

- M. Provide air supply piping with sectionalizing valves and valved air inlet connections to isolate portions of system for periodic testing

3.2 VALVES, HANGERS AND OTHER FITTINGS

- A. All material shall be installed at locations as shown on the plans or as designated by the Engineer. Strict compliance with manufacturer's requirements is required.
- B. All valves shall be installed as shown and in locations convenient for operation. One valve handle shall be supplied for every two valves, which have removable handles. Provide special operators as shown on the plans.
- C. Pipe sleeving shall provide a minimum clearance of 1/4" to be made between sleeve and all pipe. Opening to be made watertight with sealant. All sleeves shall be left flush with sides of structural component penetrated.
- D. See Section 15090 and 15100

3.3 CONNECTION TO EXISTING PIPELINES

- A. Make connections between new and existing piping with suitable fittings
- B. Schedule connection to minimize inconvenience to the Owner
- C. Undertake connections in order to disturb the system as little as possible
- D. Where connection involves potable water systems, provide disinfection methods as prescribed in these Specifications
- E. Once tie in to existing system is initiated, continue Work continuously until tie-in is made and tested

3.4 JOINTS

- A. Make pipe joints carefully and neatly
- B. Connect piping in accordance with manufacturer recommendations
- C. Threaded
 1. ANSI B2.1, NPT fully and cleanly cut with sharp dies
 2. No more than 3 threads exposed after installation
 3. Ream pipe ends after threading to remove burrs
 4. Apply Teflon thread tape to joints in all plastic and stainless steel piping
 5. Apply thread tape or joint compound to joints in other piping
 6. Apply Teflon thread tape or litharage and glycerine paste to joints on steel piping for chlorine service
- D. Flanged joints

1. Take care when bolting flanges to insure that there is no restraint on the opposite end of the pipe which would prevent gasket compression or cause unnecessary stress in flanges
2. Leave one flange free to move in any direction while tightening flange bolts
3. Do not pack or assemble bell and spigot joints until all flanges affected thereby have been tightened
4. Tighten bolts gradually at a uniform rate to compress gaskets uniformly

3.5 PIPE SLEEVES

- A. Provide for pipes passing through concrete or masonry
- B. If insulated, extend insulation through sleeves
- C. For piping through interior walls and floors with special finish provide pipe sleeves or holes drilled with rotary drill
- D. Make dust and gas tight through room walls and floor
- E. Six inch or smaller; special dust-tight sleeves
- F. Greater than 6 inches, seal with modular sealing elements or caulk with backer rod and seal both sides with non-sag silicone sealant
 1. For pipe sleeves located in water bearing walls provide wall pipes or sleeves with dual modular sealing elements as shown on the Drawings

3.6 PROTECTIVE COATING

- A. Paint pipe in accordance with Section 09900

3.7 CLEANING

- A. General
 1. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when erected
 2. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system
 3. Flush or blow all lines thoroughly before placing in service
 4. At completion of Work and prior to final acceptance, thoroughly clean Work installed under these specifications
 - a. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sand and dirt which may have accumulated by operation of system, from testing, or from other causes
 - b. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner

3.8 FIELD QUALITY CONTROL

A. General

1. Utilize pressures, media, and pressure test durations as specified on Piping Schedules
2. Isolate equipment which may be damaged by the specified pressure test conditions
3. Perform pressure test using calibrated pressure gauges and calibrated volumetric measuring equipment to determine leakage rates. Select each gauge so that the specified test pressure falls within the upper half of the gauge range. Notify Engineer 24 hours prior to each test
4. Completely assemble and test new piping systems prior to connection to existing pipe systems
5. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance
6. Provide all necessary equipment, materials, tools, appliances, devices, and perform all work required in connection with the tests and inspections
7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination

B. Test each line at the Contractor expense in the presence and to the satisfaction of Engineer

C. General testing methods and criteria

1. Types of pressure testing and inspection to be employed include hydrostatic pressure testing, cylinder water pumped compressed air or cylinder nitrogen testing, low pressure air testing and hydrostatic exfiltration/infiltration testing
2. Air systems
 - a. Utilize the following testing medium for air systems

Pipeline Size	Specified Test Pressure	Testing Medium
All sizes	9 PSI	Air

- b. The allowable leakage rate for systems tested with air shall be based on a maximum pressure drop of 5 percent of the specified test pressure for a duration of period of 1 hour. Prior to starting a test interval using air, ensure air is at ambient temperature and specified test pressure

3.9 DISINFECTION OF WATER PIPING SYSTEM

- A. After favorable performance of pressure test and prior to final acceptance, thoroughly flush entire water piping system, including supply, source and any appurtenant devices and perform disinfection as prescribed
- B. Flush and disinfect each segment of system in accordance with Section 02676

3.10 PIPING SCHEDULE

- A. Install pipes as scheduled in the pipe schedule provided below

Description	Size (inches)	Material	Maximum Test Pressure (psi)
Air Scour Pipe	6, 8	DIP	9

3.11 OPERATIONAL TESTING

- A. All systems shall be subjected to normal operating conditions. Based upon visual observations, any excessive vibrations, deflections, stress, or leakage in the piping systems shall be corrected to the satisfaction of the Engineer.

END OF SECTION

SECTION 15090
SUPPORTS AND ANCHORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and equipment hangers and supports
- B. Equipment bases and supports
- C. Flashing and sealing equipment

1.2 RELATED SECTIONS

- A. Section 03300 – Concrete
- B. Section 09900 – Coatings
- C. Section 15060 – Pipe and Pipe Fittings

1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM)
 - 1. F708 – Design and Installation of Rigid Pipe Hangers
- B. International Building Code (IBC)
- C. Manufacturers Standardization Society (MSS)
 - 1. SP58 – Pipe Hangers and Supports – Materials, Design and Manufacturer
 - 2. SP69 – Pipe Hangers and Supports – Selection and Application
 - 3. SP89 – Pipe Hangers and Supports – Fabrication and Installation Practices

1.4 SYSTEM DESCRIPTION

- A. Provide complete system of pipe supports and anchors for all piping
- B. Support all piping to prevent undue strain on any valve, fitting or piece of equipment
- C. Provide support and anchors at changes in direction, change in elevation, adjacent to flexible couplings, and where valve actuators/positioners add additional weight and stresses
- D. Do not install in equipment access areas

1.5 PERFORMANCE REQUIREMENTS

- A. Pipe support system components to withstand total dead load

1. Dead load: Weight of pipe filled with water plus any insulation
 - a. Dead load defined as weight of pipe filled with water plus any insulation
 2. Factor of safety: 5 minimum
- B. Pipe restraint system components to withstand thrusts created by fluid pressure within pipes
1. Factor of safety: 5 minimum
- C. Do not exceed manufacturers' recommended loads
- D. Brace all piping 2½ inch and larger for Seismic Zone B forces in accordance with International Building Code

1.6 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Shop drawings: Indicate system layout with location and detail of trapeze hangers. Include location of pipe supports
- C. Product data: Provide manufacturers catalog data including load capacity
- D. Design data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers
- E. Manufacturer's installation instructions: Indicate special procedures and assembly of components

PART 2 PRODUCTS

2.1 MATERIALS

- A. Not submerged: Galvanized steel except where otherwise indicated or specified
- B. Submerged: Stainless steel, 304L
- C. Use stainless steel materials for stainless steel pipe or galvanized steel with non-conductive isolation gaskets to prevent electrolytic corrosion

2.2 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 1. Anvil International
 2. Unistrut Corporation
 3. Elcen Metal Products Co.
 4. PHD Manufacturing, Inc
 5. Or accepted substitution

2.3 ACCESSORIES

- A. Hanger rods: ASTM A307, Grade R. Mild steel threaded both ends, threaded one end, or continuous threaded
- B. Isolation pads: neoprene waffle type
 - 1. Manufacturers: Mason Industries "Type W", Fabreka Production Company "Fabel", or accepted substitution
- C. Insulation protection shield: ANSI/MSS SP-58

2.4 FLASHING

- A. Metal flashing: 26 gauge galvanized steel
- B. Metal counter flashing: 22 gauge galvanized steel
- C. Flexible flashing: 0.125 inch thick sheet butyl-isoprene; compatible with roofing
- D. Caps: Steel, 22 gauge minimum

2.5 SLEEVES

- A. Sleeves for round ductwork: Galvanized steel
- B. Sleeves for rectangular ductwork: Galvanized steel or wood
- C. Sealant: Refer to Section 07900 – Joint Sealers

2.6 FINISHING

- A. All hangers, rods, clamps, protective shields, metal framing support components, and hanger accessories: Galvanized Steel unless otherwise indicated or specified
- B. For stainless steel components: none required

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions
- B. Pipe supports and anchors are not indicated on drawings in all locations; supports are indicated for most larger pipes
- C. Provide system of pipe supports and anchors for all piping
- D. Provide additional supports as required adjacent to couplings

- E. Pipe supports shall be provided at all changes in direction and adjacent to flexible couplings

3.2 PIPE HANGERS AND SUPPORTS

- A. For designated pipe supports located adjacent to equipment and other locations requiring vibration isolation, provide isolation pad
- B. Support horizontal piping as scheduled
- C. Install hangers to provide minimum ½ inch space between finished covering and adjacent work
- D. Brace all piping 2-1/2 inch and larger for Seismic Zone B forces in accordance with local building codes
- E. Place hangers within 12 inches of each horizontal elbow
- F. Use hangers with 1½ inch minimum vertical adjustment
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers
- H. Support riser piping independently of connected horizontal piping
- I. Design hangers for pipe movement without disengagement of supported pipe
- J. Piping connections to equipment: Provide pipe support adjacent to equipment. Pipes shall not be supported on equipment
- K. Do not support lower pipe from pipe above
- L. Support pipe 1½ inch minimum from walls and 3 inch minimum below ceilings
- M. From framing strut systems, cut ends and paint exposed metal with galvanized paint
- N. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed
- O. Do not install pipe supports in equipment access areas

3.3 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Drawings for location of pads
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure

D. Provide rigid anchors for pipes after vibration isolation components are installed

3.4 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs

B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb

3.5 SCHEDULES

A. Maximum hanger spacing and rod size for cast iron, ductile iron, steel and PVC:

Pipe size (inches)	Max. hanger spacing (feet)	Hanger rod diameter (inches)
1½ and smaller	6	3/8
1 ½ to 2	8	3/8 to 1/2
2 ½ to 3	10	1/2 to 5/8
4	10	5/8
6 and 8	12	3/4
10 and 12	14	7/8
14 and 16	16	1
18	16	1-1/8
20 and larger	18	1-1/4
PVC (all sizes)	6	Same as for steel

END OF SECTION

SECTION 15100

VALVES, COCKS, AND HYDRANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Valves indicated on the drawings specified or required for proper operation of equipment or systems

1.2 RELATED SECTIONS

- A. Section 09900 – Coatings
- B. Section 15060 – Pipe and Pipe Fittings

1.3 REFERENCES

- A. AWWA C504 – Rubber Seated Butterfly Valves for Air Service
- B. AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information with dimensions, materials, and assembled weight. Indicate valve data and pressure ratings
- C. Manufacturer's Instructions: Provide complete manufacturer's installation instruction

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual size, type and locations of valves

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01730
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views

1.7 QUALITY ASSURANCE

- A. Manufacturer's name and pressure rating marked on valve body

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience

1.9 REGULATORY REQUIREMENTS

- A. Conform to all municipal codes and ordinances, laws and regulations of the state
- B. In case of apparent conflict, state and local requirements govern over these specifications
- C. In absence of state and local regulations, Uniform Plumbing Code will apply

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600
- B. Prepare valves and accessories for shipment according to AWWA C500
- C. Accept valves on site in shipping containers with labeling in place. Inspect for damage
- D. Provide temporary protective coating on cast iron and steel valves
- E. Seal valve ends to prevent entry of foreign matter into valve body

PART 2 PRODUCTS

2.1 GENERAL

- A. Construction
 - 1. Actual valve length within $\pm 1/16"$ of specified or theoretical length
 - 2. Ends, except as otherwise specified
 - a. 3" and smaller, threaded on solder ends
 - b. 4" and larger
 - 1) Exposed interior: Flanges, ANSI 125 lb

2.2 BUTTERFLY VALVES (AIR SERVICE)

- A. Manufacturers (must be AIS compliant):
 - 1. Dezurik
 - 2. Milliken
 - 3. Valmatic
 - 4. Or accepted substitution
- B. Valve Design and Conditions
 - 1. Bi-directional pressure rating: 175 psi for 2 inch through 12 inch valves
 - 2. Temperature rating: 450°F
 - 3. Bi-directional and tested to 110% of full rating

4. Shall be in conformance with AWWA C504 and C540
 5. Valve ends:
 - a. Shall be ANSI B16.1 Class 125 for cast-iron body valves Class 25A through Class 150B
 6. The use of a stop or lug cast integrally with or mechanically secured to the body for the purpose of limiting disc travel by means of direct contact or interference with the valve disc (in either the open or closed position) will not be acceptable
- C. Materials
1. Body:
 - a. Cast iron for Class 25A through Class 150B valves
 2. Disc:
 - a. Cast iron or ductile iron for Class 25A through Class 150B valves
 3. Seats:
 - a. EPDM for services up to 250 Deg F
 - b. Shall be body mounted
 - c. Shall be resilient type
 - d. Mating seat surface shall be stainless steel or Monel
 - 1) Sprayed or plated mating surfaces are not acceptable
 4. Shaft: 316 stainless steel
 5. Shaft seals:
 - 1) Shall be designed for use of standard self-adjusting split-V-type packing or Viton O-ring seals
 - 2) Pull down packing is not acceptable
- D. Valve position indicators
1. Provide position indicators on all exposed operators
 2. Provide handwheel with an arrow with the word open on handwheel rim specifying opening direction
 - a. Arrow shall be cast on rim and raised
 3. Identify open position of valve, 0-100%
- E. Operator locking devices
1. Modulating service: Infinitely variable locking device or a totally enclosed geared operator as indicated
- F. Manual Actuators
1. Provide manual actuators for all valves not specified to be power actuated or designed for automatic operation
 - a. Worm Gear actuator
 - 1) Actuators shall be totally-enclosed oil or grease-lubricated worm gear
 - 2) Actuators shall have AWWA input stops. Actuator shall be self-locking at all variable opening positions
 - b. Traveling nut actuator
 - 1) Travel limiting stop nuts or collars installed in the actuating mechanisms shall be field adjustable
 - 2) Shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device

- 3) Setscrews and clamps are not acceptable
 - c. General use: Handwheel
 - d. Seven (7'-0") feet or more above the floor or grade unless otherwise indicated:
 - Chain wheel with operating chain
 - 1) Equipped with chain guide to permit rapid chain handling of the chain without "gagging" the wheel and to permit reasonable side pull on the chain
 - 2) With extensions as required to prevent interference with adjacent piping or equipment
 - 3) Chain heavily zinc or cadmium-plated and looped to extend between 3' and 4' of the floor or grade below valve
 - 2. Rotation
 - a. Valves shall open counterclockwise
 - b. The word "OPEN" and a raised cast arrow indicating the direction to open cast on each valve body or operator
 - c. Position indicator clearly visible from operating floor
 - 3. Actuators and handwheels shall be located in positions indicated or as otherwise determined when manufacturer's drawings are submitted to Engineer
- G. Electric Actuators
- 1. Provide motor actuators as indicated on Drawings, for automated system operation or as specified for individual systems
 - 2. Provide actuator that meets the latest AWWA standards and is suitable for use in a water treatment plant
 - 3. Each motor actuator to consist of motor, actuator unit gearing, handwheel, limit and torque switches, mechanical position indicator, external mechanical travel stops, fail-safe mechanism, lubricants, heating elements, wiring, terminals and integral reversing controller constructed as a self-contained unit
 - 4. Housing: Cast, weatherproof, NEMA 4 with minimum two (2) conduit connections (one for power and one for control) unless indicated otherwise
 - 5. Operating time from fully open to fully closed or the reverse:
 - a. For open/close valves: 30 seconds
 - b. For modulating valves: adjustable from 15 seconds to two minutes
 - 6. Motors
 - a. Mounted horizontally adjacent to or vertically above gearing
 - b. Do not mount with motor vertical below gearing
 - c. Totally enclosed, high torque, designed expressly for valve operator service
 - d. Thermal overload sensor
 - e. Service rating:
 - 1) Open/close service motors shall be rated for 15 minute continuous duty
 - 2) Modulating service motors shall be rated for a minimum of 600 starts/hour
 - 3) Capable of operating valve under full differential pressure for two complete open-close cycles without overheating
 - 4) Designed in accordance with NEMA Standards
 - 5) Insulation: Class F or better
 - 6) Bearings: Permanently lubricated
 - 7) Voltage tolerance: +/- 10 percent
 - 8) Voltage rating: 120 Volt, 60 Hz, 1 phase

- 9) Produce 1.5 times required torque
- 10) Conform to AWWA C540
- 7. Backup Fail-safe:
 - a. If not shown on drawings Owner shall indicate failure position (open/close)
 - b. Housing shall be NEMA 4 or 6 for submersion (where indicated on the drawings)
 - c. Minimum four limit switches
 - d. Equipped with heater and thermostat
 - e. Voltage rating: 120 V, 60 Hz, 1 phase
 - f. On-off/local control box
 - g. Battery power level indication
 - h. Suitable for a minimum four operations per hour
 - i. LED indication for power supply, open and close
 - j. Battery operated or Engineer approved
 - k. No additional wiring shall be required (integral to unit)
 - l. Equipped with manual override
- 8. Gearing
 - a. All grease lubricated
 - b. Service factor: 2.0
 - c. Effectively sealed against entrance of foreign material
 - d. AGMA nameplate not required
 - e. Supported by anti-friction bearings
 - f. Designed so motor comes up to speed before stem load is encountered in opening and closing direction
 - g. Self-locking worm gear drive with alloy bronze worm gear and hardened steel worm
- 9. Handwheel/Chainwheel (manual override) mechanism
 - a. Designed so handwheel/chainwheel acts as the manual override. Include an override switch if it is required to disengage the wheel from (automatic) operation
 - b. Designed so handwheel/chainwheel does not operate during motor operation
 - c. Designed so motor does not rotate when handwheel/chainwheel is rotated after declutching
 - d. Provide declutching extensions to allow declutching of all electric actuators from floor level
 - e. Actuator responsive to electrical power and control at all times, instantly disengaging handwheel/chainwheel
 - f. Rotation: Counter clockwise to open
 - g. An arrow indicating the open direction and the word "OPEN" cast on the handwheel/chainwheel
 - h. Max force required: 80 lb
 - i. Shall meet all requirements for manual actuator
- 10. Torque switches
 - a. Provide opening and closing torque and thrust limit switches
 - b. Micrometer adjustment on each switch
 - 1) Reference setting indicator
 - 2) Variability 40 percent
 - c. Contact rating: 6 amp inductive at 120 V AC and 2.2 amp at 115V DC
- 11. Geared limit switches

- a. Space for 4 geared limit switch assemblies
 - b. Each assembly with 2 sets of NO contacts and 2 sets of NC contacts
 - c. Each assembly geared to driving mechanism and independently adjustable to transfer at any point between fully open and fully closed valve position
 - d. Contact rating: 6 amp inductive at 120 V AC and 2.2 amps at 115 V DC
 - e. Set limit switches as indicated on Drawings
 - f. Provide three limit switch assemblies
12. Heating elements
- a. Provide in actuator housing
 - b. Rated 120 V AC
 - c. Continuously energized
13. Terminal facilities: Provide for connection to motor leads, switches, slide-wire type position transmitter (if required), heating elements, control and power supply
14. Controller
- a. Integrally mounted solid state reversing controller for modulating operators, integrally mounted electromechanical controller for open-close operators
 - b. Motor overload protective device
 - c. A nameplate of permanent type construction on the controller enclosure identifying the equipment controlled as with letters and numerals not less than 3/4 inch high
 - d. Electrically interlocked
 - e. Provided with the necessary direct operated auxiliary contacts for required interlocking and control
 - f. Pilot devices, Modulating Service
 - 1) In a weatherproof enclosure close-coupled to actuator housing
 - 2) Open-stop-close maintained contact push buttons
 - 3) Hand-Auto maintained selector switch
 - 4) Red "Open" and green "Closed" indicating lights
 - 5) Auto position of selector allows 4-20 ma input proportional to required valve position
 - g. Pilot Devices, Open/Close Service
 - 1) In a weatherproof enclosure close-coupled to actuator housing
 - 2) Local Open/Close maintained pushbuttons
 - 3) Local Hand-Auto maintained selector switch
 - 4) Local red "Open" and green "Closed" indicating light
 - 5) Auto position of selector allows open or close operation from remote un-powered contact from maximum distance of 300 feet
 - h. NEMA Size 1 minimum
 - i. Action on loss of command signal shall be selectable to include open, close, or last position
 - j. For modulating valves, provide manual-automatic switch and solid state modulator to receive 4-20 mA control signal and actuate valve to signaled position
 - k. Controller for modulating service shall include provisions for zero, span gain, opening and closing speed potentiometer and deadband adjustment
15. Manufacturers:
- a. Modulating service

- 1) Bray
 - 2) Keystone
 - 3) Auma
 - 4) Or Engineered Approved Equal
- b. Open/Close service
- a) Bray
 - b) Keystone
 - c) Auma
 - d) Bettis Model EM-200, EM-212, EM-420 as required
 - e) Or Engineered Approved Equal

H. Mass Flowmeter (Thermal Dispersion):

1. Insertion type, low profile probes, negligible pressure loss
2. Thermal dispersion design with true mass flow output utilizing a differential temperature signal generated by a constant current power source between two RTDs.
3. 4 wire, 24 volt DC powered
4. Accuracy: +/- 2% of reading & +/- 0.5% of full scale
5. Output: (2) 4 to 20mA, user assignable to flow rate or process temperature and (1) 0 to 1000Hz pulse output of flow.
6. Provide compression fitting process connection
7. Connection: 3/4 inch MNPT
8. Insertion lengths as required to place sensor in the center of the line
9. Provide integral or remote electronics package with flowrate indication, unless otherwise noted
10. This project has less than 20 upstream diameters and 10 downstream diameters available at point of instrument mounting, so a flange captured insertion sleeve or tabbed panel flow conditioner shall be provided, to remove swirl and velocity profile distortion with lowest possible pressure drop, install 3 diameters upstream of insertion meter.
11. Provide one handheld communicator/calibrator
12. Manufacturer:
 - a. Fluid Components, Inc., series ST51 with VIP flow conditioner
 - b. Or Approved Equal

2.3 CORROSION CONTROL

- A. Shop paint all ferrous metal surfaces of valves and accessories, both interior and exterior for corrosion protection
- B. Manufacturer's standard paint will be acceptable if it is functionally equivalent to the specified paint and compatible with the specified field painting
- C. Materials:
 1. Asphalt varnish: TT-U-51
 2. Coal tar: Koppers "Bitumastic Super Tank Solution", Tnemec, or accepted substitution
 3. Rust-inhibitive primer: Mobil "13-R-50 Chromox Q.D. Primer", Tnemec "77H Chem-Prime", or accepted substitution

4. Rust-preventive compound: Houghton “Rust Veto 344”, “Rust-Oleum R-9” , or accepted substitution
- D. Surfaces to be painted
1. Unfinished surfaces:
 - a. Interior: Asphalt varnish (2 coats), coal tar, or epoxy
 2. Polished or machined surfaces: Rust-preventive compound
 3. Operators and accessories: rust-inhibitive primer

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
1. Carefully inspect valve before installation. Clean interior. Operate valve to determine parts in proper working order, with valves seating and drain valve operating properly
 2. Install valves and accessories in accordance with the manufacturer's recommendation and in accordance with referenced standards and specifications and shown on construction drawings
 3. Provide a union or flanged connection within 2' of each threaded end valve unless the valve can otherwise be easily removed from piping
 4. Set valve and valve boxes plumb
 5. Install valve box directly over the valve it serves with the top of the box flush with finish grade
 6. Fill around box with earth and thoroughly tamp on all sides

3.2 ADJUSTMENT

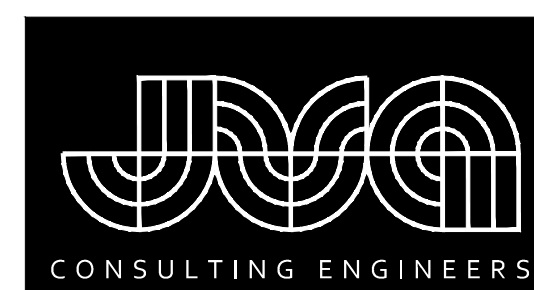
- A. Check and adjust valves and accessories for smooth operation in accordance with manufacturer's instructions

END OF SECTION

CITY OF GRAND JUNCTION WATER TREATMENT PLANT FILTER UPGRADE PROJECT GRAND JUNCTION, COLORADO BID SET

CONTACTS

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ENGINEER:	JVA, INC 214 8TH STREET, SUITE 210 GLENWOOD SPRINGS, CO 81601 COOPER BEST, P.E.	(970) 404-3100
ELECTRICAL ENGINEER:	BROWNS HILL ENGINEERING 8119 SHAFFER PARKWAY LITTLETON, CO 80127 TED WILLE, P.E.	(720) 344-7771
MECHANICAL ENGINEER:	MEC, INC. 4191 W. 98TH WAY WESTMINSTER, CO 80031 BRYAN MOEN, P.E.	(303) 907-4285



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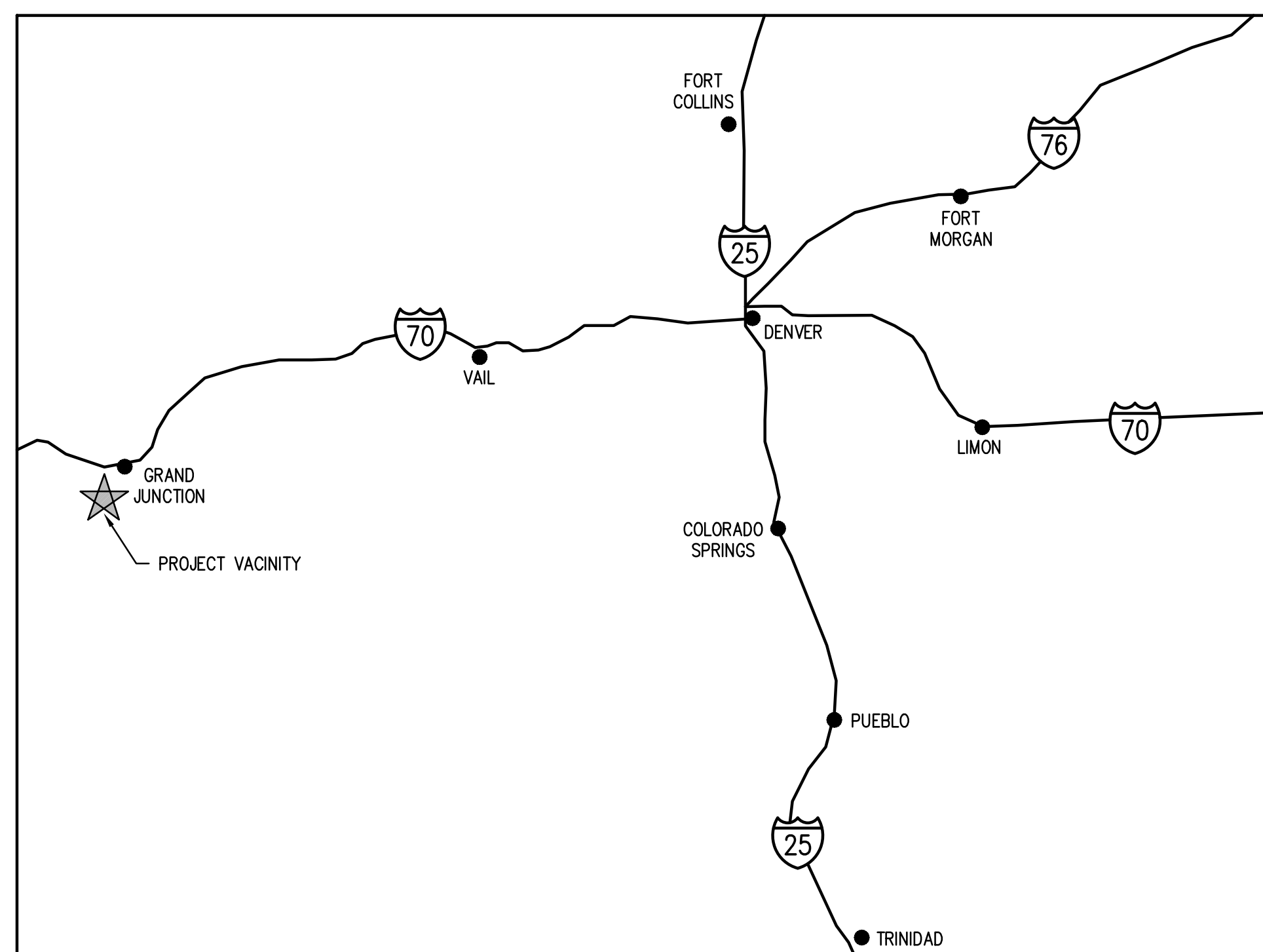
AUGUST 2016

PREPARED UNDER THE SUPERVISION OF

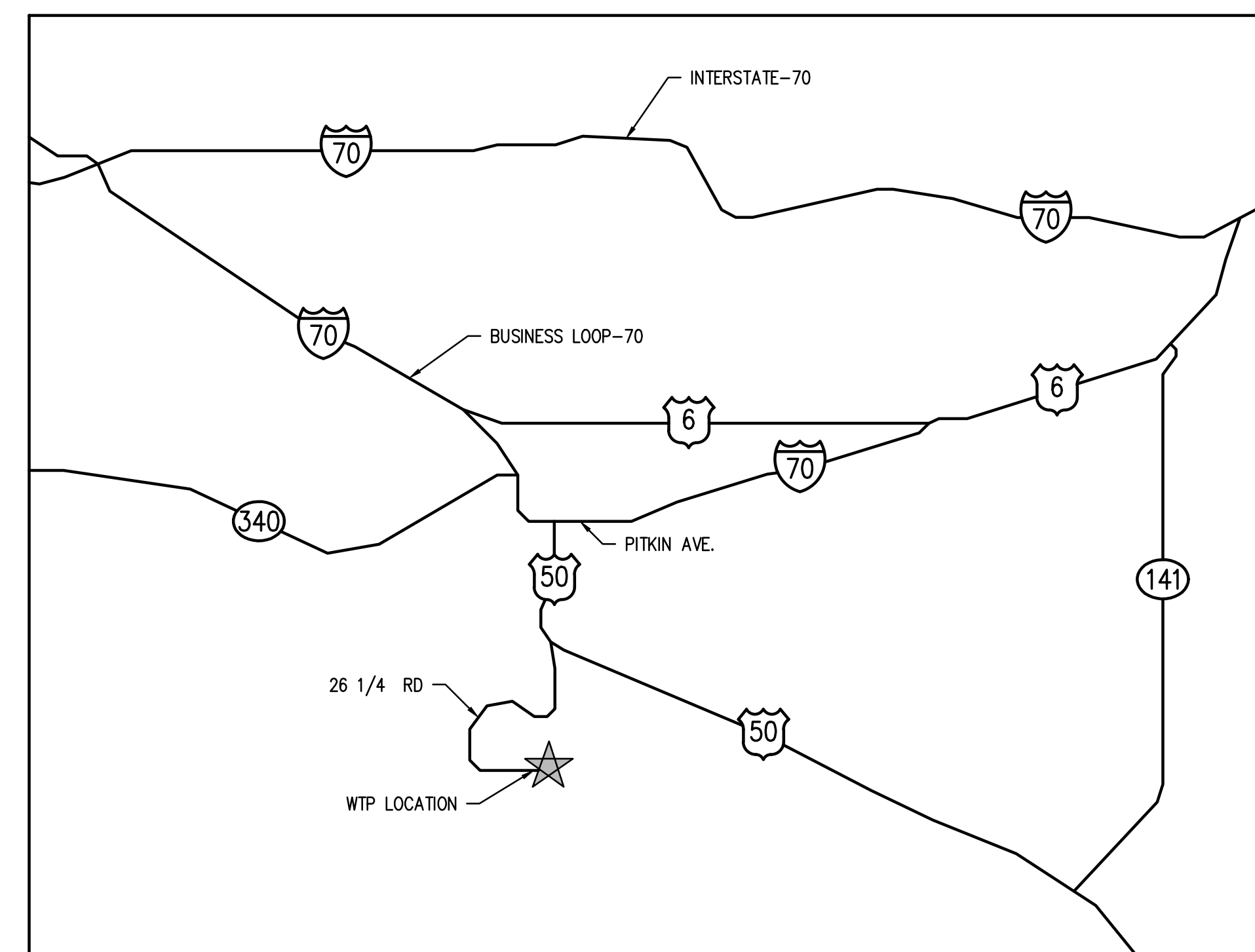
JVA, Inc.

