

Contractor \_\_\_\_\_

Set No. \_\_\_\_\_

**PROJECT MANUAL FOR  
WEDOWEE SEWER SYSTEM IMPROVEMENTS  
CWSRF PROJECT NO. CS010883-02 & CS010883-04  
& ARC PROJECT NO. AL-20358-2021**

Prepared for:

**Town of Wedowee**

Wedowee, Alabama

August 2023

Prepared by:



**Wedowee Sewer System Improvements**  
**CWSRF Project No. CS010883-02 & CS010883-04**  
**& ARC Project No. AL-20358-2021**

*Town of Wedowee*  
*Randolph County, Alabama*

**OWNER**

**TOWN OF WEDOWEE**

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Wedowee, Alabama 36278

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Mayor Tim Coe

**ENGINEER**

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**CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

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**SECTION 00 11 13**  
**ADVERTISEMENT FOR BIDS**

Sealed bids will be received by the Town of Wedowee at Wedowee Town Hall located at 24 Main Street, Wedowee, Alabama 36278, until **Tuesday, September 19, 2023, at 1:00 P.M. CST**, and then publicly opened and read aloud for furnishing all labor and materials, and performing all work described as follows:

**Wedowee Sewer System Improvements**

The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.

A non-mandatory pre-bid conference will be held virtually on Thursday, September 7, 2023, at 1:00 P.M. CST. Instructions for attending the virtual pre-bid conference are included in the contract specifications.

Wedowee obtained assistance through the Alabama Department of Environmental Management (ADEM) Clean Water State Revolving Fund (CWSRF/ARPA-BIL) and a grant through the Appalachian Regional Commission (ARC) to make improvements to the sewer system. Compliance with all applicable Federal, State, and local laws, rules, and regulations is required.

Bid documents may be purchased **ONLY** from Alabama Graphics online plan room at [www.algraphicsplanroom.com](http://www.algraphicsplanroom.com) or by calling (205) 252-8505. The project engineering firm is The Kelley Group, (256) 248-7030. General Contractors who bid must purchase, at a minimum, the half-size plans and specifications. Documents are available at reproduction cost with no refunds available.

All bids must be on the bid form provided in the Specifications and submitted in its entirety. A cashier's check drawn on an Alabama bank or Bidder's Bond, payable to the Town of Wedowee for an amount not less than five percent (5%) of the amount