DRAWING INDEX

SHEET NO.	TITLE
G0.0	COVER SHEET
G0.1	LEGEND, NOTES AND ABBREVIATIONS
P1.0	OPERATING FLOOR - DEMO PLAN
P1.1	LOWER LEVEL AND PIPE GALLERY - DEMO PLAN - PHASE I
P1.2	LOWER LEVEL AND PIPE GALLERY - DEMO PLAN - PHASE II
P1.3	FILTER BOTTOM / CLEARWELL - DEMO PLAN - PHASE I
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VICINITY MAP
NTS

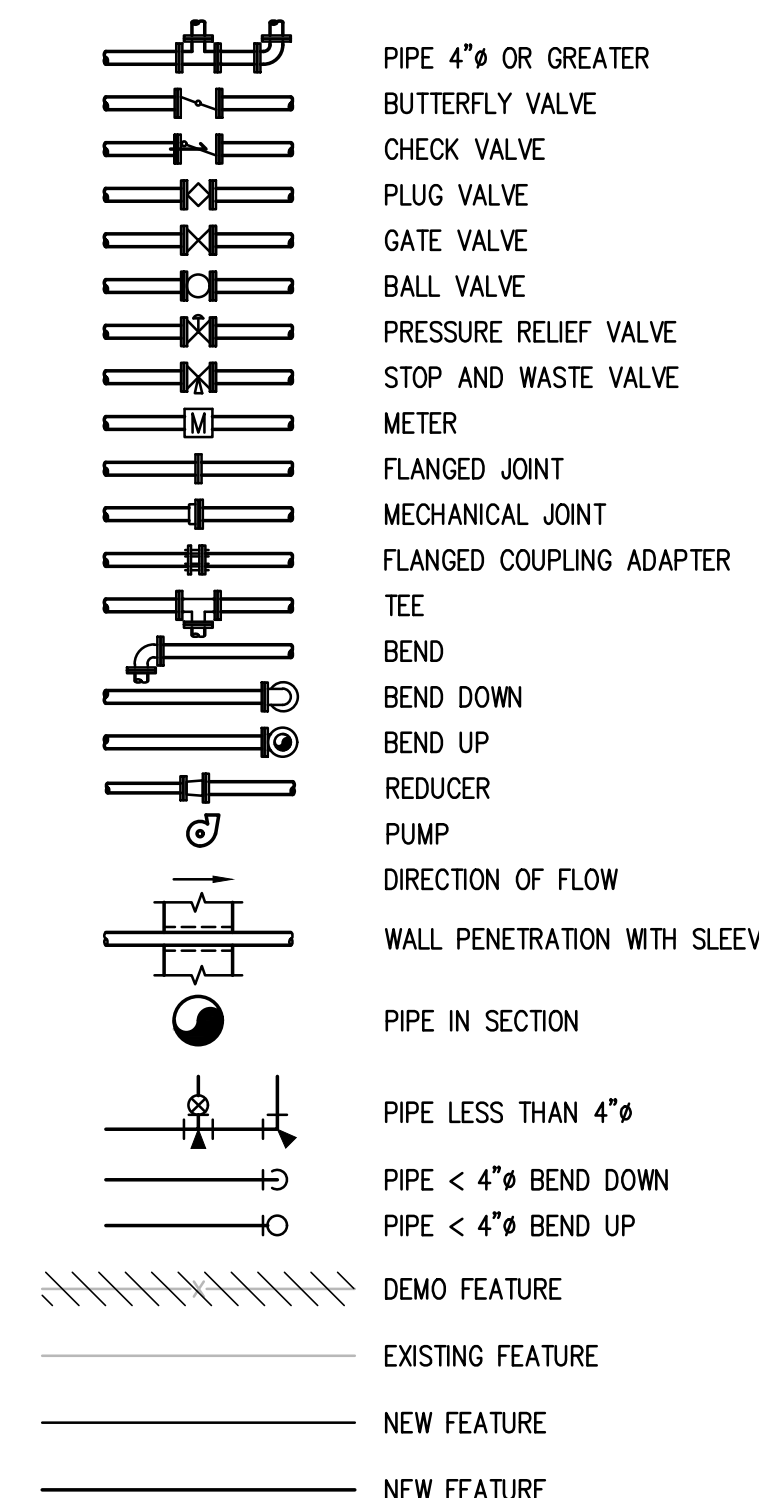


PROJECT LOCATION MAP
NTS

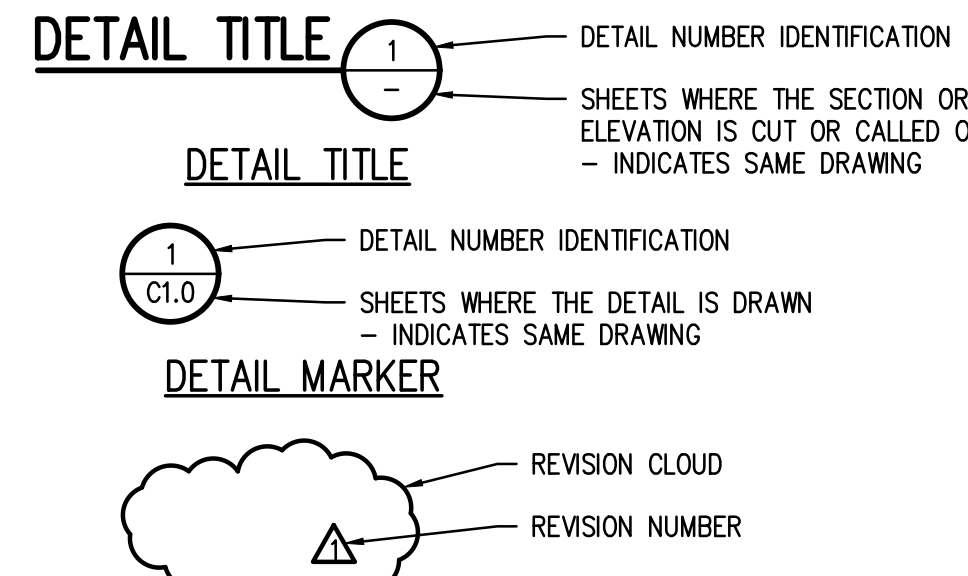
ABBREVIATIONS

AB	ANCHOR BOLT	F/F	FACE TO FACE	N	NITROGEN
ABAN	ABANDON	FCA	FLANGE COUPLING ADAPTER	NAC	NOCL SUPPLY LINE
ABC	AGGREGATE BASE COURSE	FD	FLOOR DRAIN	NAL	NOAIO2 SUPPLY LINE
AC	AIR CONDITIONING	FDN	FOUNDATION	NIC	NOT IN CONTRACT
ACKV	AUTOMATIC CHECK VALVE	FED	FEDERAL	NP	NO PAINT
ACOUS	ACOUSTICAL	FES	FLARED END SECTION	NPL	NAMEPLATE
ACP	ASPHALTIC CONCRETE PAVING	FIN	FINISH	NPT	NATIONAL PIPE THREAD
ACTR	ACTUATOR	FIN FL	FINISH FLOOR	NPW	NON-POTABLE WATER
AD	AREA DRAIN OR ACCESS DOOR	FIN GR	FINISH GRADE	NRS	NON-RISING STEM
ADDL	ADDITIONAL	FL	FLOWLINE	NS	NEAR SIDE
ADDM	ADDENDUM	FLR	FLOOR	NTS	NOT TO SCALE
ADJ	ADJUSTABLE	FF	FLOOR FINISH		
AFF	ABOVE FINISHED FLOOR	FN	FENCE		
AFG	ABOVE FINISHED GRADE	FOC	FACE OF CONCRETE	OC	ON CENTER
AHU	AIR HANDLING UNIT	FBM	FEET PER MINUTE	OD	OUTSIDE DIAMETER
AL	ALUMINUM	FP	FEED POINT	OF	OUTSIDE FACE
ALT	ALTERNATE	FPS	FEET PER SECOND	OPNG	OPENING
AMT	AMOUNT	FPW	FIRE PROTECTION WATER SUPPLY	OPP	OPPOSITE
APPROX	APPROXIMATE	FR	FRAME	OPT	OPTIONAL
ARCH	ARCHITECT(URAL)	FRP	FIBERGLASS REINFORCED PLASTIC		
ARV	AIR RELIEF VALVE	FSTNR	FASTENER	P	PUMP
ASME	AMERICAN SOCIETY MECHANICAL ENGINEERS	FT	FEET	PA	PIPE ANCHOR
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	FTG	FOOTING OR FITTING	PAR	PARALLEL
ASPH	ASPHALT	FUR	FURNACE	PC	POINT OF CURVE, OR PORTLAND CEMENT
ASSY	ASSEMBLY			PCO	PRESSURE CLEAN OUT
ASYM	ASYMMETRICAL	G	GAS	PCP	PROGRESSING CAVITY PUMP
ATS	AUTOMATIC TRANSFER SWITCH	GA	GAUGE	PCR	POINT OF CURVE RETURN
AUTO	AUTOMATIC	GAL	GALLON	PD	PUMP DISCHARGE LINE
AVG	AVERAGE	GALV	GALVANIZED	PE	PLAIN END
AVS	AUTOMATIC VALVE STATION	GIP	GALVANIZED IRON PIPE	PERM	PERMANENT
		GPD	GALLONS PER DAY	PERP	PERPENDICULAR
B	BLOWER	GPM	GALLONS PER MINUTE	PG	PRESSURE GAGE
B&F	BELL AND FLANGE	GR	GRADE	PI	POINT OF INTERSECTION
BB	BOND BEAM	GR BM	GRADE BEAM	PICV	POINT OF INTERSECTION FOR VERTICAL CURVE
BAF	BAFFLE	GRC	GALVANIZED RIGID CONDUIT	PL	PLATE OR PROPERTY LINE
BC	BACK OF CURB	GRG	GRATING	PLB	PLUMBING
BE	BELL END	GSP	GALVANIZED STEEL PIPE	PLYWD	PLYWOOD
BF	BOTTOM FACE	GV	GATE VALVE	PNT	PAINT
BFG	BUTTERFLY VALVE	GWB	GYPSUM WALL BOARD	POLY	POLYETHYLENE
BLK	BLOCK	H	HIGH	PORT	PORTABLE
BM	BENCH MARK	HB	HOSE BIB	POST	POSTIVE
BMP	BEST MANAGEMENT PRACTICES	HDWL	HEADWALL	PPM	PARTS PER MILLION
BODS	BIOCHEMICAL OXYGEN DEMAND	HNDRL	HAND RAIL	PRCST	PRECAST
BOT	BOTTOM	HNDWL	HANDWHEEL	PREFAB	PREFABRICATED
BS	BACKSIGHT	HORIZ	HORIZONTAL	PREFIN	PREFINISHED
BSMT	BASEMENT	HP	HORSEPOWER	PRELIM	PRELIMINARY
BU	BELL UP	HR	HOUR	PREP	PREPARATION
BV	BALL VALVE	HS	HIGH STRENGTH HEATING, VENTILATION, AIR CONDITIONING	PROJ	PROJECT
BCV	BUTTERFLY CHECK VALVE	HVAC	HIGH STRENGTH HEATING, VENTILATION, AIR CONDITIONING	PROP	PROPERTY
		HW	HOT WATER	PRS	PRESSURE REDUCING STATION
C/C	CENTER TO CENTER	HWL	HIGH WATER LINE	PRV	PRESSURE REDUCING VALVE OR PRESSURE RELIEF VALVE
CA	CITRIC ACID SUPPLY LINE	HWY	HIGHWAY	PS	PIPE SUPPORT
CB	CATCH BASIN	HYD	HYDRANT	PSF	POUNDS PER SQUARE FOOT
CCW	COUNTER CLOCKWISE			PSI	POUNDS PER SQUARE INCH
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION	INCL	INCLUDED	PSIA	POUNDS PER SQUARE INCH ABSOLUTE
CEB	CONCRETE EQUIPMENT BASE	INCR	INCREASER	PSIG	POUNDS PER SQUARE INCH GAGE
CHKV	CHECK VALVE	ID	INSIDE DIAMETER	PT	POINT OF UNION
CIP	CAST IRON PIPE	IF	INSIDE FACE	PTD	PAINTED
CI MJ	CAST IRON MECHANICAL JOINT	INF	INFLENT	PTRV	PRESSURE TEMPERATURE RELIEF VALVE
CISP	CAST IRON SOIL PIPE	INL	INLET		
CJ	CONSTRUCTION JOINT	INSL	INSTALLATION	PV	PLUG VALVE
CL	CENTER LINE OR CHAIN LINK	INSTR	INSTRUMENT	PVC	POINT OF VERTICAL CURVE OR POLYVINYL CHLORIDE
CLG	CEILING	INSUL	INSULATION	PVG	PAVING
CLR	CLEAR	INTR	INTERIOR	PW	PAVEMENT
CMP	CORRUGATED METAL PIPE	INV	INVERT		
CMU	CONCRETE MASONRY UNIT	INV EL	INVERT ELEVATION		
CO	CLEAN OUT	ISA	INSTRUMENT SOCIETY OF AMERICA		
CONC	CONCRETE	ISO	ISOMETRIC		
CONSTR	CONSTRUCTION			Q AVG	AVERAGE DAILY FLOW
CONT	CONTINUOUS(ATION)	JST	JOIST	Q MAX	MAXIMUM DAILY FLOW
CP	CENTRIFUGAL PUMP	JTS	JOINTS	Q PEAK	PEAK HOUR FLOW
CPLG	COUPLING			QCV	QUICK COUPLER VALVE
CPVC	CHLORINATED POLYVINYL CHLORIDE	KO	KNOCKOUT	QTR	QUARTER
CR	CONCENTRIC REDUCER	KPL	KICK PLATE	QTY	QUANTITY
CTR	CENTER	KWY	KEYWAY		
CV	CHECK VALVE	L	LEFT OR LITER		
CW	COLD WATER	LAB	LABORATORY	R	RADIUS
CY	CUBIC YARDS	LSCAPE	LANDSCAPE(ING)	RAS	RETURN ACTIVATED SLUDGE
		LATL	LATERAL	RC	REINFORCED CONCRETE
DCO	DOUBLE CLEAN OUT	LAV	LAVATORY	RCP	REINFORCED CONCRETE PIPE
DEMO	DEMOLITION	LB(S)	POUND(S)	RD	ROOF DRAIN
D	DEIONIZATION	LCMU	LIGHTWEIGHT CONCRETE MASONRY UNIT	RED	REDUCER
DIA	DIAMETER	LF	LINEAR FOOT	REC	RECEIVED
DIAG	DIAGONAL	LG	LENGTH	RECT	RECTANGULAR
DIM	DIMENSION	LH	LATENT HEAT	REF	REFERENCE
DIP	DUCTILE IRON PIPE	LKR	LOCKER	REHAB	REHABILITATION
DISP	DISPENSER	LL	LIVE LOAD, LOOSE LINTEL	REIN	REINFORCE (D) (ING) (MENT)
DL	DEAD LOAD	LOC	LOCATION	REQD	REQUIRED
DMJ	DUCTILE MECHANICAL JOINT	LP	LOW PRESSURE OR LIGHT POLE	RESIL	RESILIENT
DN	DOWN	LRG	LARGE	RFA	RESTRAINED FLANGED COUPLING ADAPTER
DR	DRAIN	LT	LIGHT	RFG	ROOFING
DWG	DRAWING	LT WT	LIGHTWEIGHT	RH	RIGHT HAND
DWL	DRAWN	LWC	LIGHTWEIGHT CONCRETE	RM	ROOM
DWN	DRAIN WASTE AND VENT	LWL	LOW WATER LEVEL	RND	ROUND
				RO	ROUGH OPENING
EA	EACH			ROW	RIGHT OF WAY
ECC	ECCENTRIC	MAINT	MAINTENANCE	RPPB	REDUCED PRESSURE BACKFLOW PREVENTER
EF	EACH FACE OR ELECTRICAL FAN	MANU	MANUAL	RPM	REVOLUTIONS PER MINUTE
EFF	EFFLUENT	MATL	MATERIAL	RPS	REVOLUTIONS PER SECOND
EJ	EXPANSION JOINT	MAX	MAXIMUM	RR	RAILROAD
EL	ELEVATION	MCC	MOTOR CONTROL CENTER	RRAS	RAPID RETURN ACTIVATED SLUDGE
ELB	ELBOW	MECH	MECHANICAL	RTN	RETURN
ELEC	ELECTRICAL	MED	MEDIUM		
ENGR	ENGINEER	MFM	MAGNETIC FLOW METER	SA	SUPPLY AIR
EOA	EDGE OF ASPHALT	MFR	MANUFACTURER	SALV	SALVAGE
EOP	EDGE OF PAVEMENT	MG	MILLION GALLONS OR MILLIGRAMS	SAN	SANITARY
EQ	EQUAL	MGD	MILLION GALLONS PER DAY	SB	SPLASH BLOCK
EQ SP	EQUALLY SPACED	MGMT	MANAGEMENT	SOFM	STANDARD CUBIC FEET PER MINUTE
EQUIP	EQUIPMENT	MH	MANHOLE	SCH	SCHEDULE
EQUIV	EQUIVALENT	MIN	MINIMUM	SCRN	SCREEN
ESMT	EASEMENT	MISC	MISCELLANEOUS	SD	STORM DRAIN
EST	ESTIMATE	MJ	MECHANICAL JOINT	SDR	STANDARD DIMENSION RATIO
EUH	ELECTRIC UNIT HEATER	MLSS	MIXED LIQUID SUSPENDED SOLIDS	SECT	SECTION
EW	EACH WAY	MO	MASONRY OPENING	SHLDR	SHOULDER
EXH	EXHAUST	MRCWB	MOISTURE RESISTANT	SHT	SHEETING
EXP BT(S)	EXPANSION BOLT(S)	MTG	MOUNTING	SHTHG	SHEATHING
EXP JT	EXPANSION JOINT			SIM	SIMILAR
EXIST	EXISTING			SLV	SLEEVE
EXIST GR	EXISTING GRADE				
EXT	EXTERIOR				
EXTN	EXTENSION				

LEGEND



SYMBOLS

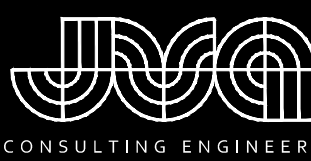


GENERAL NOTES:

- ALL MATERIALS AND WORKMANSHIP SHALL BE IN CONFORMANCE WITH THE LATEST STANDARDS AND SPECIFICATIONS OF THE CITY OF GRAND JUNCTION, GRAND JUNCTION FIRE DEPARTMENT, COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, AND ALL APPLICABLE STATE AND LOCAL STANDARDS AND SPECIFICATIONS. THE CONTRACTOR SHALL HAVE IN POSSESSION AT THE JOB SITE AT ALL TIMES ONE (1) SIGNED COPY OF APPROVED PLANS, STANDARDS AND SPECIFICATIONS. CONTRACTOR SHALL CONSTRUCT AND MAINTAIN EMERGENCY ACCESS ROUTES TO THE SITE AND STRUCTURE AT ALL TIMES PER THE LOCAL FIRE PROTECTION DISTRICT REQUIREMENTS. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FOR ANY VARIANCE TO THE ABOVE DOCUMENTS. NOTIFY ENGINEER OF ANY CONFLICTING STANDARDS OR SPECIFICATIONS. IN THE EVENT OF ANY CONFLICTING STANDARD OR SPECIFICATION, THE MORE STRINGENT OR HIGHER QUALITY STANDARD, DETAIL OR SPECIFICATION SHALL APPLY.
- THE CONTRACTOR SHALL OBTAIN, AT HIS OWN EXPENSE, ALL APPLICABLE CODES, LICENSES, STANDARD SPECIFICATIONS, PERMITS, BONDS, ETC., WHICH ARE NECESSARY TO PERFORM THE PROPOSED WORK, INCLUDING, BUT NOT LIMITED TO AN ELECTRICAL PERMIT THROUGH THE CITY OF GRAND JUNCTION.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE REQUIRED PARTY (OWNER, ENGINEER AND/OR UTILITY OWNER) AT LEAST 48 HOURS PRIOR TO THE START OF ANY CONSTRUCTION. THE CONTRACTOR SHALL CONTINUE WITH NOTIFICATIONS THROUGHOUT THE PROJECT AS REQUIRED BY THE STANDARDS AND SPECIFICATIONS.
- THE LOCATIONS OF EXISTING UTILITIES ARE SHOWN IN THE APPROXIMATE LOCATION BASED ON INFORMATION BY OTHERS. NOT ALL UTILITIES MAY BE SHOWN. THE CONTRACTOR SHALL DETERMINE THE EXACT SIZE, LOCATION AND TYPE OF ALL EXISTING UTILITIES WHETHER SHOWN OR NOT BEFORE COMMENCING WORK. THE ENGINEER AND/OR OWNER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE FULLY AND SOLELY RESPONSIBLE FOR ANY AND ALL DAMAGES AND COSTS WHICH MIGHT OCCUR BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES. THE CONTRACTOR SHALL NOTIFY ALL PUBLIC AND PRIVATE UTILITY COMPANIES AND DETERMINE THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO PROCEEDING WITH GRADING AND CONSTRUCTION. ALL WORK PERFORMED IN THE AREA OF UTILITIES SHALL BE PERFORMED AND INSPECTED ACCORDING TO THE REQUIREMENTS OF THE UTILITY OWNER. LIKEWISE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND MAPPING ANY EXISTING UTILITY (INCLUDING DEPTH) WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION, AND FOR RELOCATING ENCOUNTERED UTILITIES AS DIRECTED BY THE ENGINEER. CONTRACTOR SHALL CONTACT AND RECEIVE APPROVAL FROM THE CITY OF GRAND JUNCTION AND ENGINEER BEFORE RELOCATING ANY ENCOUNTERED UTILITIES. CONTRACTOR IS RESPONSIBLE FOR SERVICE CONNECTIONS, AND RELOCATING AND RECONNECTING AFFECTED UTILITIES AS COORDINATED WITH UTILITY OWNER AND/OR ENGINEER, INCLUDING NON-MUNICIPAL UTILITIES (TELEPHONE, GAS, CABLE, ETC., WHICH SHALL BE COORDINATED WITH THE UTILITY OWNER). THE CONTRACTOR SHALL IMMEDIATELY CONTACT ENGINEER UPON DISCOVERY OF A UTILITY DISCREPANCY OR CONFLICT. AT LEAST 48 HOURS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE UTILITY NOTIFICATION CENTER OF COLORADO (1-800-922-1987, WWW.UNCC.ORG).
- THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS AT AND ADJACENT TO THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING THE PERFORMANCE OF THE WORK.
- ALL SURPLUS MATERIALS, TOOLS, AND TEMPORARY STRUCTURES, FURNISHED BY THE CONTRACTOR, SHALL BE REMOVED FROM THE PROJECT SITE BY THE CONTRACTOR. ALL DEBRIS AND RUBBISH CAUSED BY THE OPERATIONS OF THE CONTRACTOR SHALL BE REMOVED, AND THE AREA OCCUPIED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO ITS ORIGINAL CONDITION WITHIN 48 HOURS OF PROJECT COMPLETION, UNLESS OTHERWISE DIRECTED BY THE MUNICIPALITY OR OWNER'S REPRESENTATIVE.
- ELEVATIONS WERE TAKEN FROM THE 1967 CITY OF GRAND JUNCTION WTP IMPROVEMENT PROJECT BY HENNINGSON, DURHAM & RICHARDSON. THE FINISHED FLOOR ELEVATIONS WERE USED TO SET ELEVATIONS AND HORIZONTAL OFFSETS. THE 1967 HENNINGSON, DURHAM & RICHARDSON DRAWINGS ARE AVAILABLE AT [HTTP://ARCIS-FS.CI.GRANDJUNCT.CO.US/MAPS/07055300.PDF](http://arcgis-fs.ci.grandjunct.co.us/maps/07055300.pdf). CONTRACTOR TO REFER TO PREVIOUS DRAWINGS FOR EXISTING INFORMATION. COORDINATE AND VERIFY ALL VERTICAL AND HORIZONTAL DATA SHOWN AND REPORT ANY IRREGULARITIES OR DISCREPANCIES TO ENGINEER PRIOR TO CONSTRUCTION.
- PIPE LENGTHS AND HORIZONTAL CONTROL POINTS SHOWN ARE FROM CENTER OF STRUCTURES, END OF FLARED END SECTIONS, ETC. SEE STRUCTURE DETAILS FOR EXACT HORIZONTAL CONTROL LOCATION. CONTRACTOR IS RESPONSIBLE FOR ADJUSTING ACTUAL PIPE LENGTHS TO ACCOUNT FOR STRUCTURES AND LENGTH OF FLARED END SECTIONS.
- THE CONTRACTOR SHALL FURNISH THE ENGINEER OF RECORD A COMPLETE SET OF CONSTRUCTION RECORD DRAWINGS ("AS-BUILTS"), FOR THE CONSTRUCTED IMPROVEMENTS. THE PLANS SHALL SHOW SUFFICIENT DIMENSION TIES TO PERMANENT SURFACE FEATURES FOR ALL BURIED FACILITIES TO ALLOW FOR FUTURE LOCATING. ENGINEER WILL PRODUCE FINAL RECORD DRAWINGS.
- CONTRACTOR SHALL PROVIDE ALL TEMPORARY PROCESS, POWER, AND UTILITY SERVICE BYPASSES AND CONNECTIONS AS REQUIRED BY THE WORK AND AS REQUIRED TO SUSTAIN CONTINUOUS OPERATIONS OF THE FACILITY.
- CONTRACTOR SHALL PROVIDE TEMPORARY THRUST RESTRAINTS AND PIPE SUPPORTS FOR ANY EXISTING FACILITIES AND/OR UTILITIES AS REQUIRED TO PERFORM THE WORK. ANY EXISTING RESTRAINT, PIPE SUPPORT, OR SUPPORT SYSTEM SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE IF ANY DAMAGE OCCURS.

GENERAL DEMO NOTES:

- CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS, DIMENSIONS, AND ELEVATIONS PRIOR TO CONSTRUCTION AND/OR FABRICATION. EXISTING PIPE LOCATIONS ARE APPROXIMATE.
- REMOVE CONCRETE TO THE LIMITS NOTED. IN EXPOSED AREAS NOT COVERED BY NEW CONSTRUCTION, REMOVE REINFORCEMENT AND EMBEDMENTS 1" BEYOND FINISHED SURFACE AND PATCH SURFACE WITH GROUT TO MATCH ADJACENT FINISHED SURFACE.
- REMOVE CONCRETE ANCHORS, ANCHOR BOLTS, AND OTHER EMBEDMENTS FOR MATERIALS AND EQUIPMENT BEING REMOVED. IN EXPOSED AREAS NOT COVERED BY NEW CONSTRUCTION, REMOVE CONCRETE ANCHORS, ANCHOR BOLTS, AND OTHER EMBEDMENTS 1" BEYOND FINISHED SURFACE AND PATCH SURFACE TO MATCH ADJACENT FINISHED SURFACE.
- WHERE EQUIPMENT IS INDICATED TO BE REMOVED, REMOVE ALL ASSOCIATED POWER AND CONTROL WIRING AND CONDUIT BACK TO SOURCE. WHERE CONDUIT SYSTEMS CONTAIN CIRCUITS TO OTHER EQUIPMENT THAT REMAINS, RETAIN THESE CIRCUITS AND RELOCATE EXISTING CONDUIT AND EXTEND EXISTING CIRCUITS AS REQUIRED FOR THE INSTALLATION OF NEW EQUIPMENT.
- REMOVE ALL SUPPORTS ASSOCIATED WITH REMOVED PIPING, DUCTWORK, CONDUIT, AND EQUIPMENT. REMOVE RODS AND FASTENERS FROM CEILINGS, FLOORS, AND WALLS WITH CARE. WHERE SURFACE HAS BEEN MARRED, CHIPPED, SPAWLED, ETC. AS A RESULT OF REMOVAL, PATCH AND PAINT TO MATCH ADJACENT FINISHED SURFACE.
- WHERE OPENINGS ARE LEFT IN WALLS OR SLABS DUE TO REMOVED PIPING, EQUIPMENT, OR OTHER WORK, PATCH OPENING TO MATCH ADJACENT SURFACES UNLESS NOTED OTHERWISE. THE PERIMETER OF OPENINGS IN CONCRETE WALLS AND SLABS EXPOSED TO EARTH, WEATHER, OR WATER SHALL BE LINED WITH A GASKET TYPE WATERSTOP PRIOR TO PATCHING THE WALL.



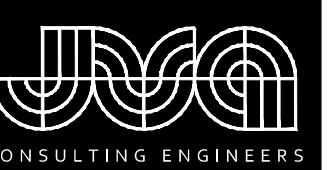
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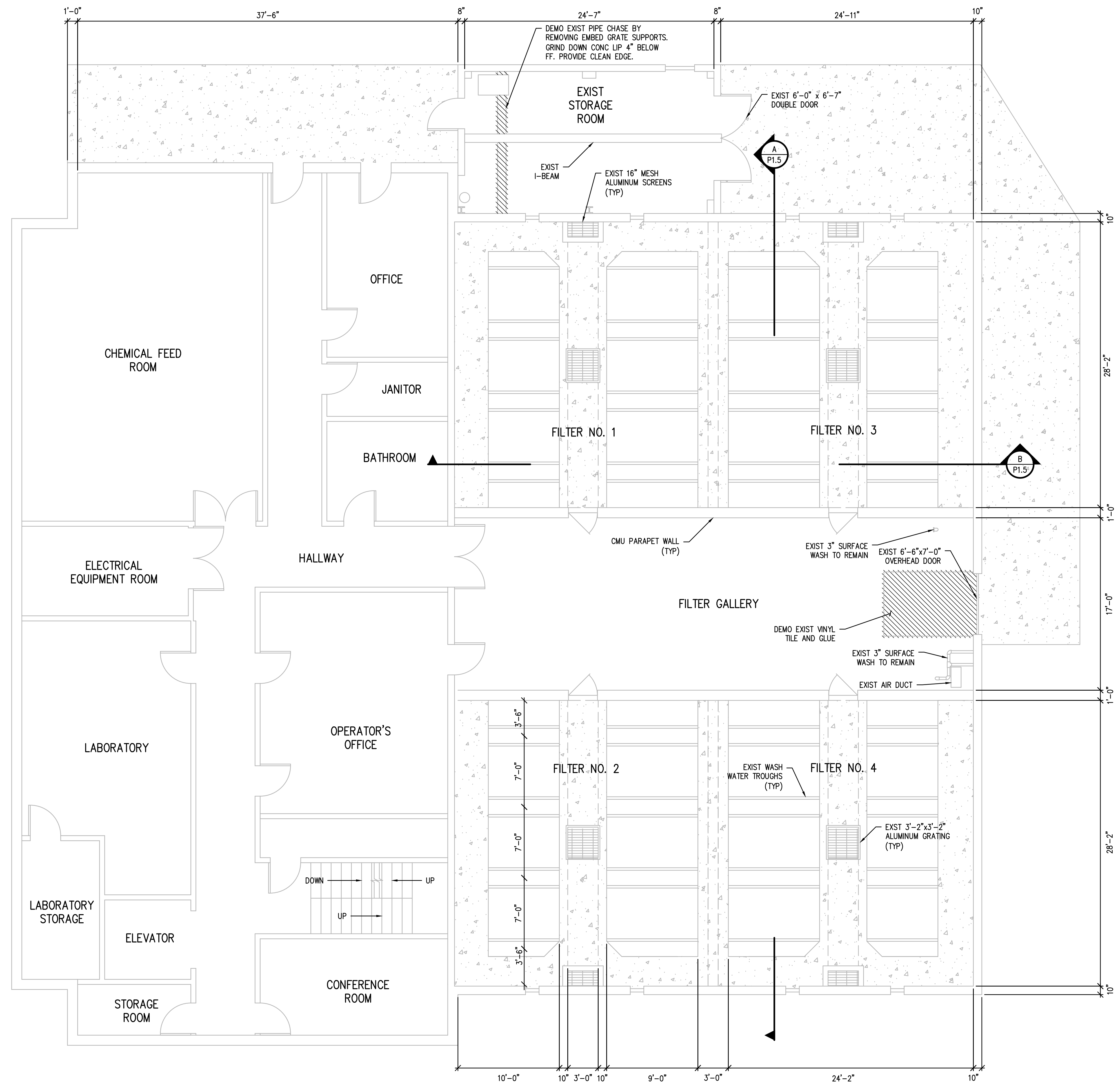
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 DATE: AUGUST 2016
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CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT
 LEGEND, NOTES AND ABBREVIATIONS

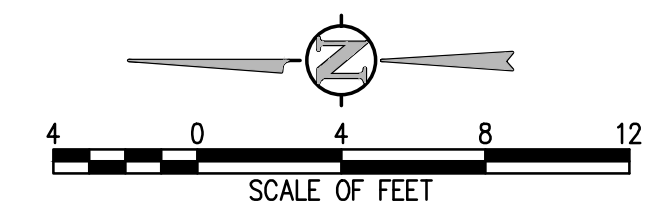
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OPERATING FLOOR PLAN
 3/16" = 1'-0"

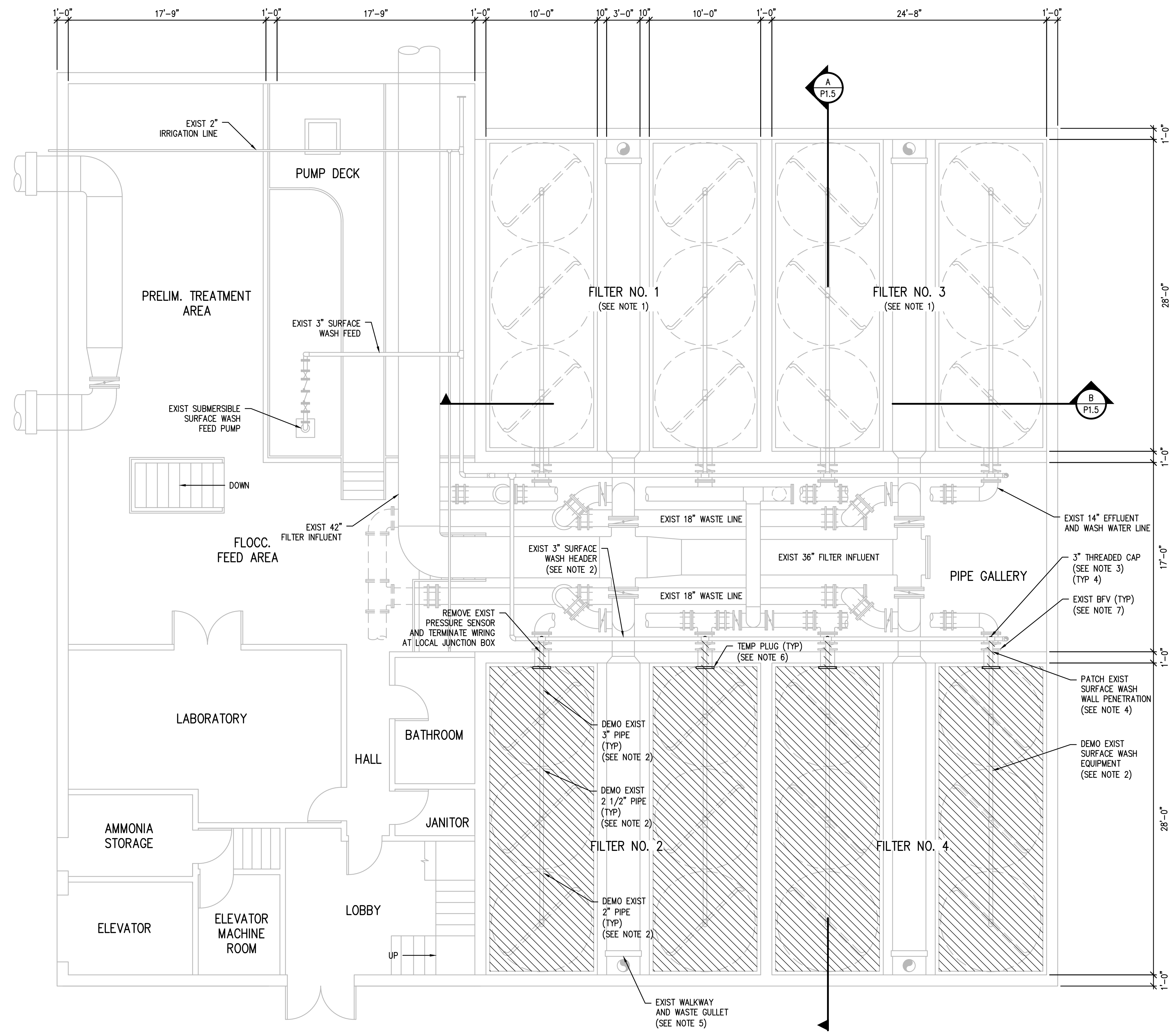


NO.	DATE	DESIGN	DESCRIPTION

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DRAWN BY:	LLG
CHECKED BY:	JJM/CDB
JOB #:	2538c
DATE:	AUGUST 2016
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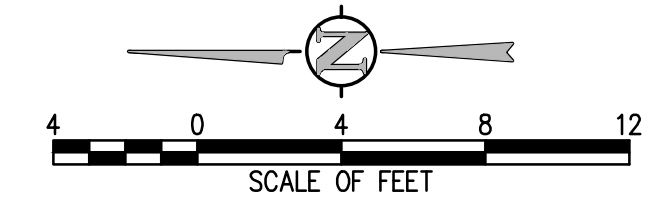
CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT
 OPERATIONS LEVEL
 DEMO PLAN

SHEET NO.
P1.0



LOWER LEVEL AND PIPE GALLERY PLAN
3/16" = 1'-0"

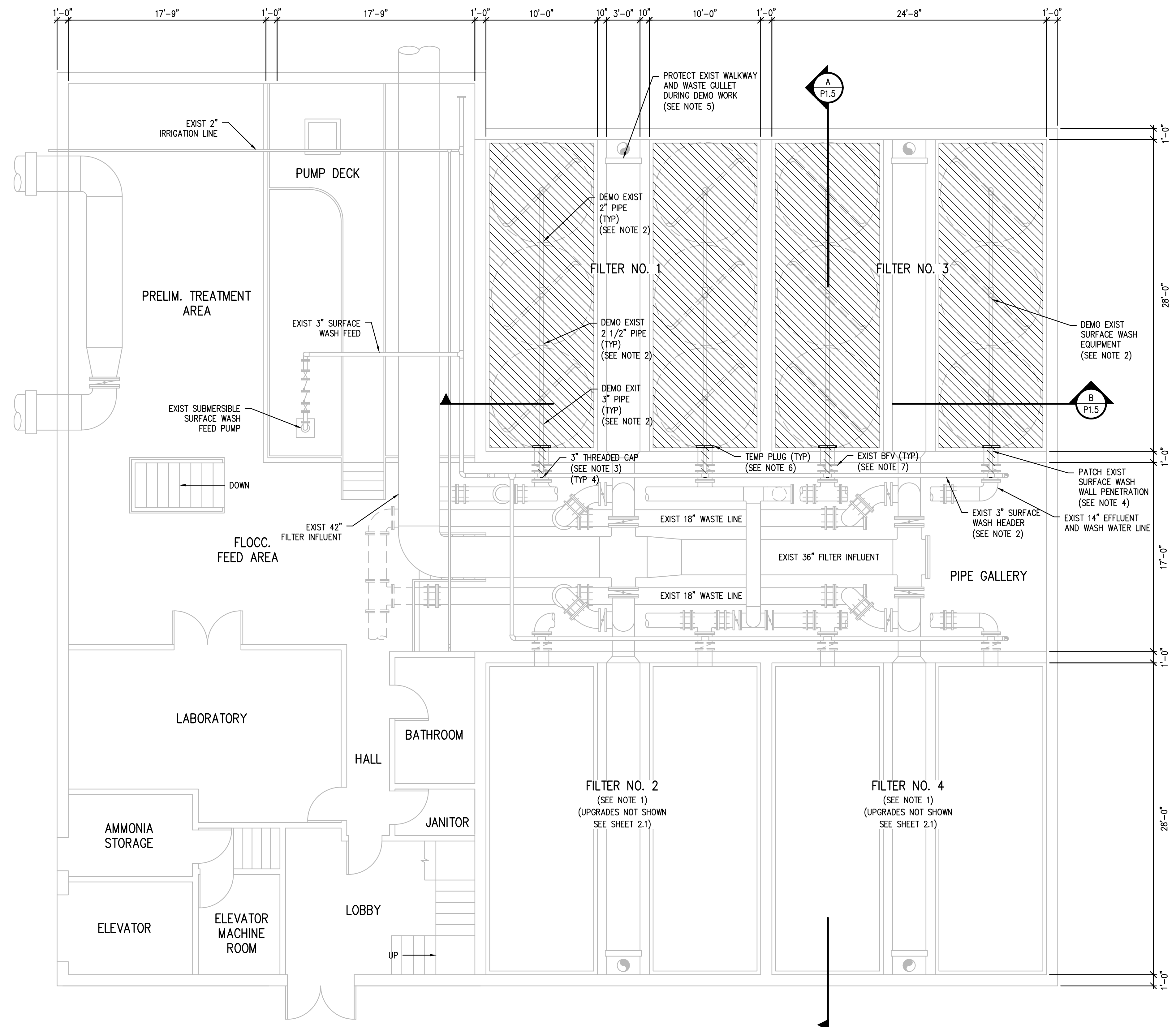
- PHASE I DEMO NOTES:**
- FILTERS 1 AND 3 MUST REMAIN IN OPERATION WHILE FILTERS 2 AND 4 ARE BEING DEMOED. ONCE FILTERS 2 AND 4 ARE FULLY FUNCTIONAL AND OPERATIONAL, CONTRACTOR CAN BEGIN DEMO WORK ON FILTERS 1 AND 3, AFTER OWNERS APPROVAL.
 - DEMO ALL SURFACE WASH EQUIPMENT, PIPING, SUPPORTS, BEAMS, SPRAY NOZZLES, ETC. FROM INSIDE FILTERS UP TO SURFACE WASH HEADER AS SHOWN (TYP).
 - INSTALL THREADED CAP IN SURFACE WASH HEADER WHERE FILTER SURFACE WASH PIPING WAS DEMOED.
 - PATCH PIPE PENETRATION BY ROUGHENING CONCRETE SURFACE TO 1/4" AMPLITUDE, INSTALLING EXPANDING TYPE WATERSTOP (WATERSTOP RX OR EQUAL), AND PATCH WITH NON-SHRINK GROUT TO MATCH EXISTING WALL SURFACES. PROTECT EXIST WALKWAY, WASTE GULLET AND TROUGHS DURING DEMO PHASE.
 - PROTECT VALVES, SEAL EFFLUENT PIPE LEAVING THE FILTERS WITH WATERTIGHT SEAL (I.E. TEMP PLUG).
 - CITY TO ISOLATE EFFLUENT VALVE PRIOR TO DEMO.



NO.	DATE	DESIGNED BY	DESCRIPTION

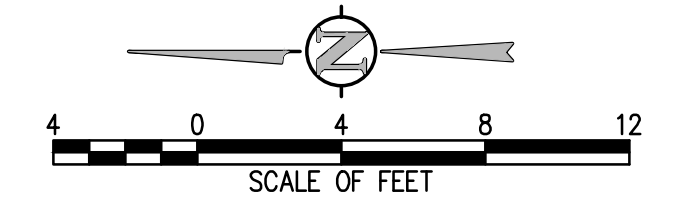
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JOB #:	2538c
DATE:	AUGUST 2016
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CITY OF GRAND JUNCTION
WTP FILTER UPGRADE PROJECT
LOWER LEVEL AND PIPE GALLERY
DEMO PLAN - PHASE I



LOWER LEVEL AND PIPE GALLERY PLAN
3/16" = 1'-0"

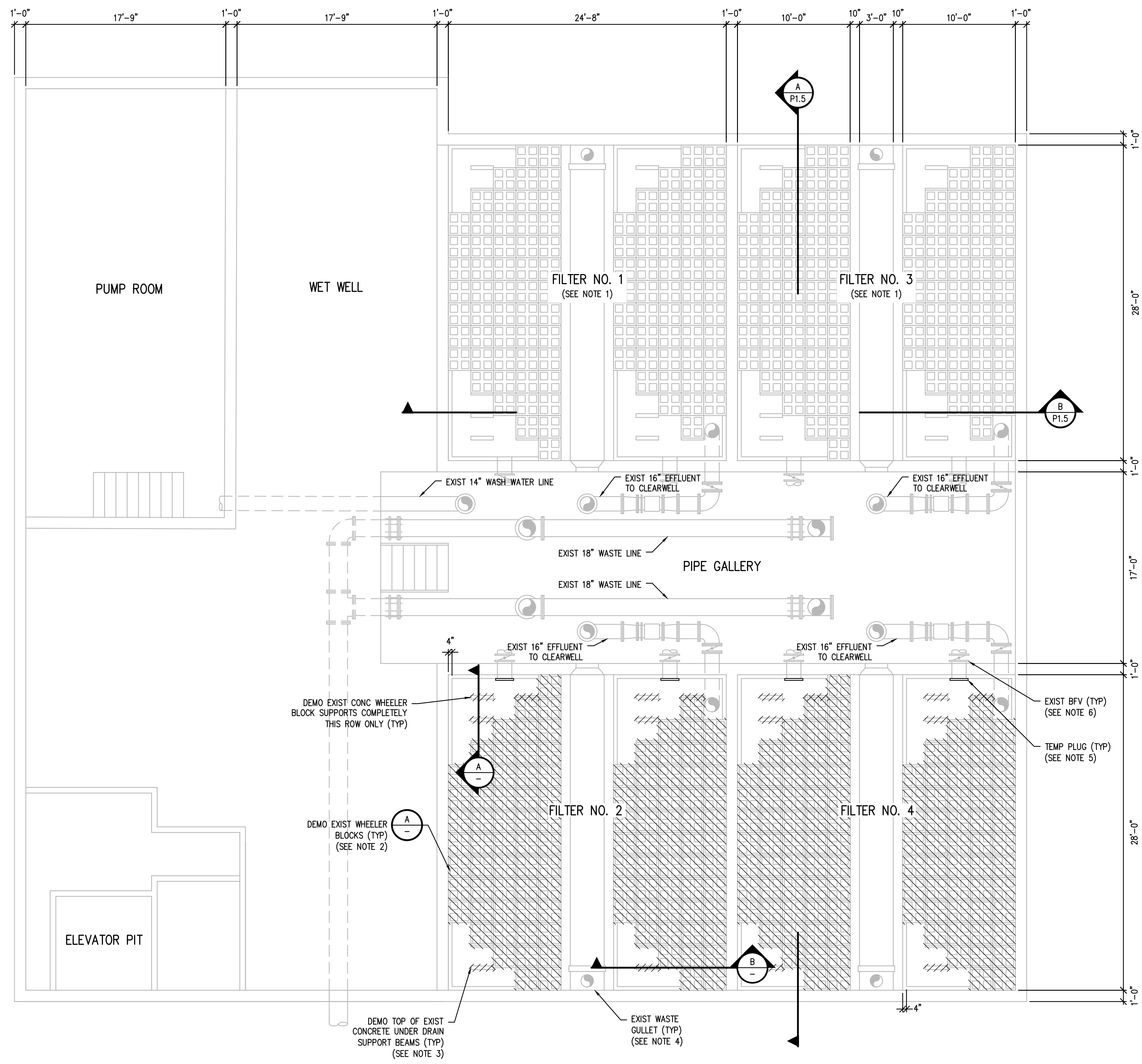
- PHASE II DEMO NOTES:**
1. FILTERS 2 AND 4 MUST BE IN OPERATION WHILE FILTERS 1 AND 3 ARE BEING DEMOED.
 2. DEMO ALL SURFACE WASH EQUIPMENT, PIPING, SUPPORTS, BEAMS, SPRAY NOZZLES, ETC. FROM INSIDE FILTERS UP TO SURFACE WASH HEADERS AS SHOWN (TYP).
 3. INSTALL THREADED CAP IN SURFACE WASH HEADER WHERE FILTER SURFACE WASH PIPING WAS DEMOED.
 4. PATCH PIPE PENETRATION BY ROUGHENING CONCRETE SURFACE TO 1/4" AMPLITUDE, INSTALLING EXPANDING TYPE WATERSTOP (WATERSTOP RX OR EQUAL), AND PATCH WITH NON-SHRINK GROUT TO MATCH EXISTING WALL SURFACES.
 5. PROTECT EXIST WALKWAY, WASTE GULLET AND TROUGHS DURING DEMO PHASE.
 6. PROTECT VALVES, SEAL EFFLUENT PIPE LEAVING THE FILTERS WITH WATERTIGHT SEAL (I.E. TEMP PLUG).
 7. CITY TO ISOLATE EFFLUENT VALVE PRIOR TO DEMO.



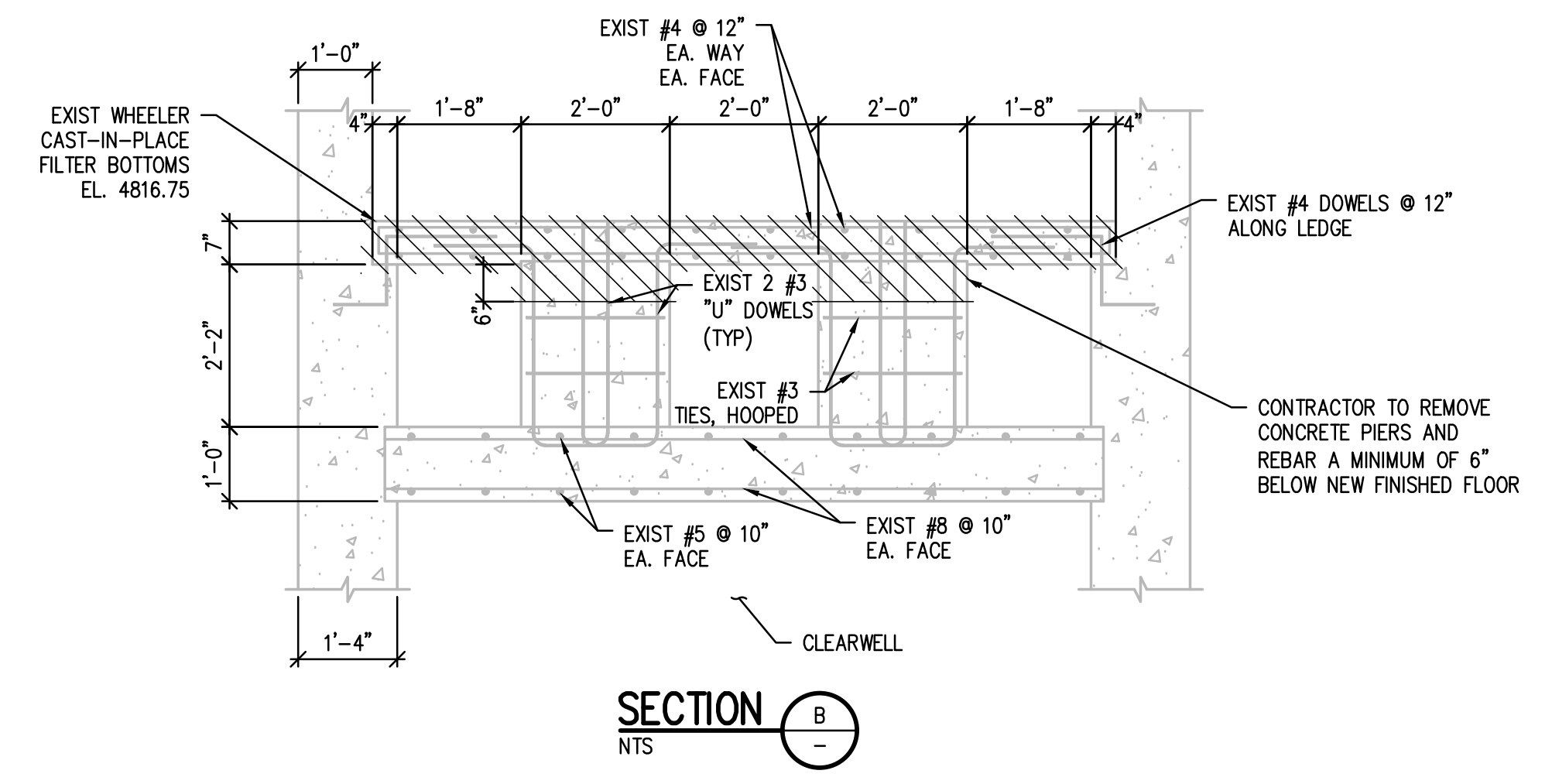
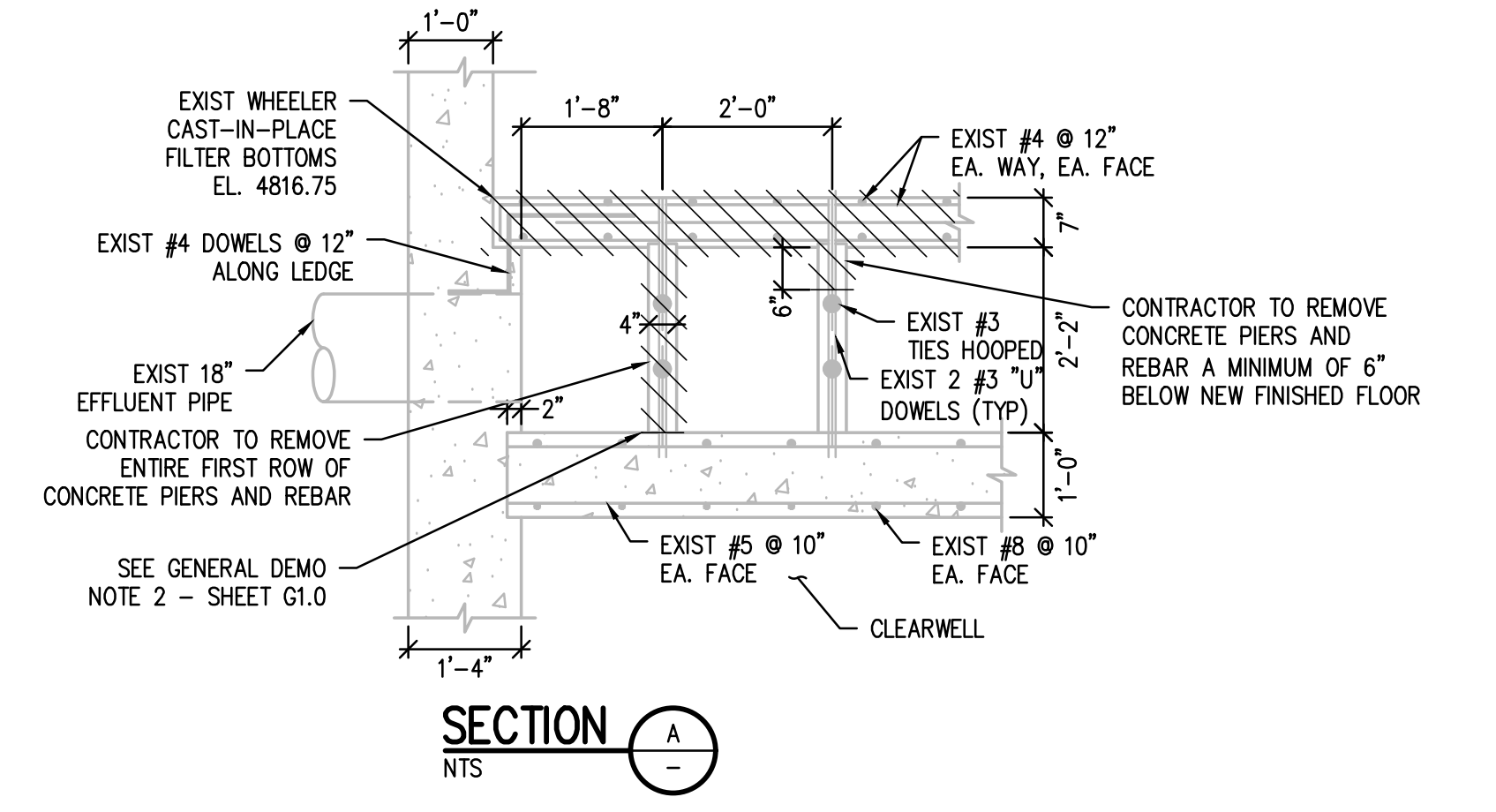
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		DWN	

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DRAWN BY:	LLG
CHECKED BY:	JJM/CDB
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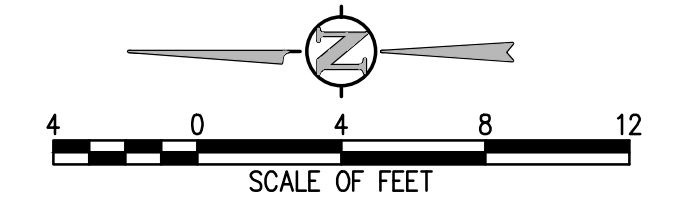
CITY OF GRAND JUNCTION
WTP FILTER UPGRADE PROJECT
LOWER LEVEL AND PIPE GALLERY
DEMO PLAN - PHASE II



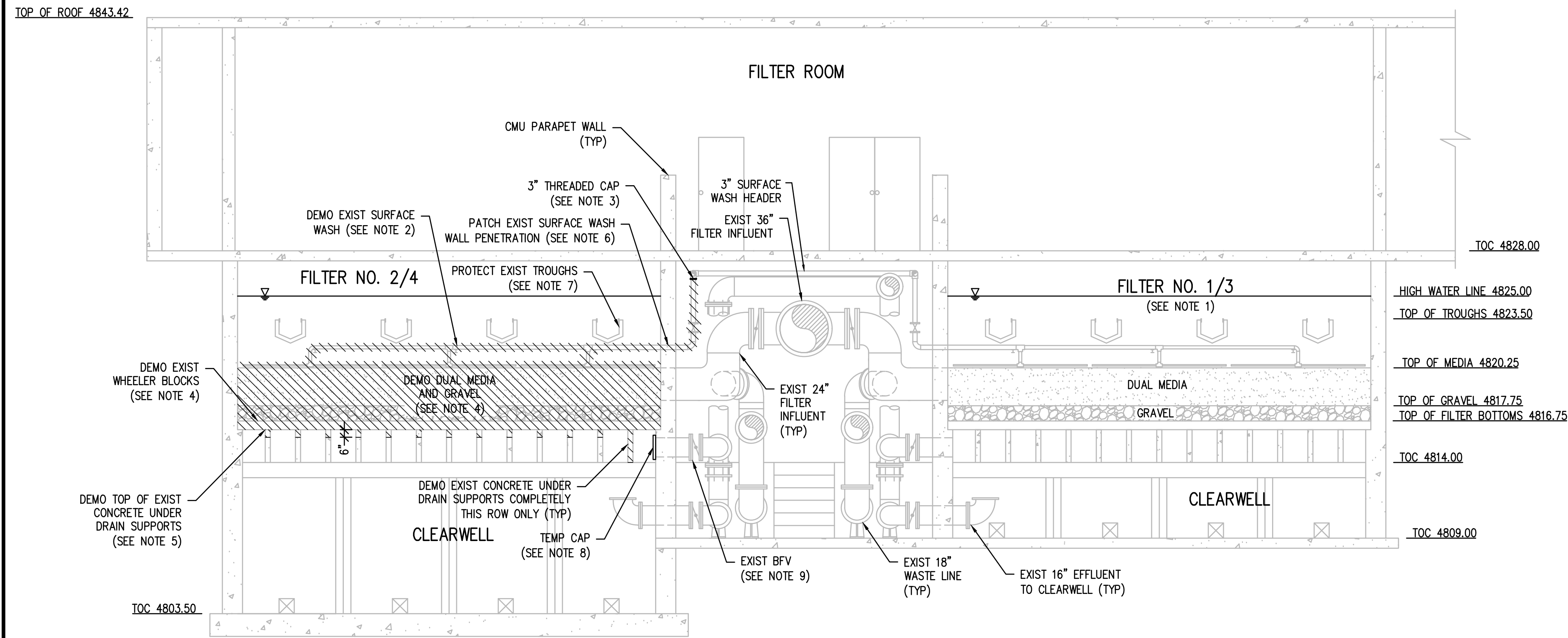
FILTER BOTTOM/CLEARWELL PLAN
3/16" = 1'-0"



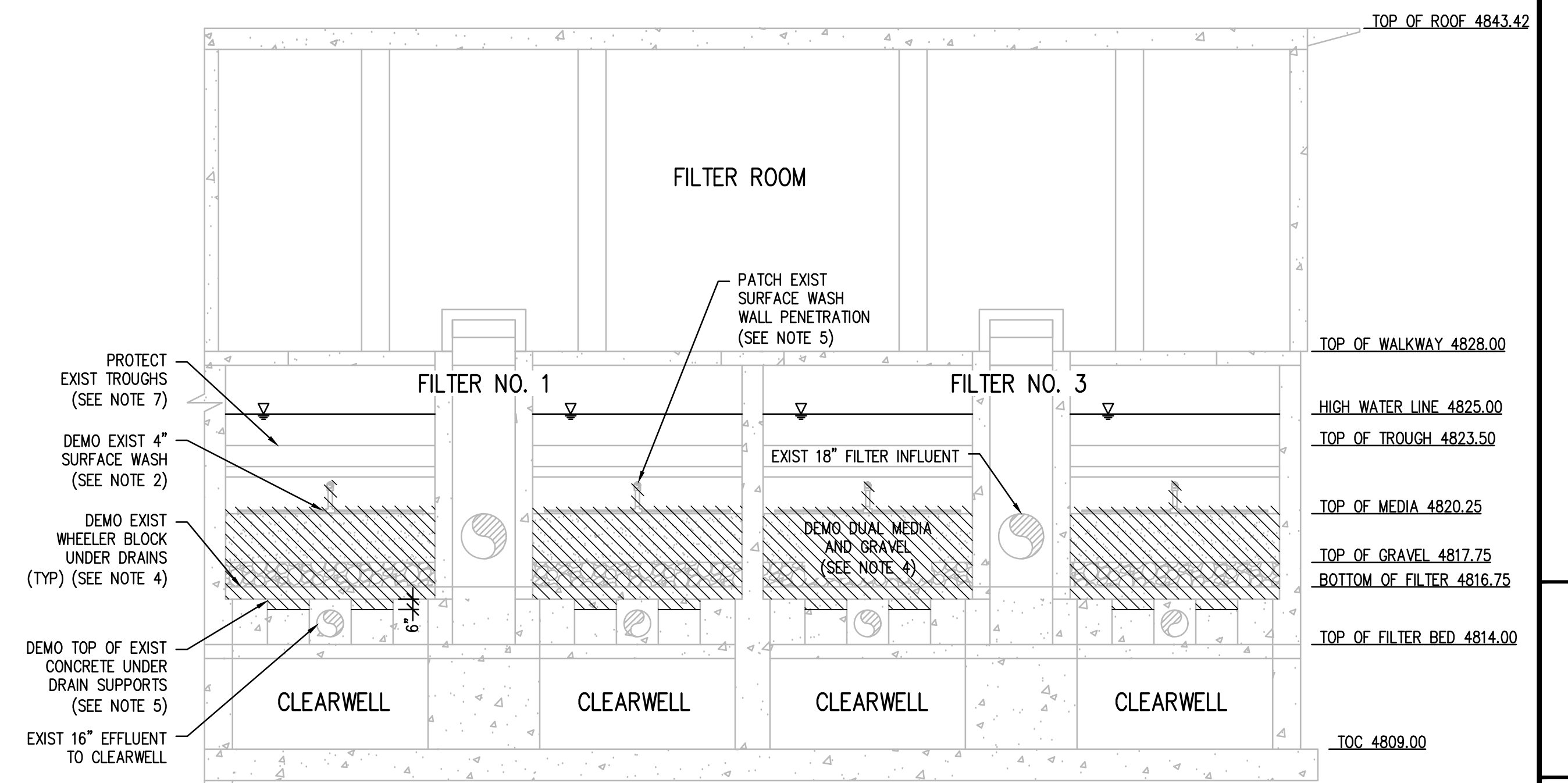
- PHASE I DEMO NOTES:**
1. FILTERS 1 AND 3 MUST REMAIN IN OPERATION WHILE FILTERS 2 AND 4 ARE BEING DEMOED. ONCE FILTERS 2 AND 4 ARE FULLY FUNCTIONAL AND OPERATIONAL, CONTRACTOR CAN BEGIN DEMO WORK ON FILTERS 1 AND 3, AFTER OWNERS APPROVAL.
 2. DEMO OF FILTERS INCLUDES REMOVAL OF ALL SURFACE WASH EQUIPMENT WITHIN FILTERS, SAND, ANTHRACITE, GRAVEL, WHEELER UNDERDRAINS AND CONCRETE AS NEEDED TO PREPARE THE FILTER FOR THE ADDITION OF AIR SCOUR AND NEW LEOPOLD UNDERDRAINS.
 3. DEMO EXIST CONCRETE SUPPORT BLOCKS A MINIMUM OF 6" BELOW FINISHED FLOOR.
 4. PROTECT EXIST WALKWAY, WASTE GULLET AND TROUGHS DURING DEMO PHASE.
 5. PROTECT VALVES, SEAL EFFLUENT PIPE LEAVING THE FILTERS WITH WATERTIGHT SEAL (I.E. TEMP PLUG).
 6. CITY TO ISOLATE EFFLUENT VALVE PRIOR TO DEMO.



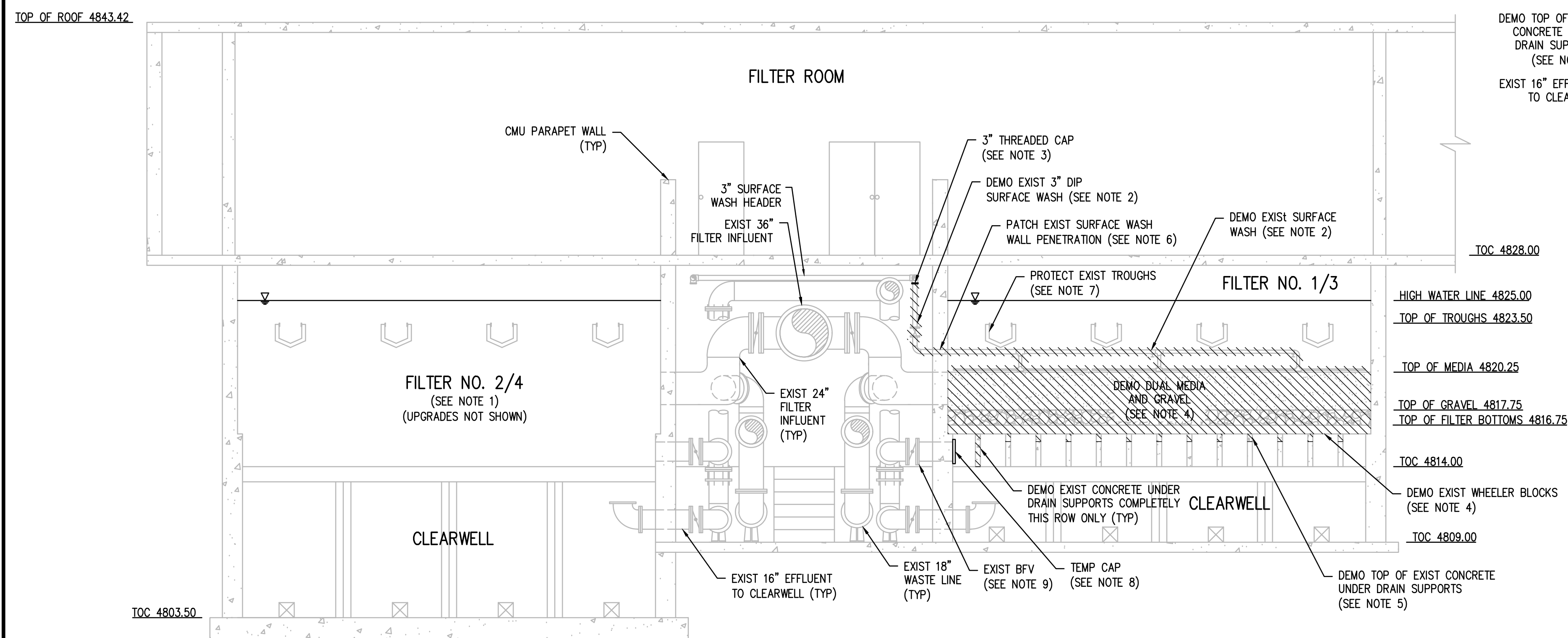
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CITY OF GRAND JUNCTION	
WTP FILTER UPGRADE PROJECT	
FILTER BOTTOM / CLEARWELL	
DEMO PLAN - PHASE I	
SHEET NO.	
P1.3	



SECTION -- PHASE I DEMO
3/16" = 1'-0" (A) P1.0



FILTER SECTION B
1/4" = 1'-0" (B) P1.0



SECTION -- PHASE II DEMO
3/16" = 1'-0" (A) P1.0

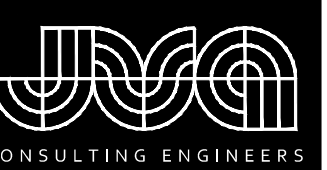
DEMO NOTES:

1. FILTERS 1 AND 3 MUST REMAIN IN OPERATION WHILE FILTERS 2 AND 4 ARE BEING DEMOED. ONCE FILTERS 2 AND 4 ARE FULLY FUNCTIONAL AND OPERATIONAL, CONTRACTOR CAN BEGIN DEMO WORK ON FILTERS 1 AND 3. AFTER OWNERS APPROVAL.
2. DEMO ALL SURFACE WASH EQUIPMENT, PIPING, SUPPORTS, BEAMS, SPRAY NOZZLES, ETC. FROM INSIDE FILTERS 2 AND 4 UP TO SURFACE WASH HEADER AS SHOWN (TYP).
3. INSTALL 3" THREADED CAP IN SURFACE WASH WHERE FILTER SURFACE WASH PIPING WAS DEMOED (I.E. TEMP PLUG).
4. DEMO OF FILTERS INCLUDES REMOVAL OF SAND, ANTHRACITE, GRAVEL, WHEELER UNDERDRAINS AND CONCRETE AS NEEDED TO PREPARE THE FILTER FOR THE ADDITION OF AIR SCOUR AND NEW LEOPOLD UNDERDRAINS.
5. DEMO EXIST CONCRETE SUPPORT BLOCKS A MINIMUM OF 6" BELOW FINISHED FLOOR.
6. PATCH PIPE PENETRATION BY ROUGHENING CONCRETE SURFACE TO 1/4" AMPLITUDE, INSTALLING EXPANDING TYPE WATERSTOP - WATERSTOP RX OR EQUAL, AND PATCH WITH NON-SHRINK GROUT TO MATCH EXISTING WALL SURFACES.
7. PROTECT EXIST WALKWAY, WASTE GULLET AND TROUGHS DURING DEMO PHASE.
8. PROTECT VALVES, SEAL EFFLUENT PIPE LEAVING THE FILTERS WITH WATERTIGHT SEAL (I.E. TEMP PLUG).
9. CITY TO ISOLATE EFFLUENT VALVE PRIOR TO DEMO.

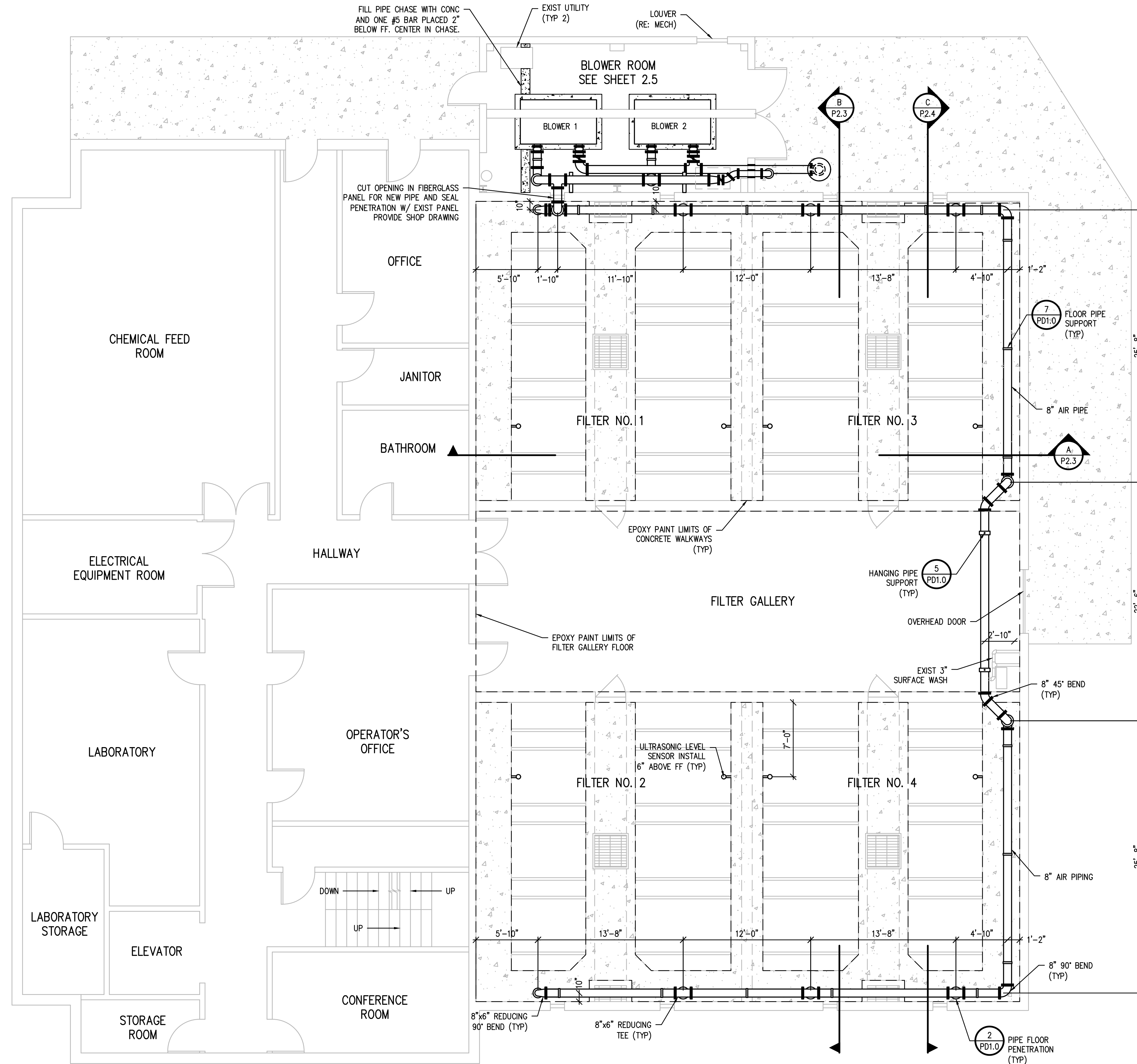
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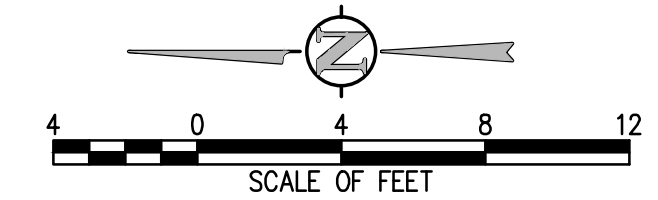
CITY OF GRAND JUNCTION
WTP FILTER UPGRADE PROJECT
SECTION A
DEMO PLAN - PHASE I & II



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OPERATING FLOOR PLAN
 3/16" = 1'-0"

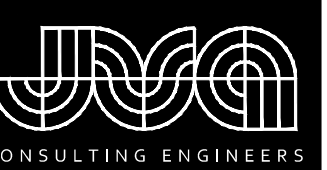


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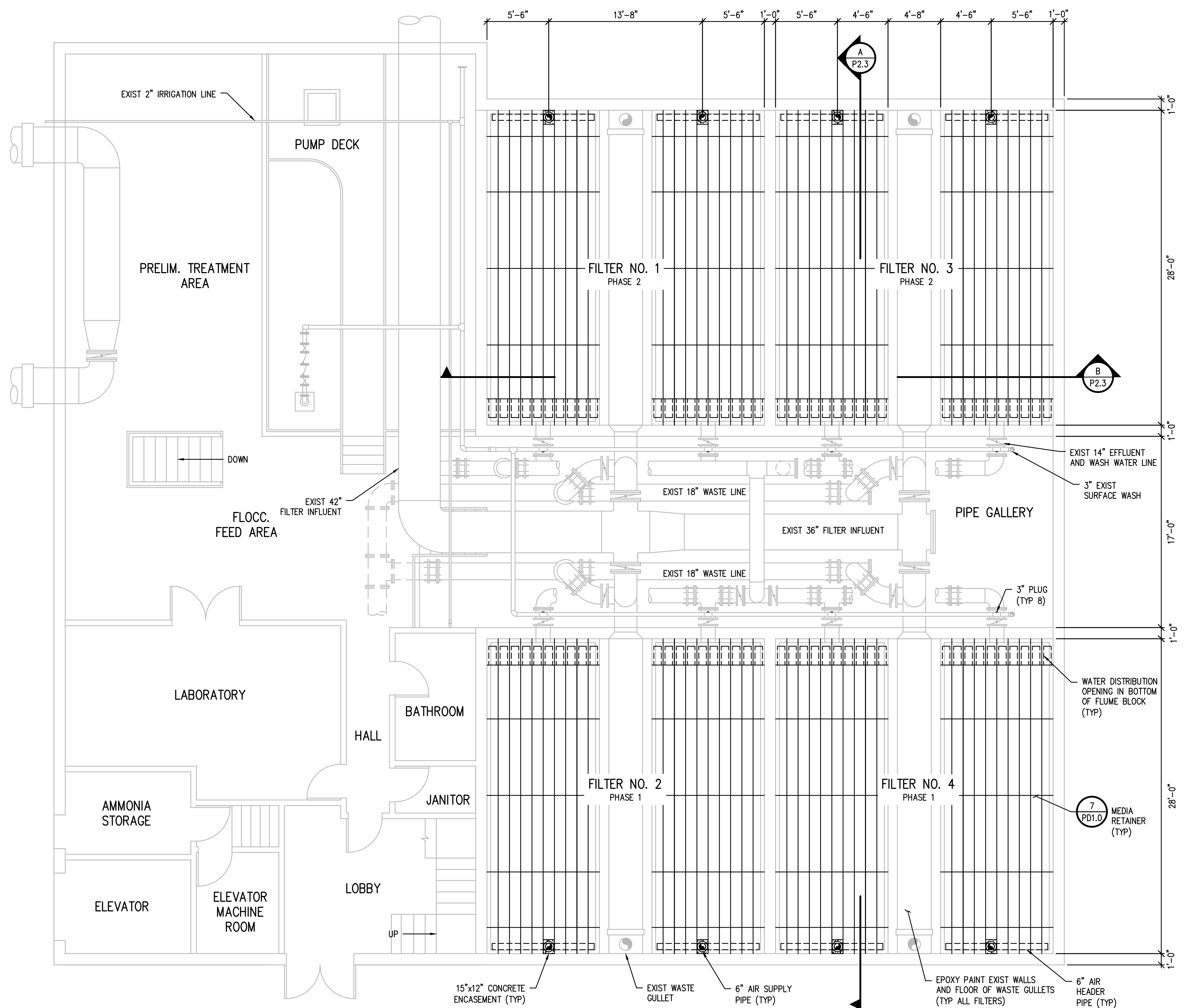
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CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT
 OPERATING FLOOR
 UPGRADE PLAN

SHEET NO.
P2.0

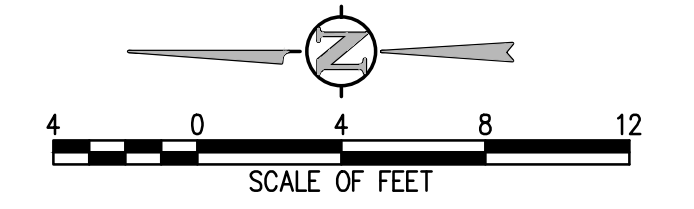


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LOWER LEVEL AND PIPE GALLERY PLAN
 3/16" = 1'-0"

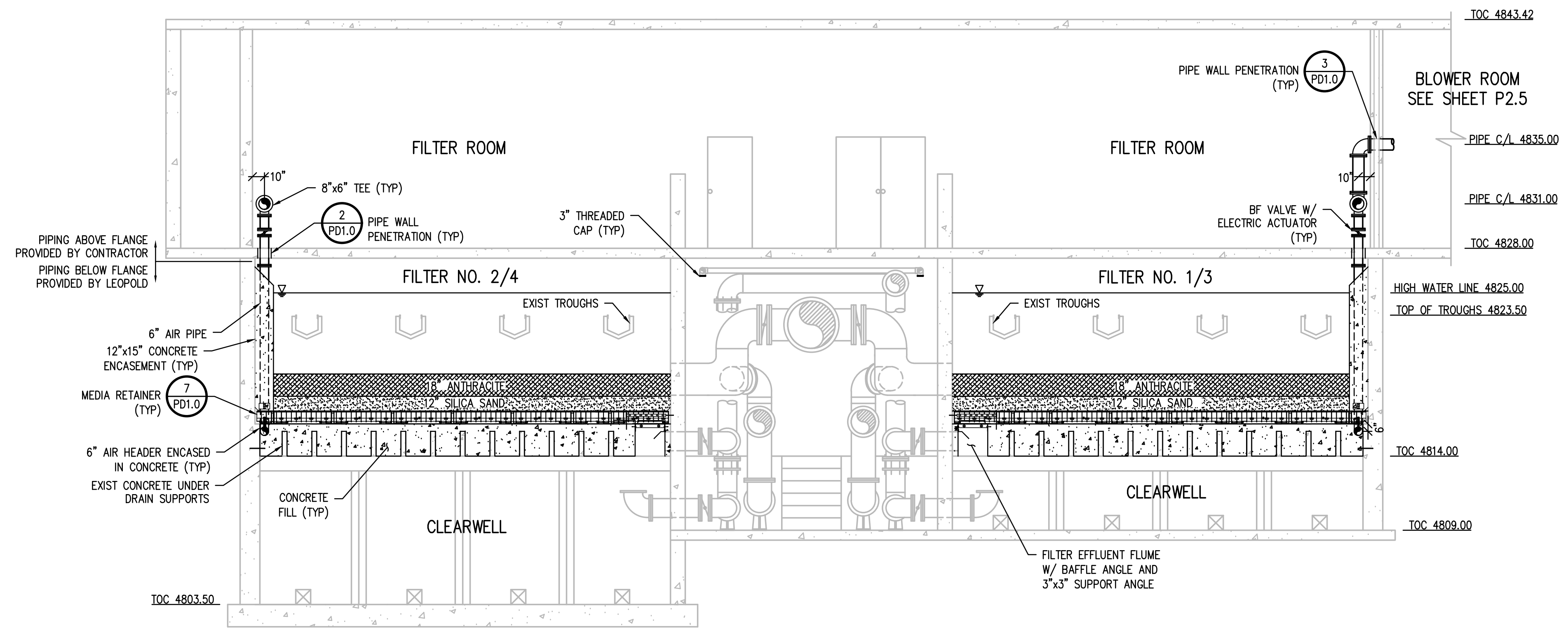
NOTE:
 1. THIS WORK IS TO BE PERFORMED IN TWO PHASES
 IN ACCORDANCE W/ DEMO PLANS.



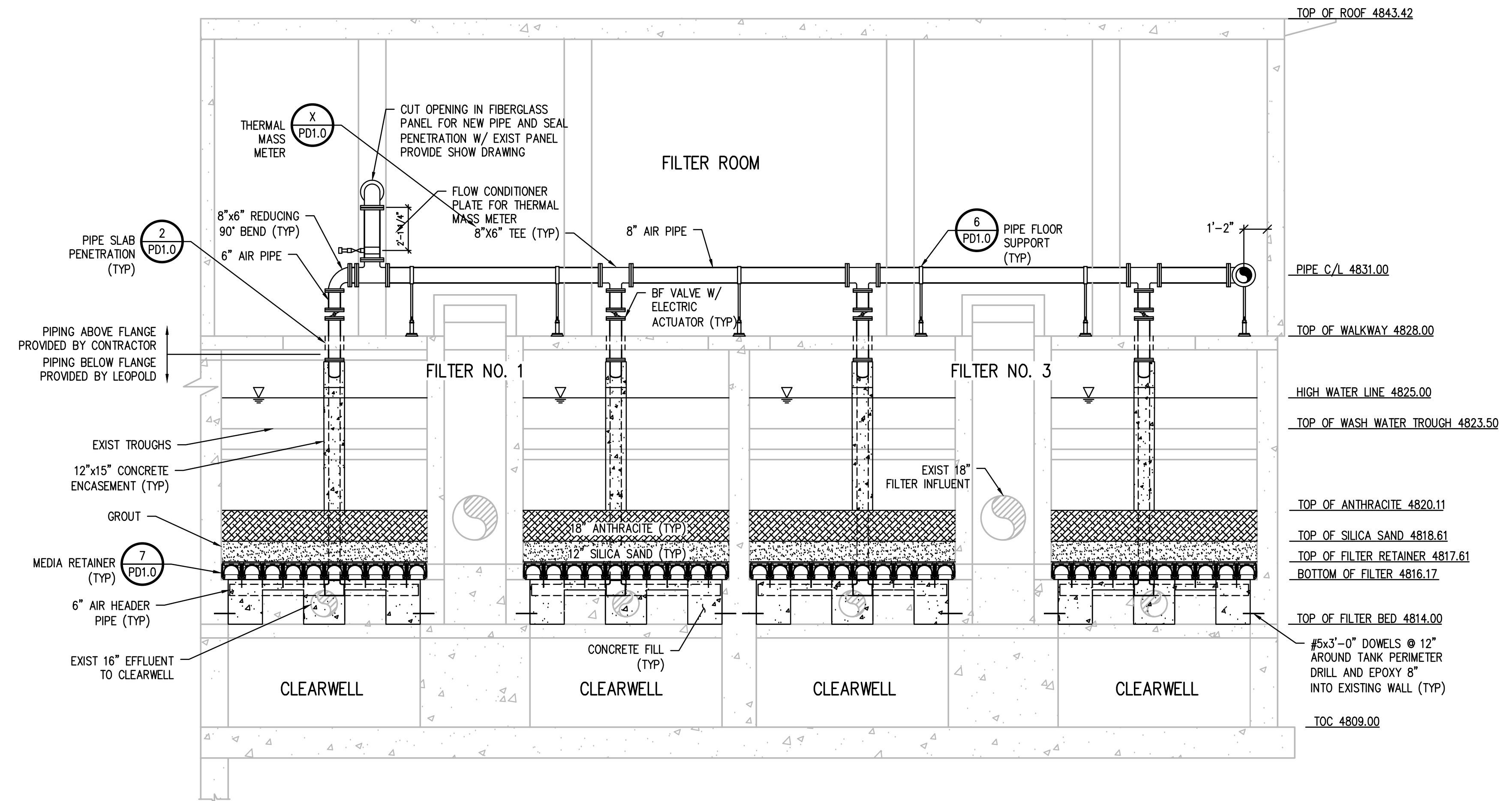
NO.	DATE	DESIGNED BY	DESCRIPTION

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CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT
 LOWER LEVEL AND PIPE GALLERY
 UPGRADE PLAN - PHASE I & II



PIPE GALLERY A
 3/16" = 1'-0" P2.0

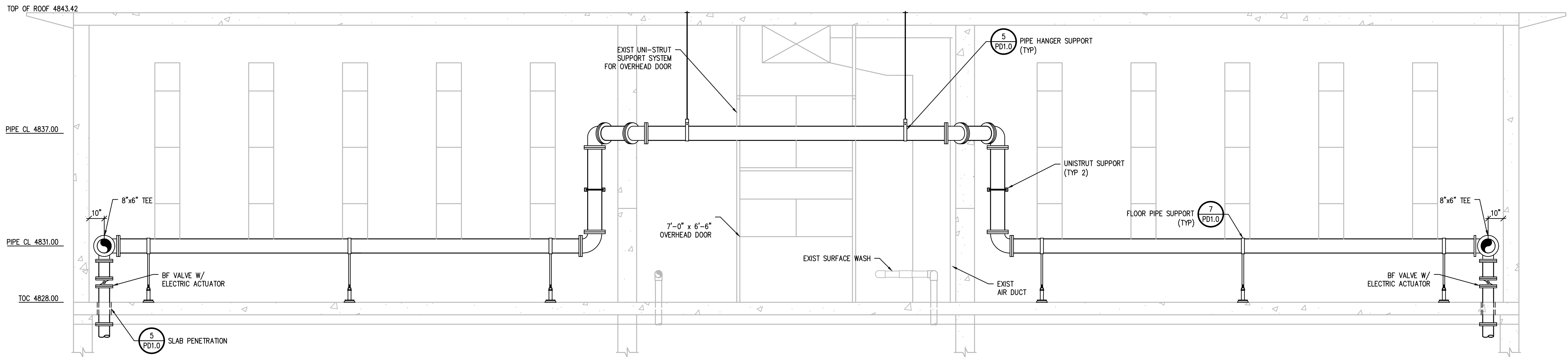


FILTER SECTION B
 1/4" = 1'-0" P2.0

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CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT
 SECTION A & B
 UPGRADE PLAN - PHASE I & II

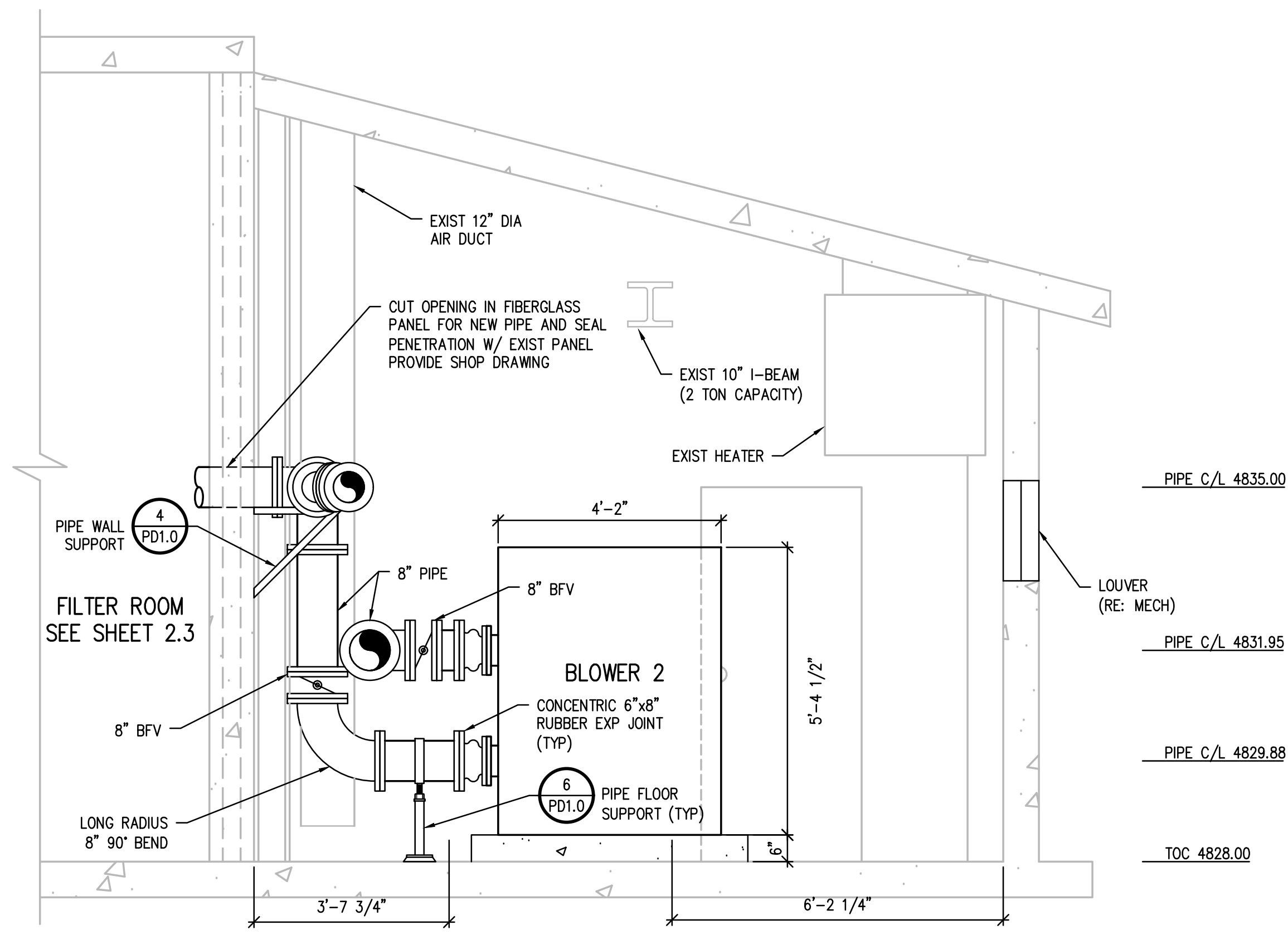


AIR PIPING C
 3/8" = 1'-0" P2.0

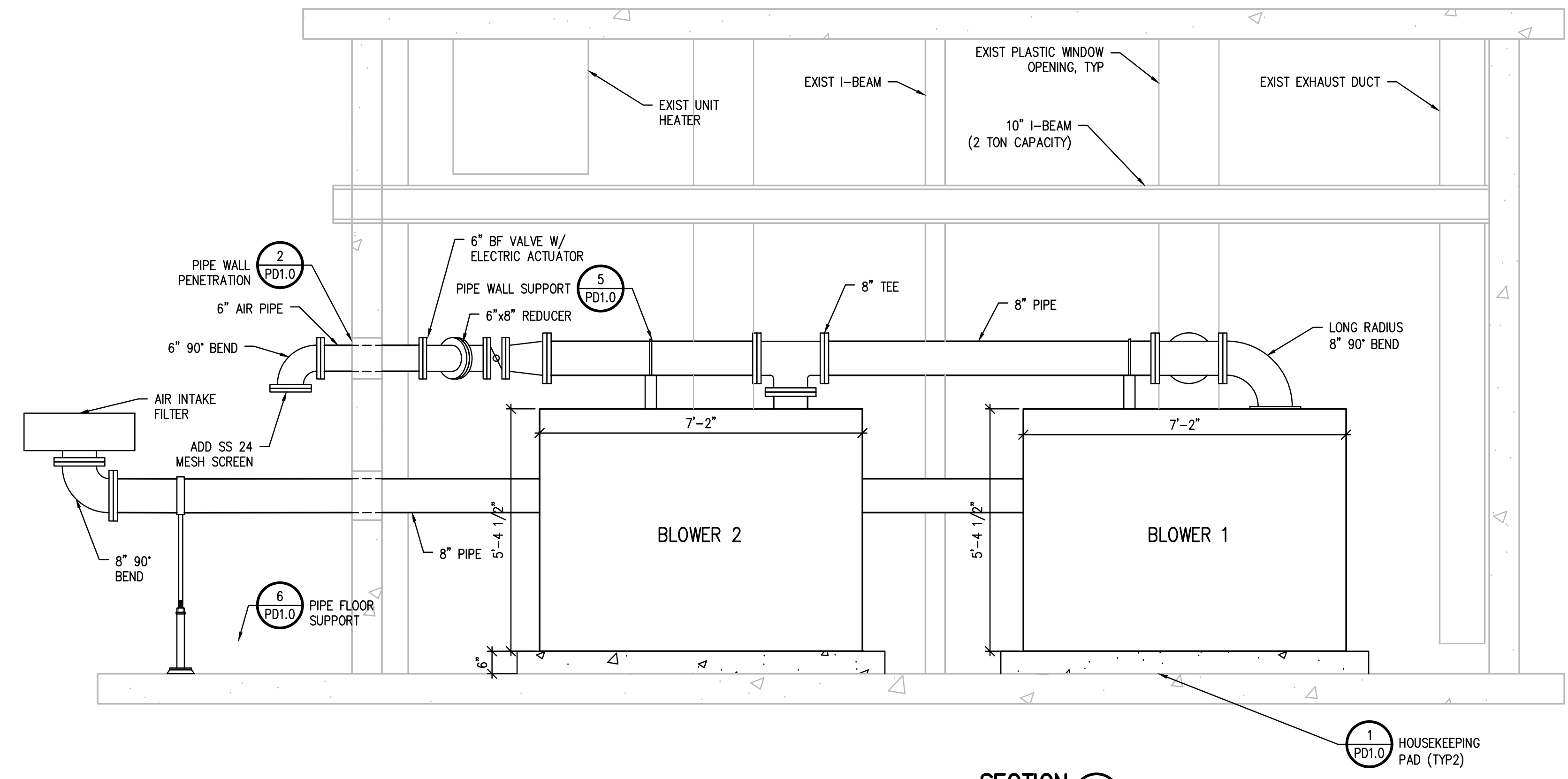
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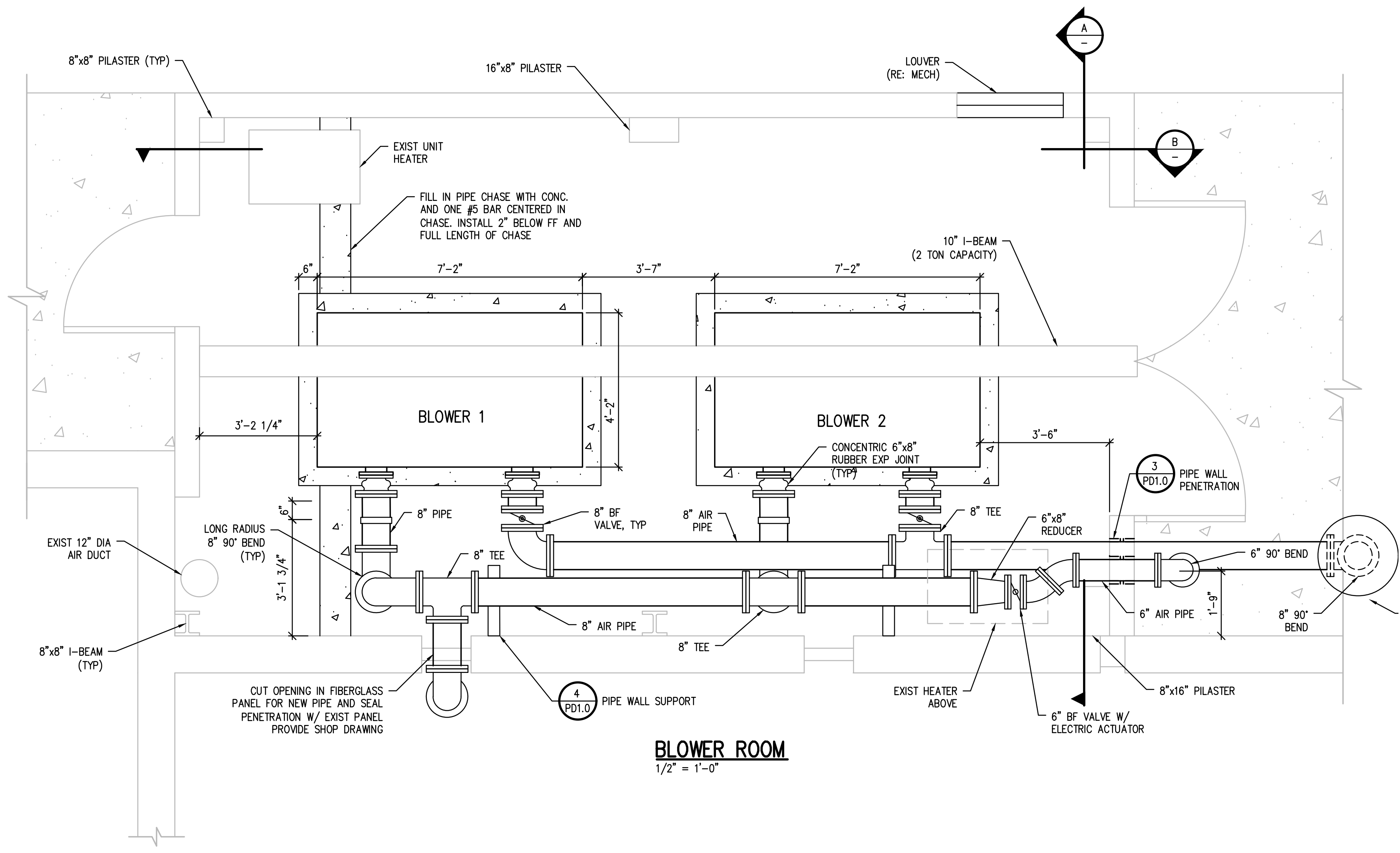
CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT
 SECTION C AND AIR SCOUR PIPING DETAIL
 UPGRADE PLAN



SECTION A
1/2" = 1'-0"



SECTION B
1/2" = 1'-0"

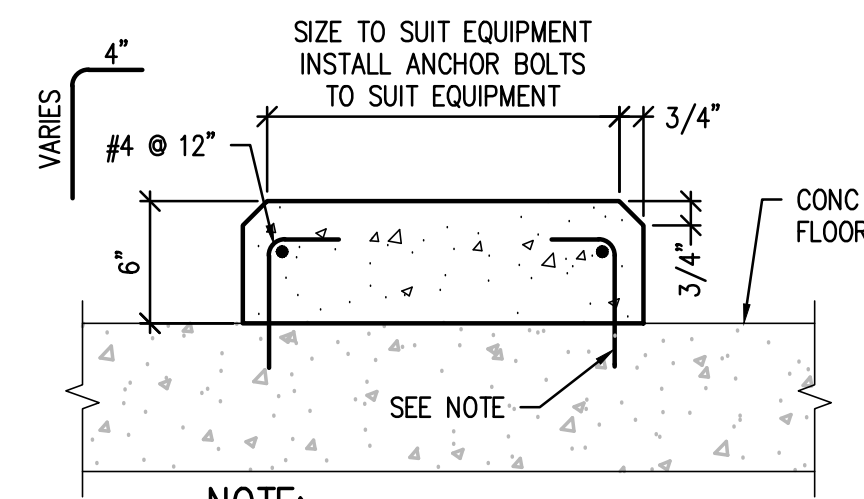


BLOWER ROOM
1/2" = 1'-0"

NO.	DATE	DESIGN	DESCRIPTION

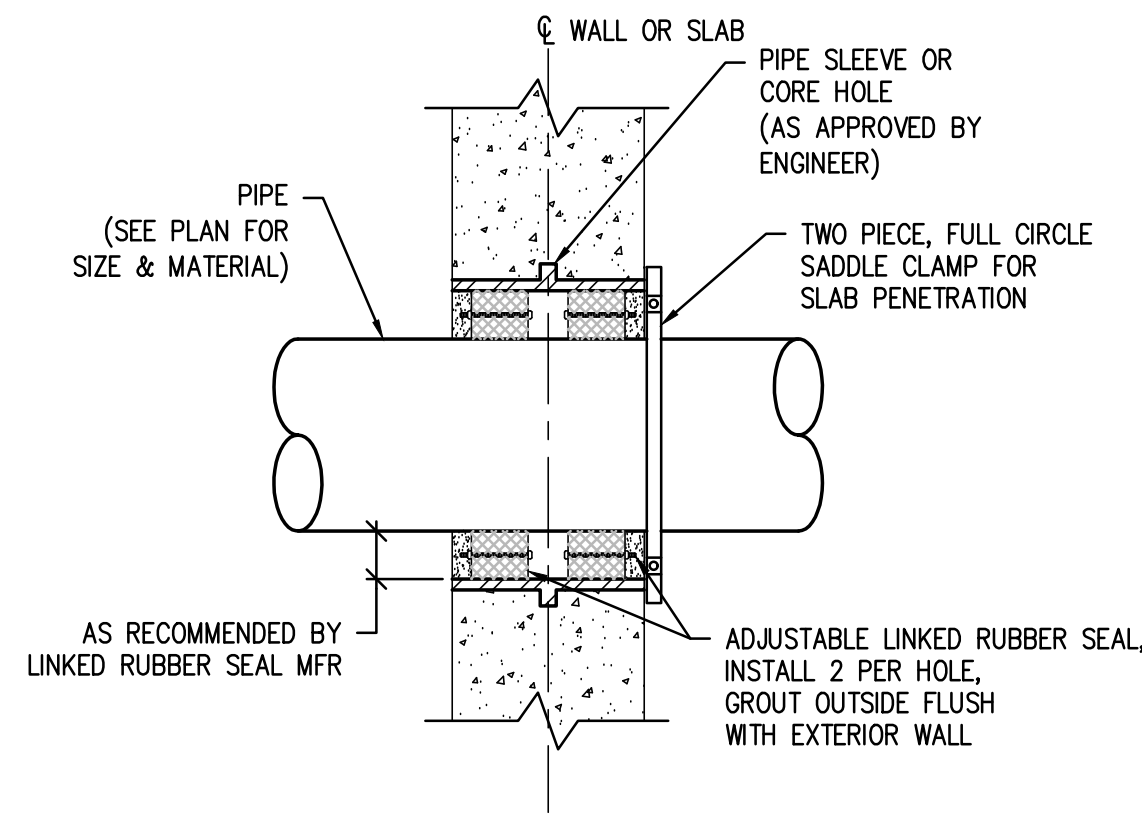
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CITY OF GRAND JUNCTION
WTP FILTER UPGRADE PROJECT
BLOWER ROOM PLAN AND SECTION
UPGRADE PLAN

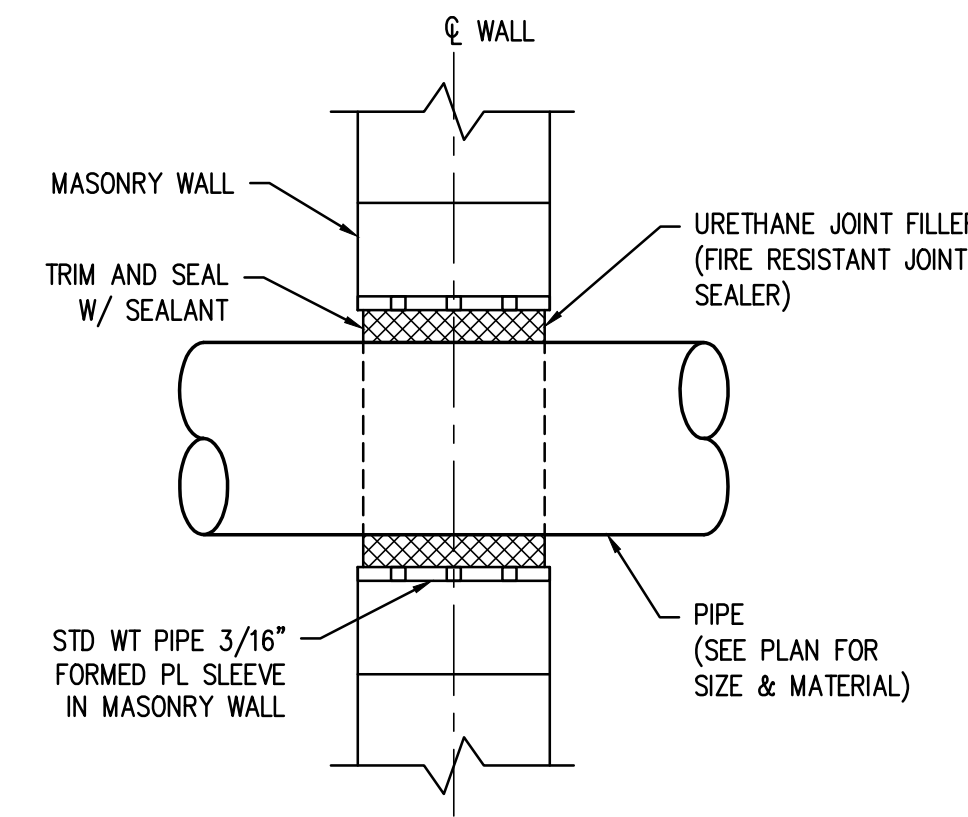


NOTE:
DRILL CONCRETE FLOOR 7/8"x6" AT 12" OC,
BLOW HOLE CLEAN OF DUST AND DIRT WITH OIL
FREE COMPRESSED AIR. EPOXY GROUT REBAR
IN HOLE. ALLOW FOR PROPER SET TIME PRIOR
TO POURING CONCRETE EQUIPMENT BASE.

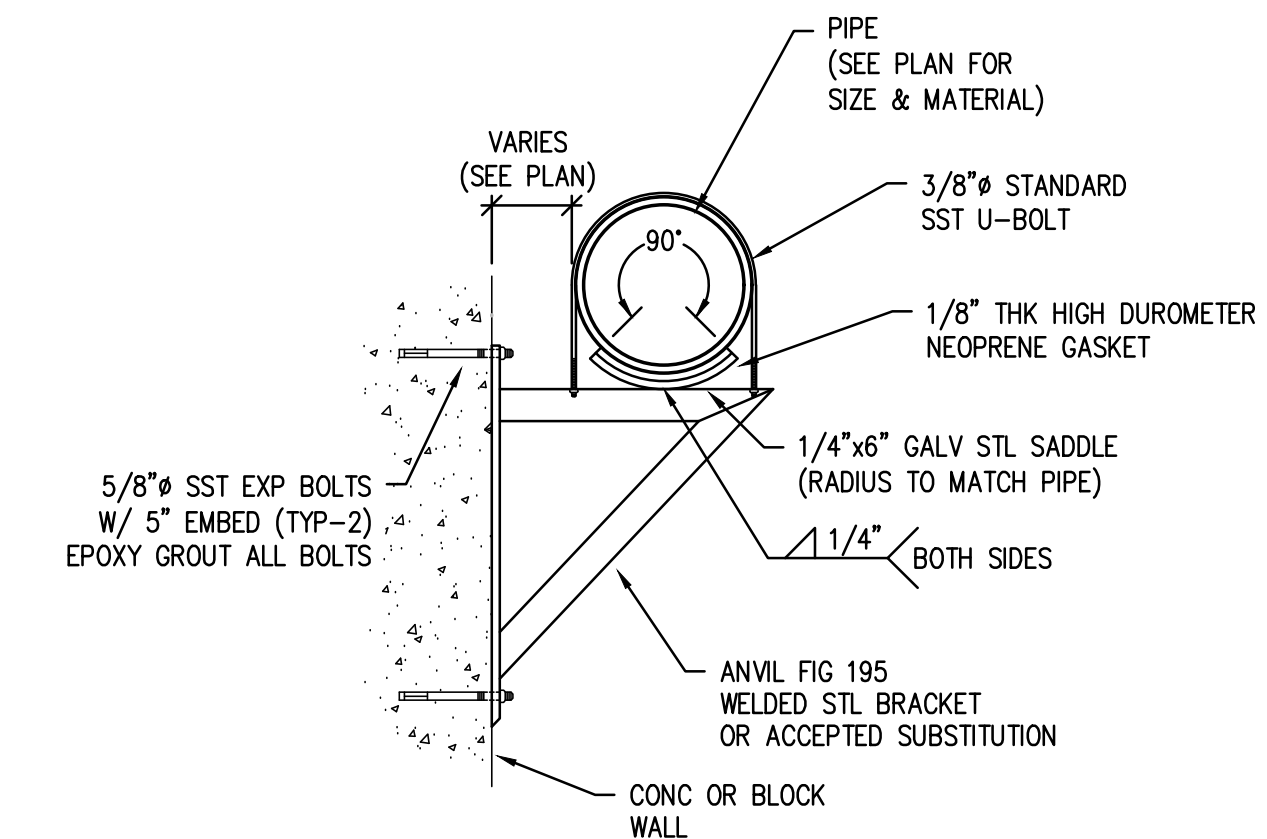
CONCRETE HOUSEKEEPING PAD DETAIL 1
NTS P2.5



WALL OR SLAB PENETRATION WITH CORE HOLE DETAIL 2
NTS P2.0

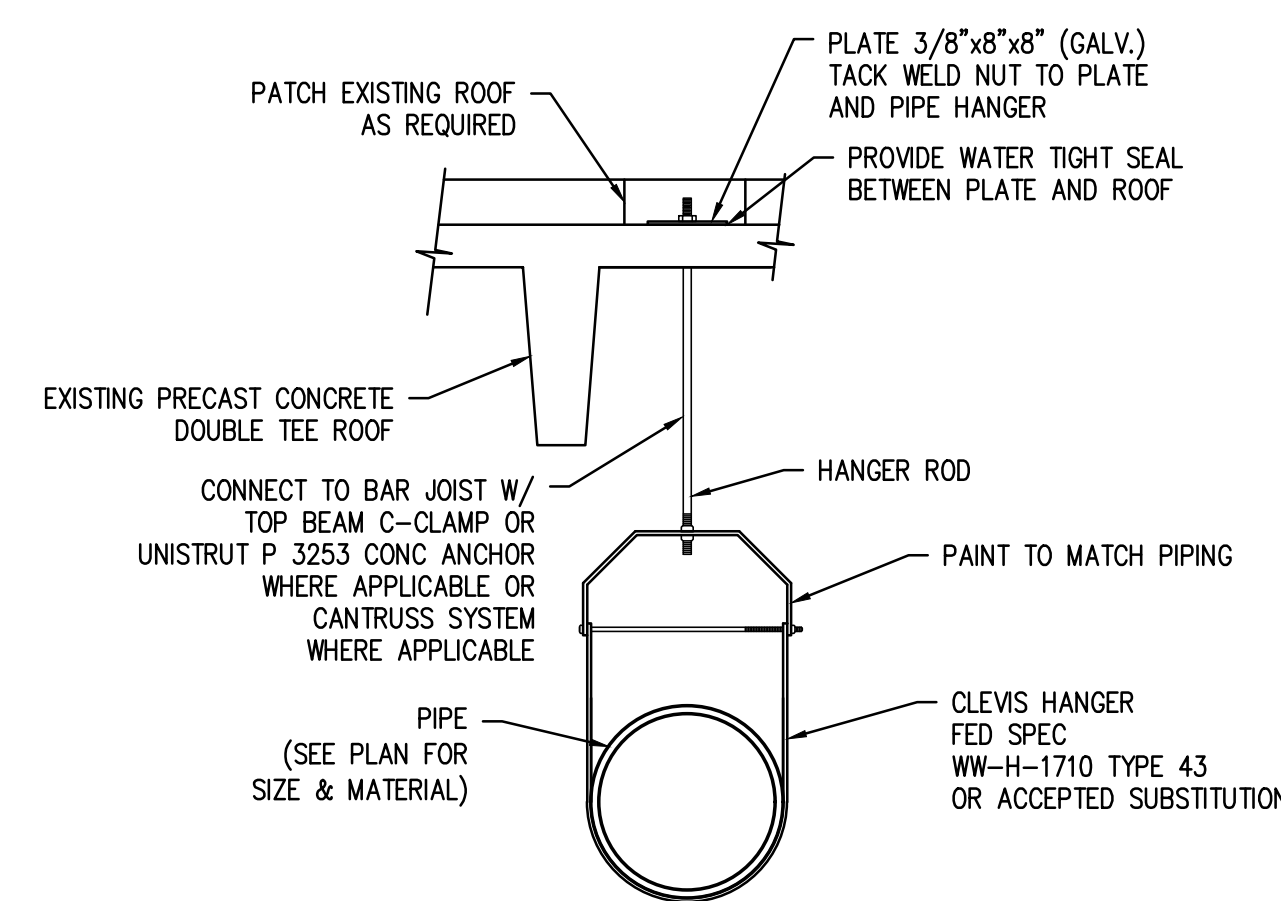


MASONRY WALL PIPE PENETRATION DETAIL 3
NTS P2.0



NOTE:
FOR MASONRY WALLS USE HIT-HY 70 ADHESIVE SYSTEM. STEEL ANCHORS SHALL BE MINIMUM 1/2" WITH SCREEN TUBE INSERTS.

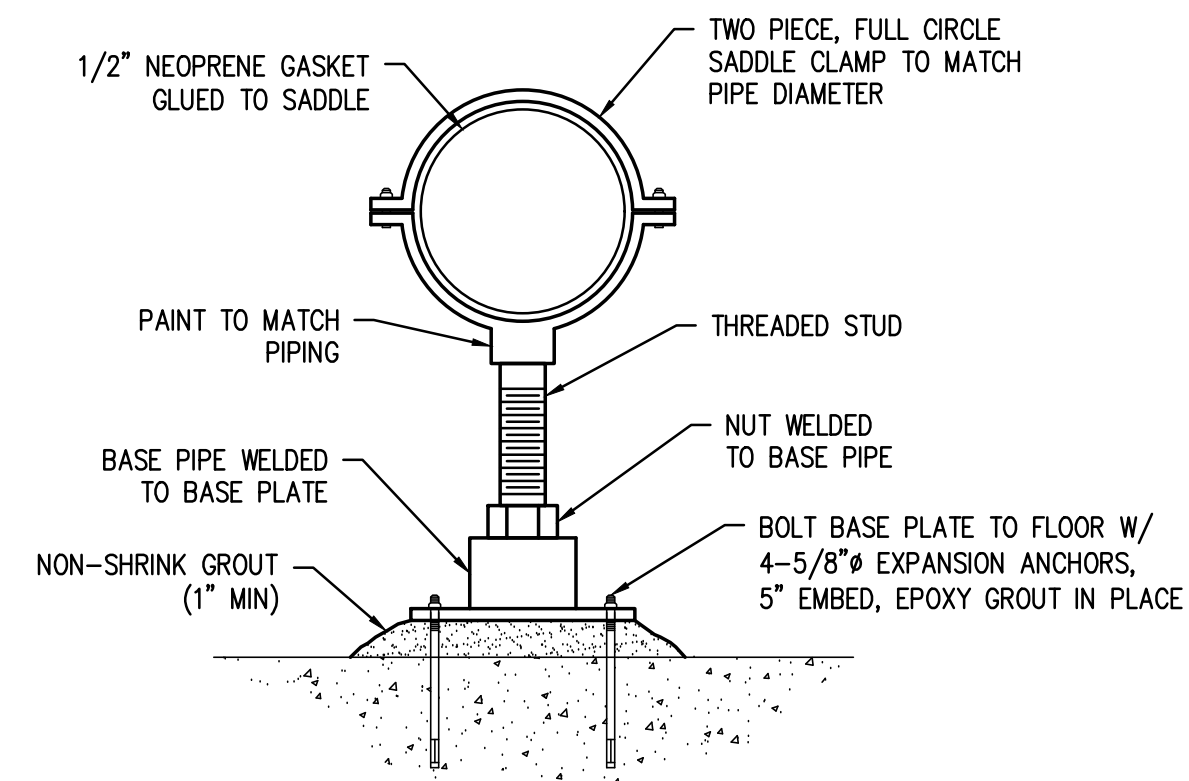
WALL PIPE SUPPORT DETAIL 4
NTS P2.0



NOTE:
TOTAL LOADING ON EACH CONCRETE INSERT SHALL NOT EXCEED MANUFACTURE'S RECOMMENDED LOADINGS.

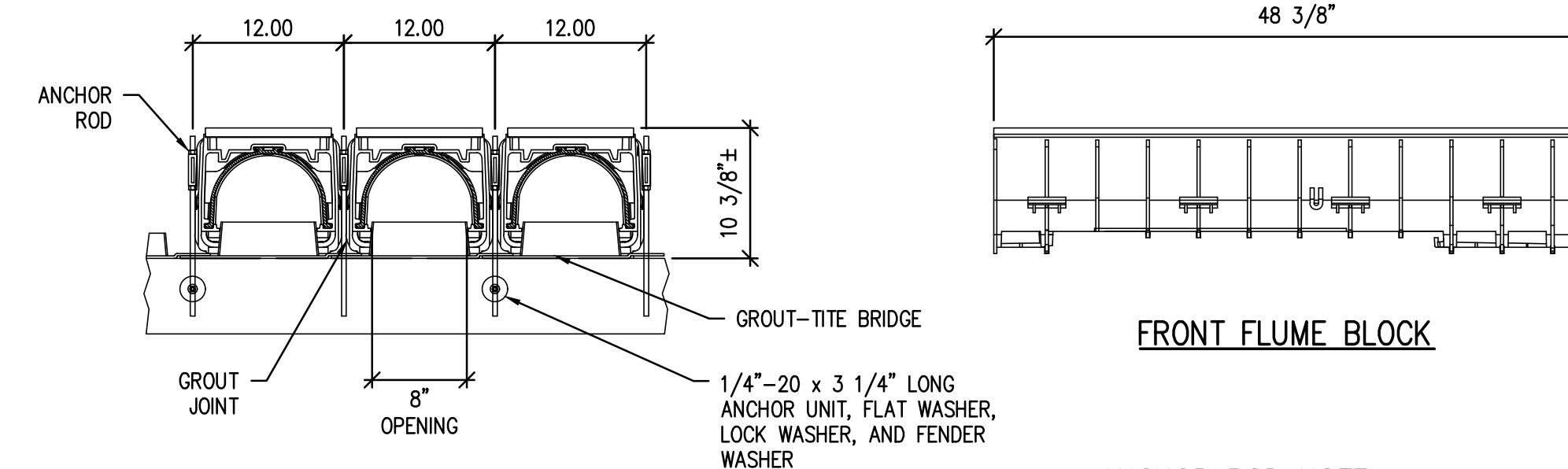
PIPE SIZE	HANGER ROD Ø
2" & SMALLER	3/8"
2 1/2"	1/2"
3" & 4"	5/8"
6" THRU 12"	3/4"

PIPE HANGER DETAIL 5
NTS P2.0



PIPE SIZE	CLAMP SIZE	THREADED STUD Ø	BASE PLATE	BASE PIPE
2", 3"	.375"x1.5"	.75"	6"x6"	2"
4"-12"	.5"x2"	1"	8"x8"	2"
14"-16"	.625"x3"	1.5"	12"x12"	3"
18"-24"	.75"x4"	2"	12"x12"	4"

FLOOR PIPE SUPPORT DETAIL 6
NTS P2.0



ANCHOR ROD NOTE:
DRILL (2) HOLES 5" (127mm) DEEP IN FLOOR, FILL HOLES WITH A SUITABLE EPOXY SYSTEM, SET ANCHOR "L" ROD. TOP OF ANCHOR ROD TO BE 11" FROM HIGHEST POINT OF THE FILTER FLOOR.

EPOXY SYSTEM:
"HILTI HIT RES500" or "EPCON C6". (HOLE DIAMETER AS SPECIFIED BY EPOXY MANUFACTURER.)

- NOTES:**
- LEOPOLD FILTER BLOCK TO BE STRUCTURAL HDPE.
 - BRIDGING TO BE INSTALLED BETWEEN FLUME BLOCK TO RETAIN GROUT OVER FLUME.
 - EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE LEOPOLD INSTALLATION INSTRUCTIONS AND TOLERANCES SHOWN ON THE DRAWINGS AND O&M MANUAL. READ ALL INSTRUCTIONS PRIOR TO RECEIVING, STORING, INSTALLING AND OPERATING FILTER EQUIPMENT.
 - ALL MOUNTING BRACKETS TO BE STAINLESS STEEL, TYPE 304 AND ALL HARDWARE TO BE STAINLESS STEEL, TYPE 18-8 EXCEPT AS NOTED.
 - THE FILTER FLOORS, MUST HAVE A ROUGH SURFACE EQUIVALENT TO A MINIMUM 1/8 INCH GROOVE BROOM FINISH PRIOR TO PLACING THE BASE GROUT.
 - THE FILTER MUST NOT INCLUDE EXPANSION JOINTS WITHIN THE FILTER BOX.
 - DIMENSIONS AND OTHER INFORMATION PRESENTED ON THE LEOPOLD PROJECT DRAWINGS REPRESENT LEOPOLD'S BEST INTERPRETATION OF THE PROJECT PLANS AND SPECIFICATIONS AS PREPARED BY OTHERS. AS SUCH, DURING THE APPROVAL PROCESS, THE PURCHASER SHALL THOROUGHLY REVIEW AND VERIFY ALL DIMENSIONS WITH RESPECT TO ACTUAL FIELD CONDITIONS. LEOPOLD DRAWINGS ARE SUPPLIED IN THE PROJECT MANUAL.
 - ANCHOR RODS AND ANCHOR ROD EPOXY MUST BE INSTALLED IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS AND TOLERANCES SHOWN ON ALL DRAWINGS, THE O&M MANUAL, AND THE EPOXY MANUFACTURER'S INSTRUCTIONS. ENSURE PROPER ANCHOR ROD LOCATION, HOLE SIZES, HEIGHTS, EMBEDMENT DEPTHS, AND EPOXY PENETRATION.

MEDIA RETAINER DETAIL 7
NTS P2.1

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CITY OF GRAND JUNCTION
WTP FILTER UPGRADE PROJECT
PROCESS DETAILS

EXHAUST FAN SCHEDULE

ITEM	MANUFACTURER/ MODEL	LOCATION/ SERVICE	CFM	ESP	FAN RPM	MAX FAN SONES	ELEC. DATA			MAX OPERATING WEIGHT (LBS)	OVERALL DIMENSIONS	NOTES
							SIZE	VOLT	PH			
EF 1	COOK/ 225C5B	ROOF/ EXHAUST	3,500	.25	596	8.0	1/2 HP	120	1	200	44"DIA X 38" TALL	① ② ③

NOTES:

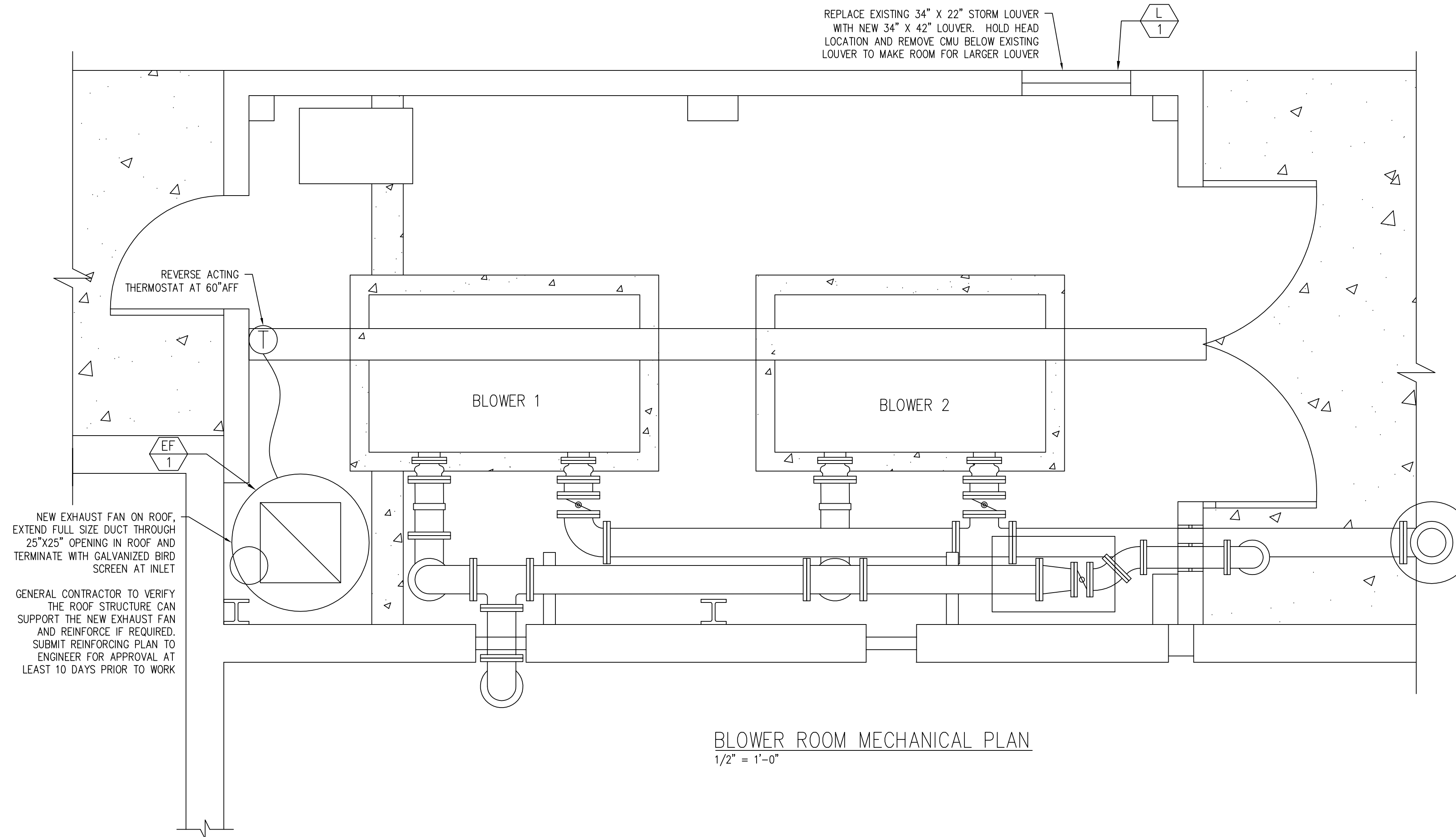
- ① ROOF MOUNTED FAN WITH 14" TALL ROOF CURB, ROTARY BELT TENSIONR, GRAVITY BACKDRAFT DAMPER, GALVANIZED BIRDSCREEN AND NEMA 1 PRE-WIRED DISCONNECT.
- ② PROVIDE MOTOR STARTER AND REVERSE ACTING THERMOSTAT SET TO TURN FAN ON WHEN SPACE TEMPERATURE EXCEEDS 85 DEG. F.
- ③ INTERLOCK EXHAUST FAN TO OPEN ALL L-1 OUTSIDE AIR INTAKE LOUVER WHEN FAN OPERATES.

LOUVER SCHEDULE

ITEM	MANUFACTURER/ MODEL	LOCATION/ SERVICE	CFM	MAX. PD (IN)	% FREE AREA	WIDTH (IN)	HEIGHT (IN)	NOTES
L 1	RUSKIN/ LC6375D	WALL/ INTAKE	-	-	-	34	42	① ②

NOTES:

- ① FURNISH WITH 18 GAUGE MINIMUM GALVANIZED STEEL DRAINABLE BLADES, AND BIRDSCREEN
- ② PROVIDE BAROMETRIC BACKDRAFT DAMPER ON ROOM SIDE OF LOUVER.



GENERAL NOTES

- ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE STATE CODES, LOCAL CODES, AND OWNER'S STANDARDS INDICATED BY THE CONSTRUCTION DOCUMENTS.
- MECHANICAL DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY INDICATE EVERY REQUIRED OFFSET, FITTING, ETC. DRAWINGS ARE NOT TO BE SCALED FOR DIMENSIONS. TAKE ALL DIMENSIONS FROM CERTIFIED EQUIPMENT DRAWINGS AND FROM THE STRUCTURE ITSELF BEFORE FABRICATING ANY WORK. VERIFY ALL SPACE REQUIREMENTS COORDINATING WITH OTHER TRADES, AND INSTALL THE SYSTEMS IN THE SPACE PROVIDED WITHOUT EXTRA CHARGES TO THE OWNER.
- CONTRACTOR SHALL COORDINATE WORK INDICATED WITH OTHER TRADES. VERIFY FIT OF MECHANICAL SYSTEMS PRIOR TO FABRICATION. COORDINATE ALL WALL AND ROOF OPENING REQUIREMENTS BEFORE CONSTRUCTION.
- PROVIDE ALL EQUIPMENT SCHEDULED OR INDICATED ON THE DRAWINGS BUT NOT INCLUDED WITHIN THE SPECIFICATIONS INCLUDING ANY REQUIRED BUT NOT LISTED MISC ITEMS NEEDED TO PROVIDE COMPLETELY OPERATIONAL SYSTEMS AS INDICATED WHETHER SPECIFICALLY CALLED FOR OR NOT. INSTALLATION SHALL CONFORM TO MANUFACTURERS RECOMMENDATIONS AND APPLICABLE CODES. PROVIDE SUBMITTALS FOR ALL PROPOSED EQUIPMENT AND MATERIALS TO BE UTILIZED. PROVIDE OPERATION AND MAINTENANCE MANUAL FOR ALL SYSTEMS AND EQUIPMENT AT END OF PROJECT.
- ELECTRICAL CHARACTERISTICS OF MECHANICAL EQUIPMENT SHALL BE VERIFIED WITH ELECTRICAL DRAWINGS AND ELECTRICAL CONTRACTOR PRIOR TO EQUIPMENT ORDER RELEASE. ADDITIONAL ELECTRICAL WORK RESULTING FROM EQUIPMENT SUBSTITUTION IS THE RESPONSIBILITY OF THE CONTRACTOR.
- AT THE COMPLETION OF WORK, PROVIDE TESTING AND BALANCING SERVICES FOR MECHANICAL SYSTEM. SUBMIT WRITTEN REPORT TO ENGINEER LISTING SYSTEM AIRFLOWS, ELECTRIC DATA, TEMPERATURES, AND PRESSURE DROPS. AIR BALANCE REPORT REQUIRED PRIOR TO SCHEDULING FINAL MECHANICAL INSPECTION.
- AT THE COMPLETION OF THE WORK AND PRIOR TO FINAL ACCEPTANCE, ALL PARTS OF THE WORK INSTALLED UNDER THIS SPECIFICATION SHALL BE THOROUGHLY CLEANED.
- ALL EQUIPMENT, MATERIALS, AND INSTALLATION IS TO BE WARRANTED FOR ONE YEAR TO BE FREE FROM DEFECT. PROVIDE WRITTEN WARRANTY TO OWNER.
- THE OWNER AND ENGINEER ARE NOT RESPONSIBLE FOR THE CONTRACTOR'S SAFETY PRECAUTIONS OR TO MEANS, METHODS, TECHNIQUES, CONSTRUCTION SEQUENCES, OR PROCEDURES REQUIRED TO PERFORM HIS WORK.
- THIS CONTRACTOR SHALL FIELD VERIFY LOCATIONS AND SIZES OF ALL EXISTING EQUIPMENT, DUCTWORK, PIPING, ELECTRICAL CONDUIT, STRUCTURAL MEMBERS, ETC., PRIOR TO STARTING OF CONSTRUCTION. COORDINATE CONFLICTS WITH THE GENERAL CONTRACTOR.
- THIS CONTRACTOR SHALL COORDINATE ALL REQUIRED EXISTING BUILDING SERVICE SYSTEM OUTAGES WITH BUILDING OWNER.
- PATCH AND REPAIR TO MATCH EXISTING, ANY WALL/CEILINGS/ROOF TO BE ACCESSED TO ROUTE PIPING, DUCTWORK, LOUVERS AND EXHAUST FAN.

MECHANICAL SPECIFICATIONS

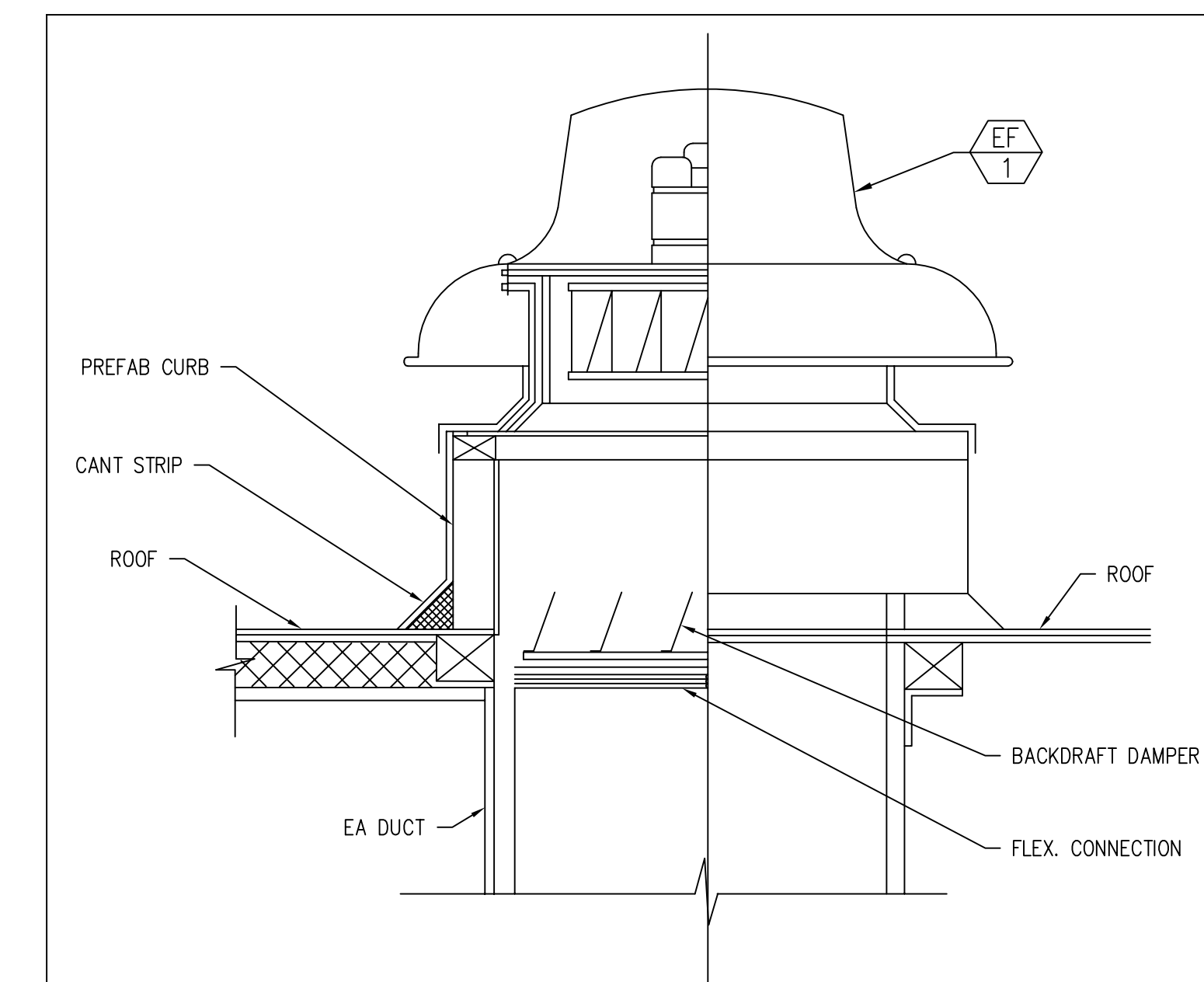
EXHAUST AIR DUCTWORK SHALL BE CONSTRUCTED OF GALVANIZED STEEL PER SMACNA DUCT CONSTRUCTION STANDARDS. EXHAUST AIR DUCTWORK SHALL BE CONSTRUCTED FOR 1" W.C. STATIC PRESSURE.

DUCT HANGERS SHALL BE CONSTRUCTED OF ALUMINUM OR GALVANIZED STEEL TO MATCH DUCT MATERIAL. DUCTS SHALL BE SUPPORTED AND CONNECTED TO THE STRUCTURE PER IMC AND SMACNA DUCT CONSTRUCTION STANDARDS.

MECHANICAL EQUIPMENT SHALL BE SECURED AND INSTALLED PER MANUFACTURERS RECOMMENDATIONS AND APPLICABLE SECTIONS OF THE JURISDICTIONAL BUILDING AND MECHANICAL CODES.

ROOF CURB ASSEMBLIES SHALL CONSIST OF HEAVY GAUGE GALVANIZED STEEL CONSTRUCTION, WITH INTEGRAL BASE PLATE, 3# DENSITY INSULATION AND 2 X 2 NAILER.

AN INDEPENDENT TEST AND BALANCE FIRM WHICH IS AABC OR NEBB CERTIFIED SHALL BE RETAINED FOR CHECK/TEST-START-UP AND TESTING AND BALANCING OF AIR AND WATER SYSTEMS. THE TEST REPORT SHALL BE IN A FORMAT APPROVED BY AABC FOR SYSTEMS OF THIS TYPE AND COMPLEXITY. QUALIFICATIONS OF INDEPENDENT TEST AND BALANCE FIRM SHALL BE SUBMITTED FOR REVIEW.



ROOF EXHAUST FAN DETAIL

NO SCALE

REVISION DESCRIPTION

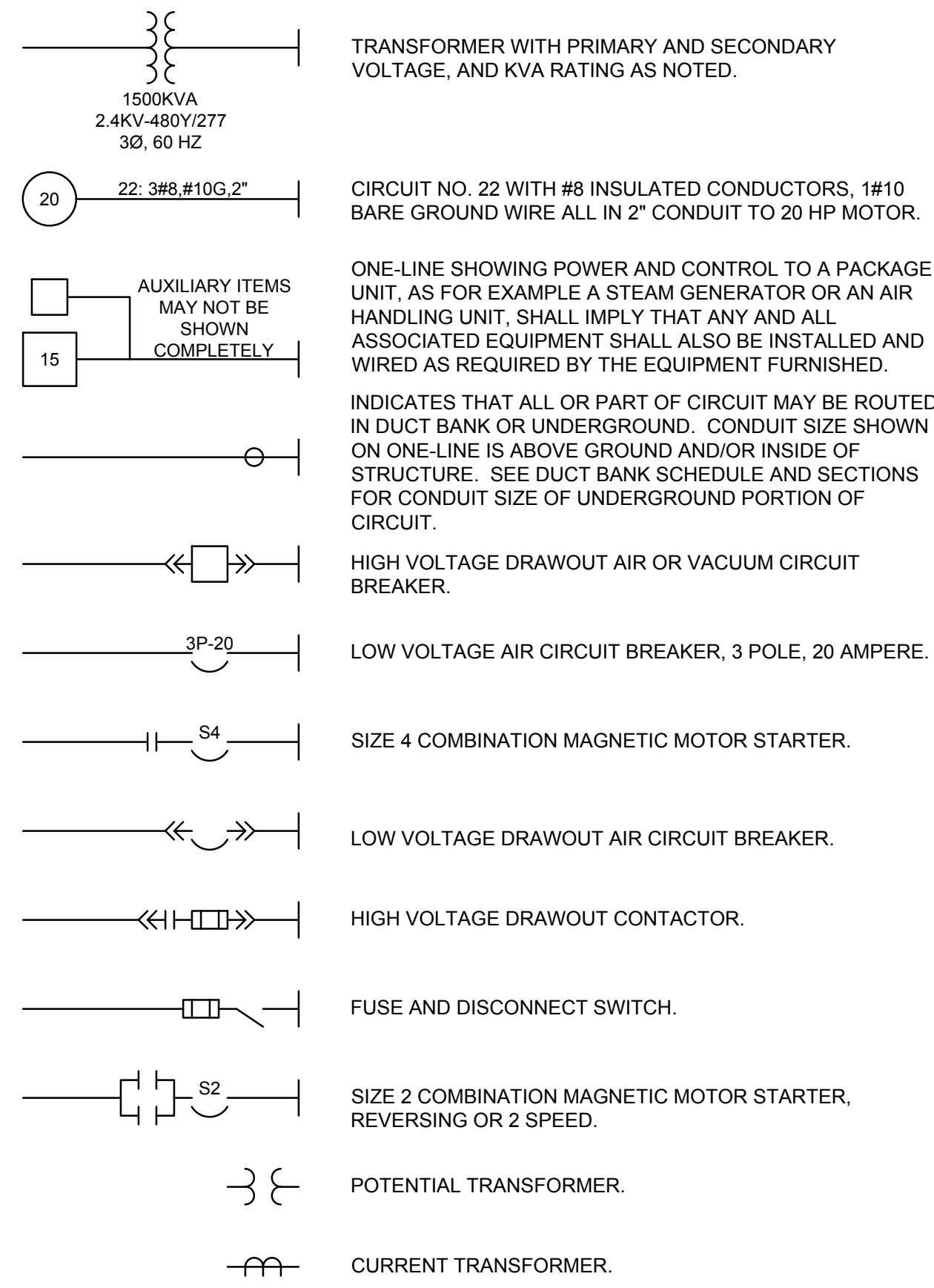
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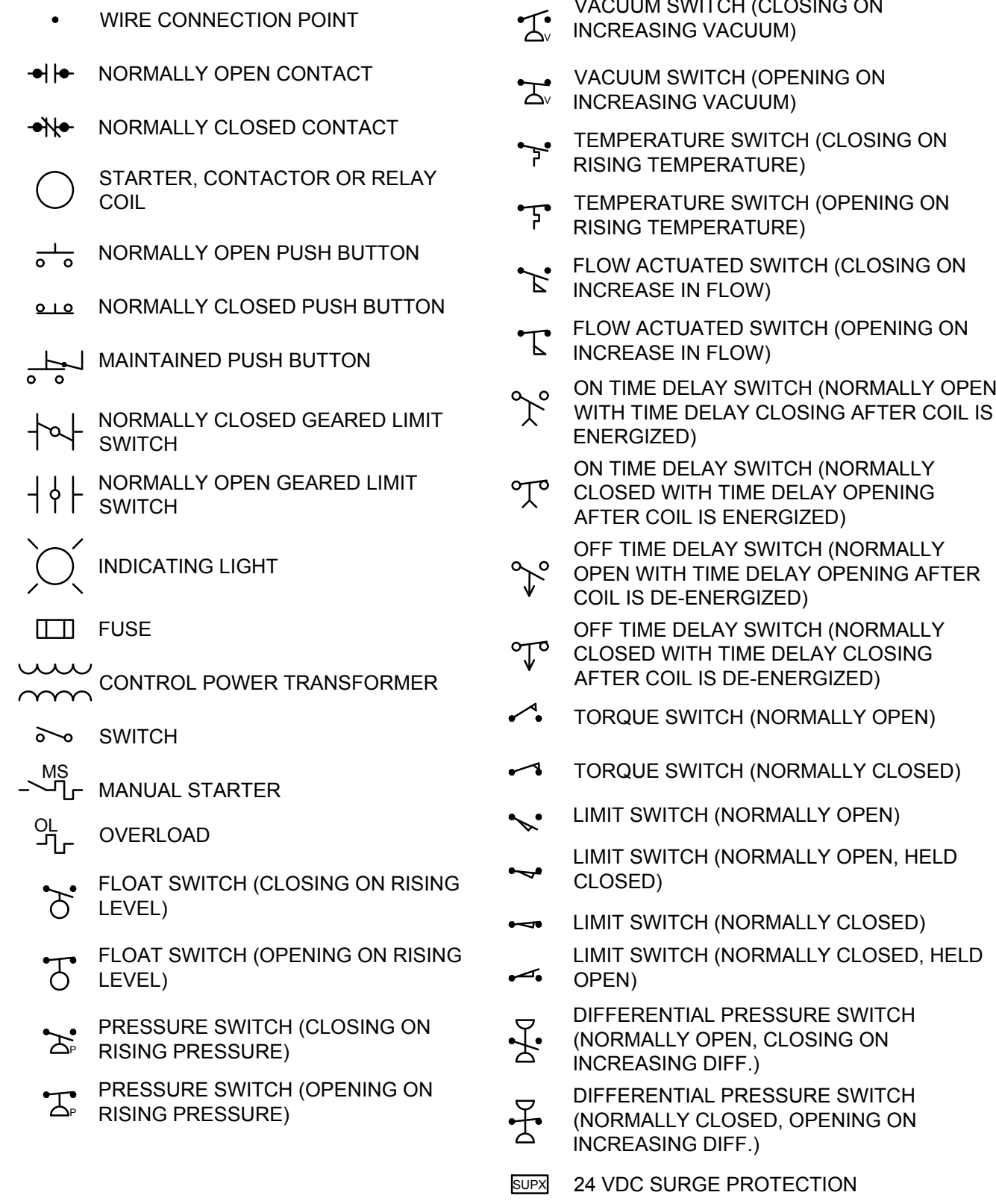
CITY OF GRAND JUNCTION
 WTP FILTER UPGRADE PROJECT

BLOWER ROOM
 MECHANICAL PLAN

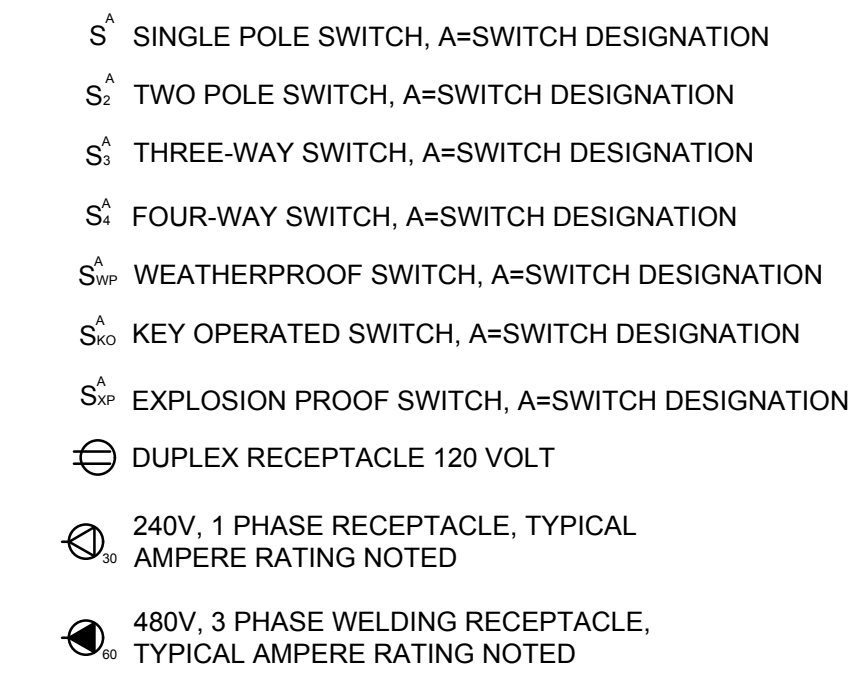
ONE LINE DIAGRAM LEGEND



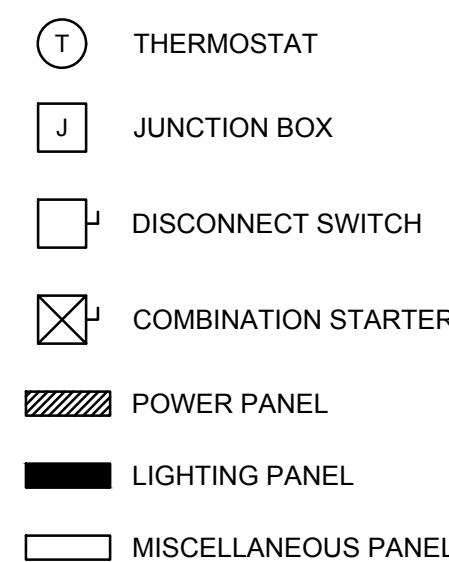
SCHEMATIC SYMBOLS



SWITCH & OUTLET SYMBOLS



MISCELLANEOUS SYMBOLS



ABBREVIATIONS

A	AMBER, AMPERE, ALARM	RECP	RECEPTACLE
AC	ALTERNATING CURRENT	RGS	RIGID GALVANIZED STEEL
AFD	ADJUSTABLE FREQUENCY DRIVE	RTD	RESISTANCE TYPE TEMP DETECTOR
AM	ABOVE FINISHED FLOOR	RTU	REMOTE TERMINAL UNIT
ATO	AMMETER	RVSS	REDUCED VOLTAGE SOLID STATE STARTER
AWG	AUTOMATIC THROUOVER	S2	SIZE 2 STARTER
C	AMERICAN WIRE GAUGE	SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
CAP	CLOSE, COUNTER, CONTACTOR	SP	SINGLE POLE
CB	CAPACITOR	SPDT	SINGLE POLE DOUBLE THROW
CD	CIRCUIT BREAKER	SPST	SINGLE POLE SINGLE THROW
CKT	CONTROL DAMPER	SS	SELECTOR SWITCH
CL2	CIRCUIT	SV	SOLENOID VALVE
CP	CHLORINE	SWB	SWITCHBOARD
CPT	CONTROL PANEL	SWGR	SWITCHGEAR
CS	CONTROL POWER TRANSFORMER	T	THERMOSTAT, TIMER, TOTALIZER
CT	CONTROL STATION	TACH	TACHOMETER
CTM	CYCLE TIMER, CURRENT TRANSFORMER	TB	TERMINAL BLOCK
2/C	CYCLE TIMER MOTOR	TD	TIME DELAY RELAY
4"/C	TEMP	TQ	TEMPERATURE
4"	2 CONDUCTOR 4" CONDUIT	TRQ	TORQUE
DC	DIRECT CURRENT	TS	TEMPERATURE SWITCH
DM	DAMPER MOTOR, DEMAND METER	UG	UNDERGROUND
DPDT	DOUBLE POLE DOUBLE THROW	UPS	UNINTERRUPTIBLE POWER SUPPLY
DPST	DOUBLE POLE SINGLE THROW	V	VOLTS
DPS	DIFFERENTIAL PRESSURE SWITCH	VA	VOLT AMPERE
DS	DISCONNECT SWITCH	VLS	VALVE LIMIT SWITCH
E	ELECTRIC OPERATOR FOR CONTROL DAMPER OR VALVE	VM	VOLTMETER
EMH	ELECTRICAL MANHOLE	W	WHITE, WATTS
ETM	ELAPSED TIME METER	WH	WATTHOUR METER
EX	EXISTING	WM	WATT METER
F	FORWARD	WP	WEATHERPROOF
FS	FLOW SWITCH	XFMR	TRANSFORMER
G	GREEN, GROUND	XP	EXPLOSION PROOF
GFI	GROUND FAULT INTERRUPTER	Y	YELLOW
GLS	GEARED LIMIT SWITCH	Z	AUXILIARY RELAY
#8G	#8 GROUND WIRE	ZS	POSITION SWITCH
H	HIGH, HUMIDISTAT		
HH	HANDHOLE		
HMT	HIGH MOTOR TEMPERATURE		
HOA	HAND-OFF-AUTO		
HOR	HAND-OFF-REMOTE		
HP	HORSEPOWER		
HWCO	HIGH WATER CUTOFF		
HZ	HERTZ (CYCLE)		
I/O	INPUT/OUTPUT		
J	JUNCTION BOX		
KV	KILOVOLT		
KVA	KILOVOLT AMPERE		
KVAR	KILOVAR		
KW	KILOWATT		
KWH	KILOWATT HOUR		
L	LOW, LEVEL		
LA	LIGHTNING ARRESTOR		
LAN	LOCAL AREA NETWORK		
LP	LIGHTING PANEL		
LS	LIMIT SWITCH, LEVEL SWITCH		
LWCO	LOW WATER CUTOFF		
M	MAGNETIC MOTOR STARTER		
MA	MILLIAMPERE		
MCB	MAIN CIRCUIT BREAKER		
MCC	MOTOR CONTROL CENTER		
MCM	THOUSAND CIRCULAR MIL		
MD	MOISTURE DETECTOR		
MH	MANHOLE, MOUNTING HEIGHT		
MOV	MOTOR OPERATED VALVE		
MS	MANUAL MOTOR STARTER		
MSH	MOTOR SPACE HEATER		
N	NEUTRAL		
NC	NORMALLY CLOSED		
NO	NORMALLY OPEN, NUMBER		
O	OPEN		
OL	OVERLOAD		
PB	PUSH BUTTON, PULL BOX		
PF	POWER FACTOR METER		
PH	PHASE (CHEMICAL TERM)		
PLC	PROGRAMMABLE LOGIC CONTROLLER		
PP	POWER PANEL		
PS	PRESSURE SWITCH		
PT	POTENTIAL TRANSFORMER, PROGRAM TIMER		
2P	2 POLE		
R	RED, RAISE, RELAY, REVERSE		

AREA DESIGNATIONS

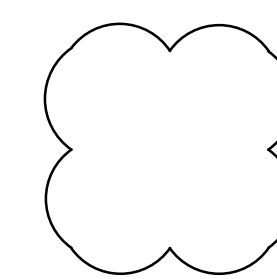
- THE SPECIAL AREA DESIGNATION BOXES, AS DEFINED BELOW, ARE LOCATED ON THE PLAN DRAWINGS TO DEFINE ELECTRICAL INSTALLATION REQUIREMENTS. DESIGNATION BOXES ARE LOCATED WITHIN ROOM OR BELOW ROOM NUMBER. ALL INDOOR AREAS NOT INDICATED OTHERWISE ARE AREA TYPE 1 AND MINIMUM NEMA TYPE 1 ENCLOSURES.
- AREA TYPE 1A CORROSIVE CHEMICAL FEED AND STORAGE ROOMS. CONDUIT SYSTEM SHALL BE EXPOSED PVC RIGID NON-METALLIC CONDUIT WITH PVC FITTINGS, BOXES, AND ACCESSORIES.
 - AREA TYPE 4 INDOOR WET LOCATIONS SUCH AS VAULTS, HOSEDOWN AREAS, BASEMENTS, ETC. MINIMUM NEMA TYPE 4 ENCLOSURE FOR EQUIPMENT AND GASKETED FITTINGS IN A CONDUIT SYSTEM.
 - AREA TYPE 7A CLASS 1, DIVISION 1 AREA AS DEFINED BY NEC. ALL EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.
 - AREA TYPE 7B CLASS 1, DIVISION 2, GROUP C AND D (METHANE, GASOLINE) AS DEFINED BY NEC. EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.
 - AREA TYPE 12 INDOOR, DRY, DIRTY AREA. REQUIRES MINIMUM NEMA TYPE 12 GASKETED ENCLOSURES FOR ALL EQUIPMENT AND GASKETED FITTINGS IN CONDUIT SYSTEMS.
 - AREA TYPE 4X OUTDOOR AND INDOOR WET LOCATIONS SUBJECT TO CORROSION. CONDUIT SYSTEM SHOULD BE PVC COATED RIGID GALVANIZED STEEL WITH PVC COATED FITTINGS, BOXES, AND STAINLESS STEEL HARDWARE.

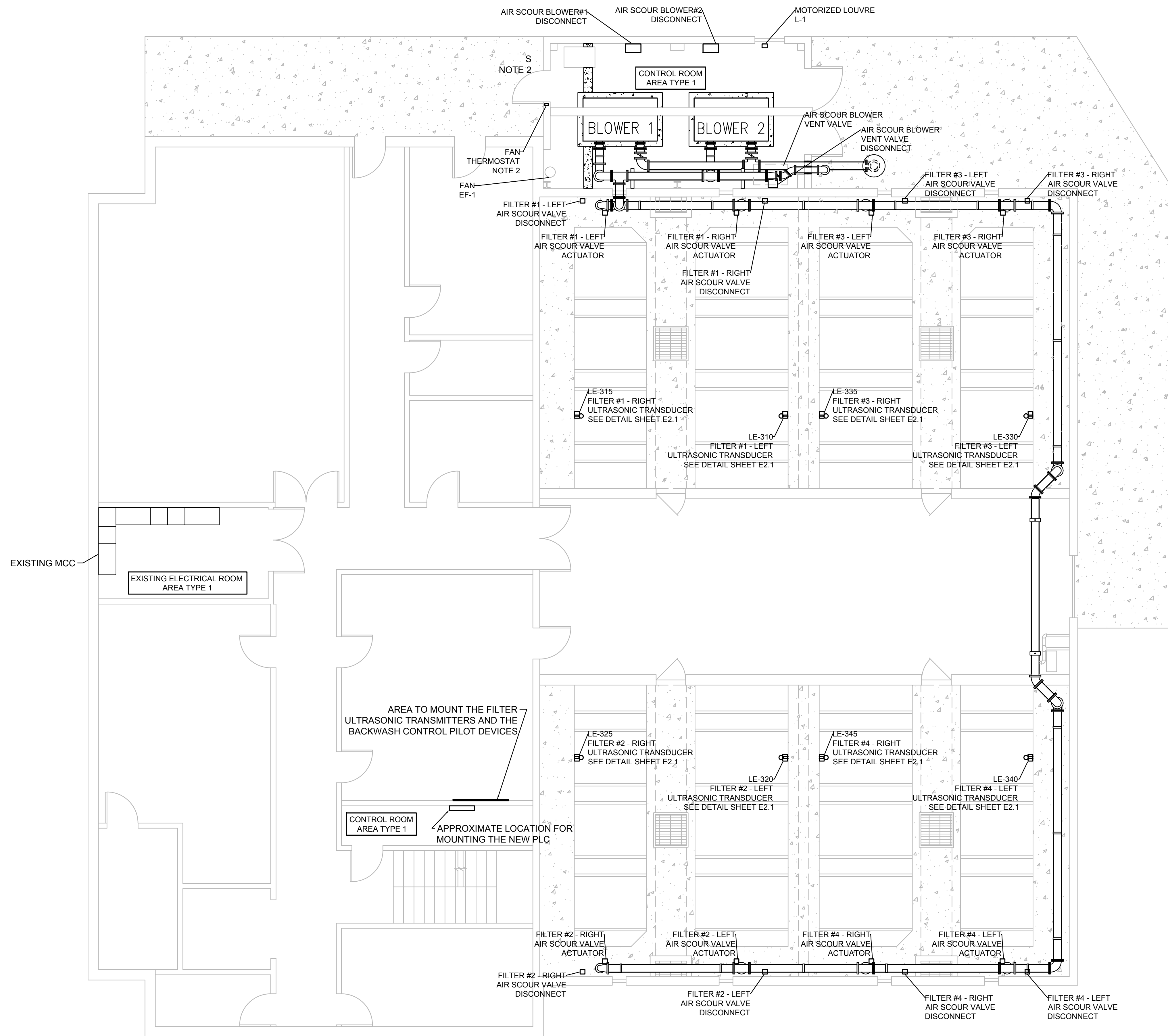
GENERAL REQUIREMENTS

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CONDUITS NOT SHOWN ON THE PLANS. THIS SHALL INCLUDE ALL CONDUITS SHOWN ON THE ONE-LINES AND HOME-RUNS SHOWN ON THE PLAN DRAWINGS. CONDUITS SHALL BE ROUTED AS DEFINED IN THE SPECIFICATIONS.
- SPARE WIRES SHALL BE TAPED AND COILED.
- IF EQUIPMENT SUPPLIED BY MANUFACTURER HAS A LARGER LOAD THAN VALUE SHOWN, THE CABLE CONDUIT AND ELECTRICAL EQUIPMENT SHALL BE ENLARGED, AS REQUIRED, TO ACCOMMODATE THE HIGHER VALUE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING PROPERLY SIZED STARTER OVERLOADS FOR EQUIPMENT FURNISHED.
- LIGHTING AND RECEPTACLE CIRCUITS DESIGNATED ON THE FLOOR PLANS ARE NOT SHOWN ON THE ONE-LINES. CONDUCTORS FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM NO. 12 AWG. CONDUIT FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM 3/4".
- IN AREAS WHERE THERE ARE OVERHEAD BRIDGE CRANES, HOISTS, ETC., NO CONDUITS SHALL BE RUN OVERHEAD THAT WILL INTERFERE WITH THE OPERATION OF THE EQUIPMENT.

GENERAL NOTES

- SOLID LINES ——— INDICATE NEW WORK OR EQUIPMENT.
- DOTTED LINES INDICATE EXISTING WORK OR EQUIPMENT.
- DASHED LINES - - - - INDICATE FUTURE WORK OR EQUIPMENT.
- THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
- INFORMATION RELATED TO CIRCUIT IDENTIFICATION, WIRE & CONDUIT SIZES, AND ROUTING, IS ON THE FOLLOWING DRAWING TYPES.
 - A. ONE-LINE DIAGRAMS SHOW CIRCUIT IDENTIFICATION, WIRE QUANTITY AND SIZES, AND CONDUIT SIZE WITHIN STRUCTURES. ONE-LINE DIAGRAMS ALSO INDICATE ORIGIN AND DESTINATION OF CIRCUITS, AND IDENTIFY CIRCUITS ROUTED UNDERGROUND.
 - B. FOR CIRCUITS WITHOUT UNDERGROUND PORTIONS, BUILDING FLOOR PLANS SHOW LOCATION OF EQUIPMENT FOR DETERMINING CIRCUIT LENGTH WITHIN THE STRUCTURE. FOR CIRCUITS WITH UNDERGROUND PORTIONS, ANTICIPATED PENETRATION OF UNDERGROUND CONDUITS ARE SHOWN ON STRUCTURE PLANS FOR DETERMINING THE LENGTH OF IN-STRUCTURE PORTIONS OF CIRCUITS. BUILDING FLOOR PLANS MAY ALSO SHOW HOME RUNS FOR LIGHTING, RECEPTACLE, AND OTHER MISCELLANEOUS EQUIPMENT CIRCUITS.
 - C. SITE PLANS INDICATE THE GENERAL ROUTING OF UNDERGROUND CONDUITS AND DUCT BANKS. CIRCUITS ROUTED IN UNDERGROUND CONDUITS OR DUCT BANKS ARE INDICATED IN DUCT BANK SECTIONS REFERENCED ON THE SITE PLAN.
 - D. DUCT BANK SECTIONS AND SCHEDULES IDENTIFY CONDUIT SIZE, CONDUIT MATERIAL, ARRANGEMENT OF THE UNDERGROUND CONDUITS, AND CIRCUITS ROUTED IN EACH UNDERGROUND CONDUIT.
- CLOUDED MARKINGS INDICATE WORK IN EXISTING AREAS THAT IS NEW OR NEW WORK ON AN EXISTING PIECE OF EQUIPMENT.





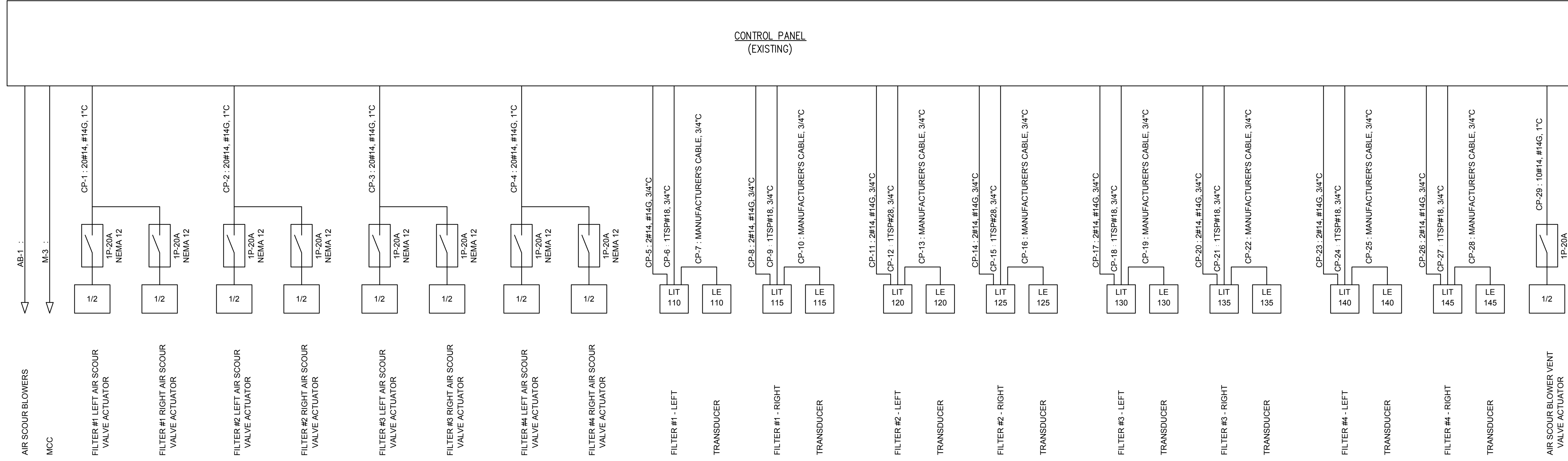
- NOTES:
1. CONDUITS FOR THE VALVE ACTUATORS AND THE ULTRASONIC TRANSDUCERS SHALL ROUTE TO THE WALL IN AS SHORT A WAY AS POSSIBLE TO MINIMIZE TRIP HAZARDS ON THE WALKWAY. WHEN THE CONDUIT IS ROUTED ALONG THE SIDE OF THE WALKWAY, IT SHALL BE LOCATED OFF THE WALKWAY.
 2. A NEW THERMOSTAT SHALL BE PROVIDED AND INSTALLED TO CONTROL THE EXISTING FAN IN THE BLOWER ROOM. THE NEW THERMOSTAT SHALL BE WIRED IN PARALLEL TO THE EXISTING MANUAL SWITCH FOR THE FAN ON THE OUTSIDE OF THE DOOR. THE CONTROLS SHALL BE WIRED INTO THE NEW FAN STARTER, WHICH SHALL BE PROVIDED BY THE HVAC CONTRACTOR, SO THAT EITHER THE SWITCH OR THE THERMOSTAT CAN TURN THE FAN ON WHEN CALLED FOR.

PROCESS PLAN
3/16" = 1'-0"

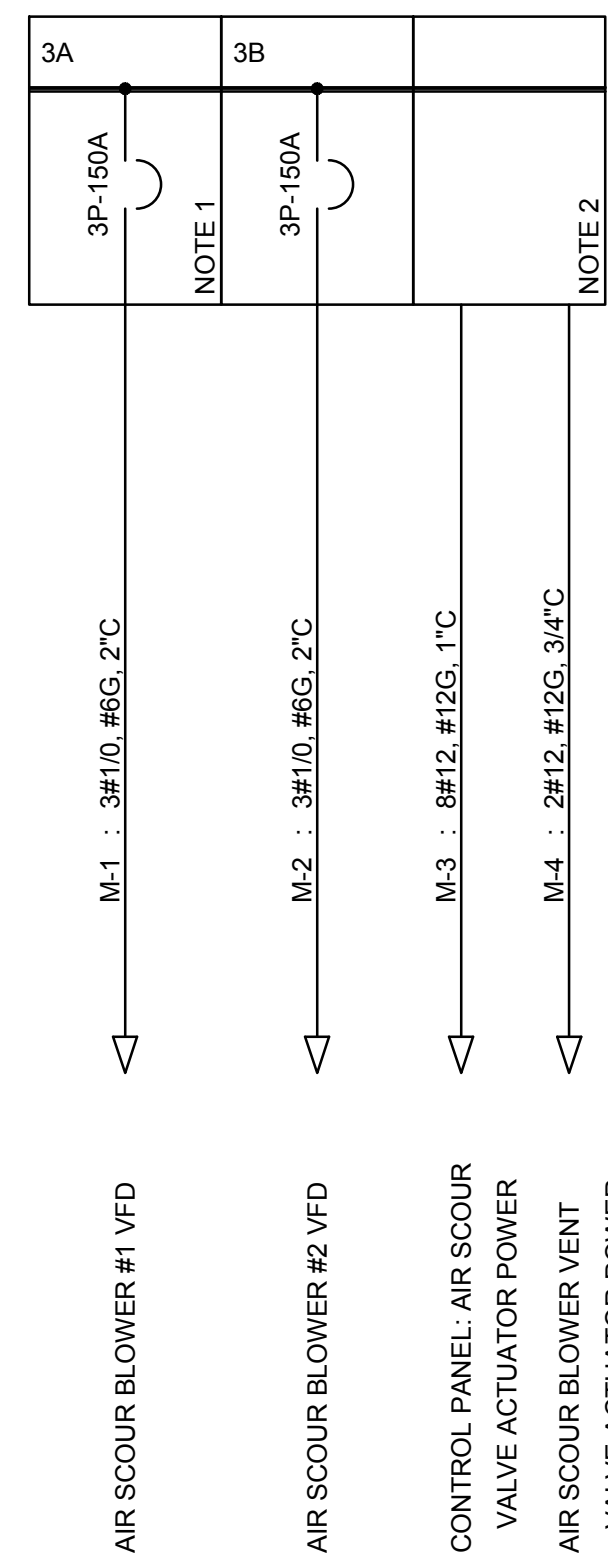
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DATE:	AUGUST 2016
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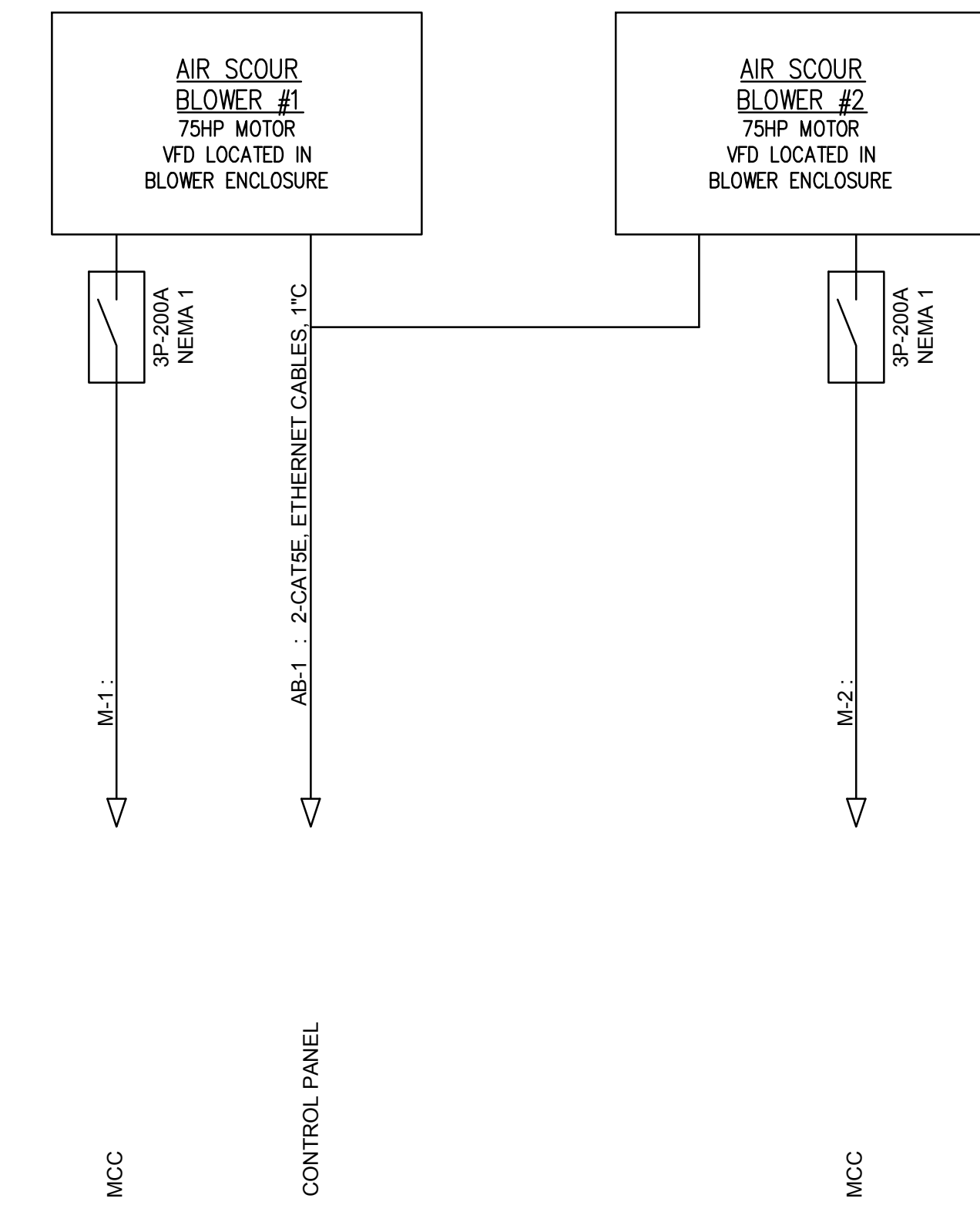
CITY OF GRAND JUNCTION
WTP FILTER UPGRADE PROJECT
ELECTRICAL
BUILDING PLAN



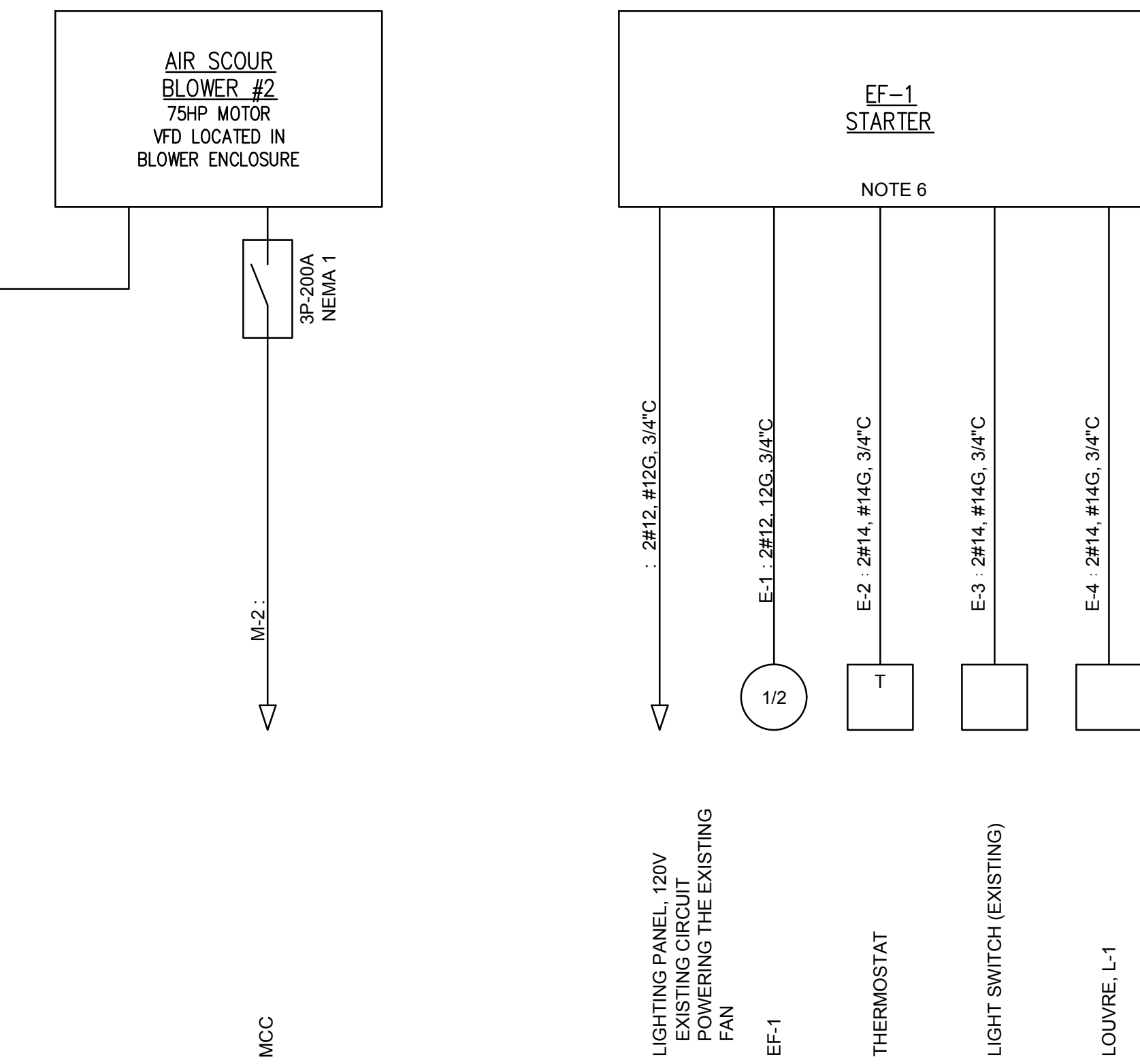
CONTROL PANEL
 ONE-LINE DIAGRAM
 ONLY NEW OR MODIFIED CIRCUITS ARE SHOWN



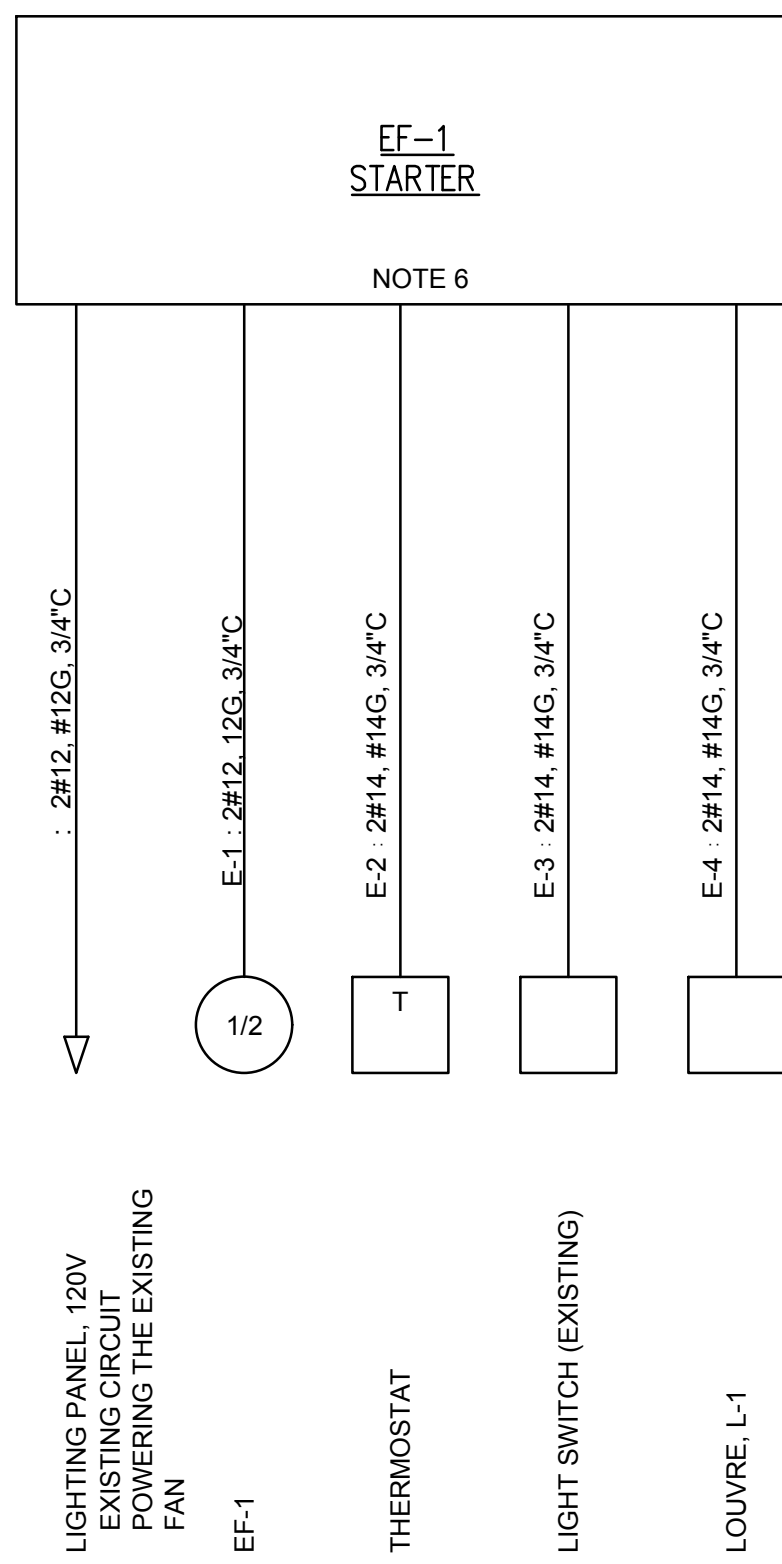
EXISTING WTP MCC
 ONLY ADDED OR MODIFIED
 CIRCUITS ARE SHOWN



AIR SCOUR BLOWER #1
 ONE-LINE DIAGRAM



AIR SCOUR BLOWER #2
 ONE-LINE DIAGRAM



EF-1
 ONE-LINE DIAGRAM

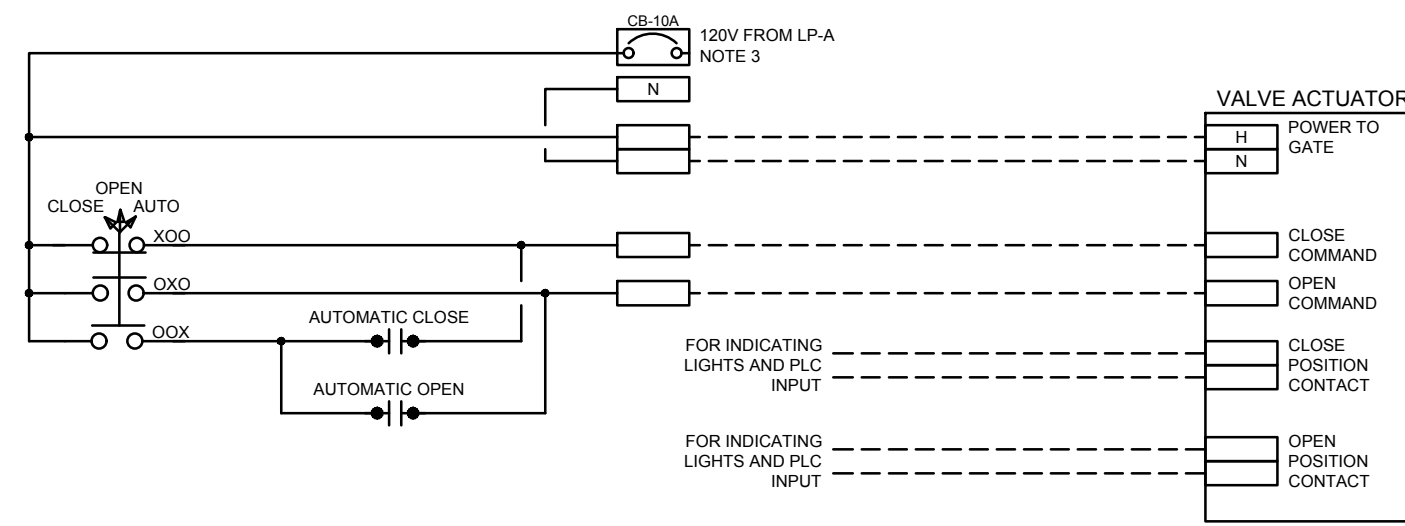
- NOTES:
1. RETROFIT THIS BUCKET AS DESCRIBED ON SHEET E2.1.
 2. 4 NEW 1P-15A BREAKERS SHALL BE ADDED IN LIGHTING PANEL A IN THE EXISTING MCC FOR POWERING THE NEW AIR SCOUR VALVE ACTUATORS AND ONE NEW 1P-15A BREAKER SHALL BE ADDED FOR THE NEW AIR SCOUR BLOWER VENT VALVE.
 3. ONE BREAKER FROM LP-A SHALL POWER BOTH AIR SCOUR ACTUATORS FOR EACH FILTER.
 4. ALL THE EXISTING EQUIPMENT IN THIS MCC BUCKET SHALL BE REMOVED AND TURNED OVER TO THE OWNER. THE BUCKET SHALL BE RETROFITTED IN THE FIELD WITH A 3P-150A BREAKER THAT MATCHES THE BUCKET BELOW IT. THE BREAKER SHALL BE LUGGED TO THE MAIN BUS THE SAME AS THE BREAKER BELOW IT.
 5. ALL WIRING ASSOCIATED WITH THE AIR SCOUR ACTUATORS SHALL LAND ON NEW TERMINAL BLOCKS ON THE BACK SIDE OF THE EXISTING CONTROL PANEL.
 6. THE EF-1 STARTER, MOTOR, AND THERMOSTAT ARE TO BE PROVIDED BY THE HVAC CONTRACTOR. ELECTRICAL CONTRACTOR SHALL PROVIDE CONDUIT AND WIRING AS SHOWN ON THE ONE-LINE DIAGRAM. THE CIRCUIT TO POWER THE FAN EXISTS TO THE EXISTING FAN THAT IS IN THE SAME LOCATION.

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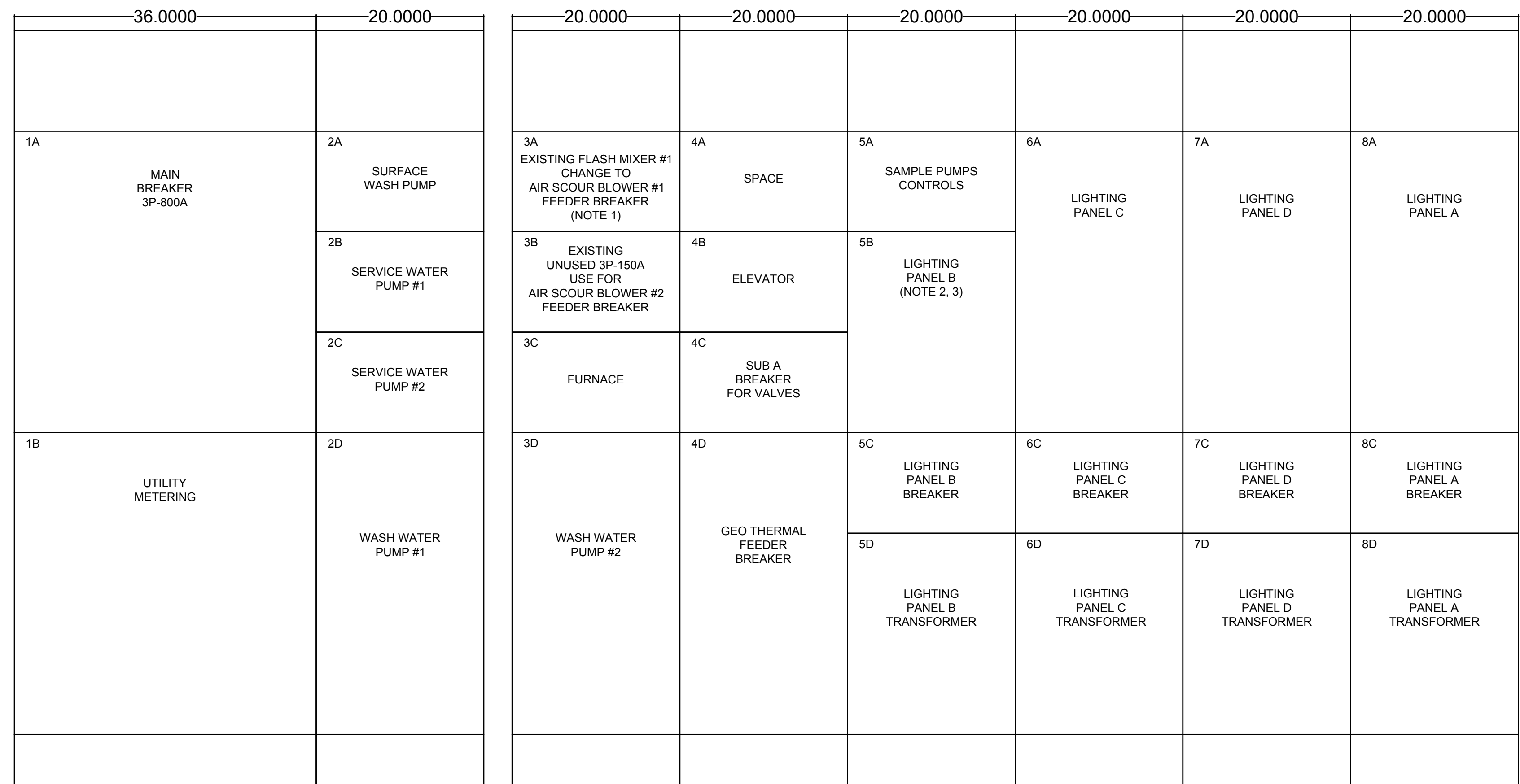
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 ELECTRICAL
 ONE-LINE DIAGRAMS

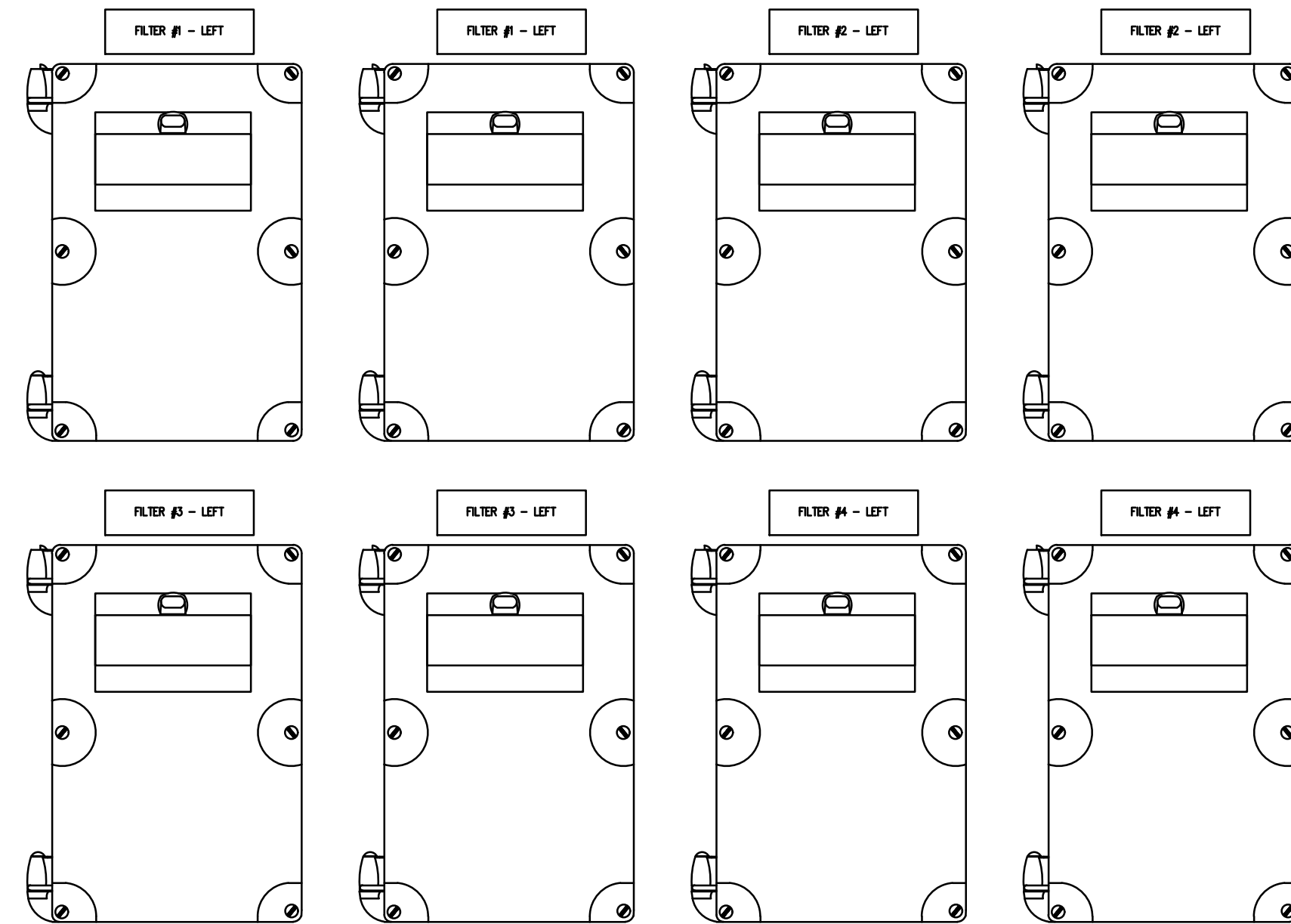


CONTROL WIRING FOR EACH AIR SCOUR VALVE ACTUATOR TYPICAL FOR ALL 8 ACTUATORS (NOTE 4)

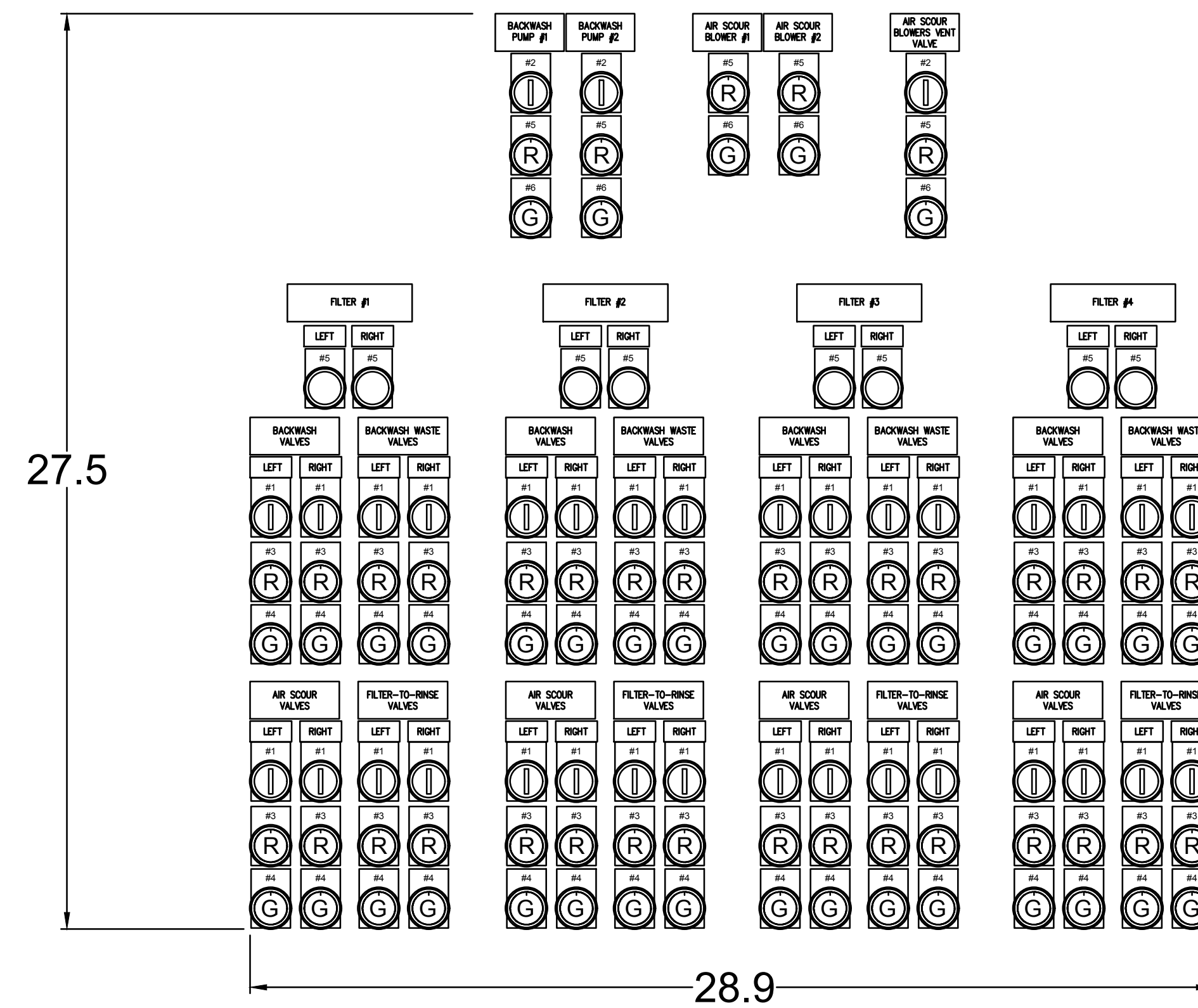
NAMEPLATES	
NAMEPLATE #	NAMEPLATE DESCRIPTION
#1	CLOSE - OPEN - AUTO
#2	HAND - OFF - AUTO
#3	CLOSED
#4	OPENED
#5	BACKWASH INITIATE
#6	RUNNING
#7	OFF



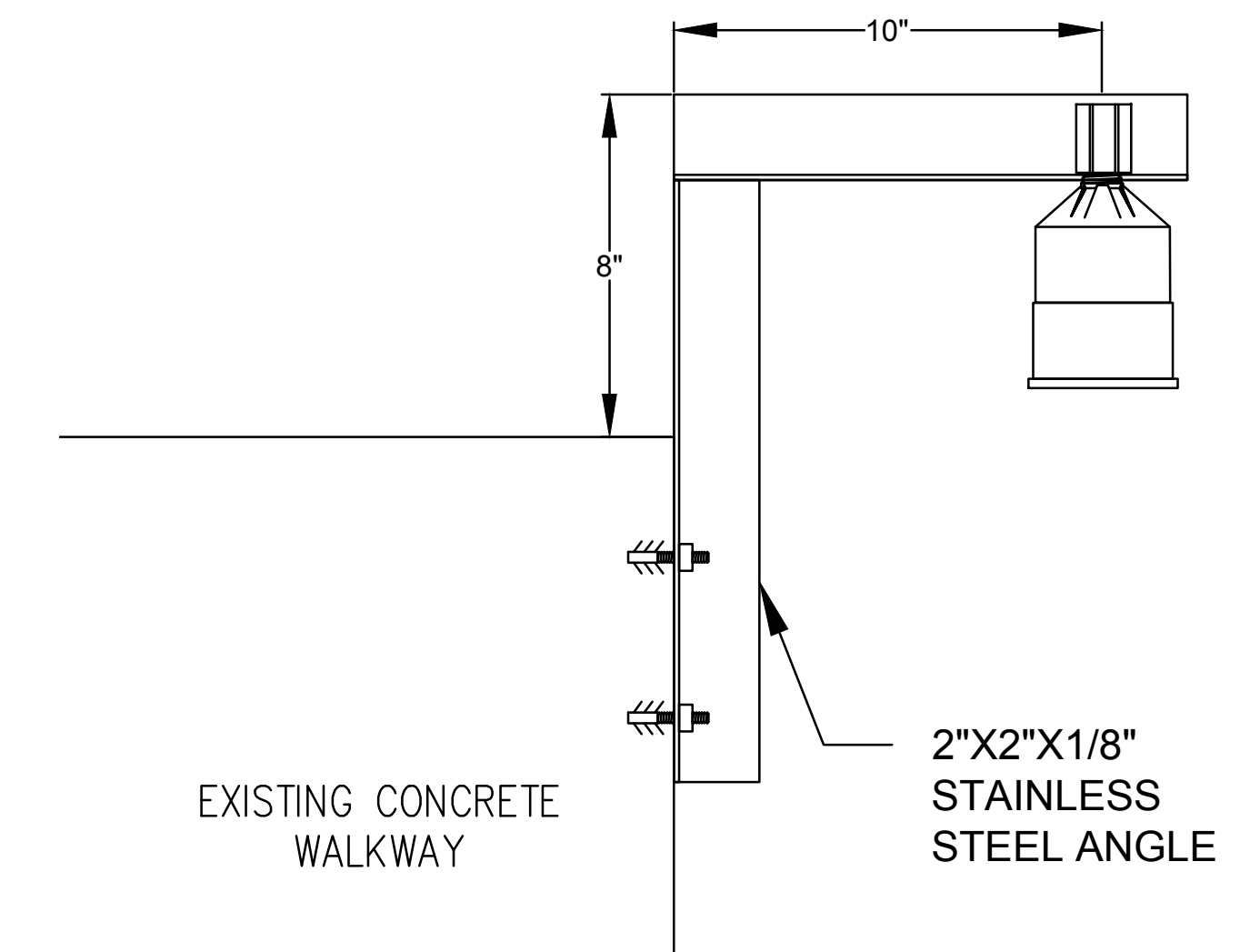
ELEVATION OF EXISTING MCC



FILTER ULTRASONIC TRANSMITTERS ON CONTROL PANEL



BACKWASH CONTROL LAYOUT ON CONTROL PANEL



FILTER ULTRASONIC TRANSDUCER MOUNTING DETAIL

- NOTES:
- ALL THE EXISTING EQUIPMENT IN THIS MCC BUCKET SHALL BE REMOVED AND TURNED OVER TO THE OWNER. THE BUCKET SHALL BE RETROFITTED IN THE FIELD WITH A 3P-150A BREAKER TO MATCH THE BUCKET BELOW IT. THE BREAKER SHALL BE LUGGED TO THE MAIN BUS THE SAME AS THE BREAKER BELOW IT.
 - 4 NEW 1P-15A BREAKERS SHALL BE ADDED IN LIGHTING MCC FOR POWERING THE NEW AIR SCOUR VALVE ACTUATORS.
 - ONE BREAKER FROM LP-B SHALL POWER BOTH AIR SCOUR ACTUATORS FOR EACH FILTER.
 - ALL WIRING ASSOCIATED WITH THE AIR SCOUR ACTUATORS SHALL LAND ON NEW TERMINAL BLOCKS ON THE BACK SIDE OF THE EXISTING CONTROL PANEL.
 - THE EXISTING CONTROLS IN THE CONTROL PANEL FOR THE BACKWASH PUMPS, BACKWASH VALVES, BACKWASH WASTE VALVES, AND FILTER-TO-WASTE VALVES SHALL BE REWIRED TO BE CONTROLLED BY THE NEW PLC.

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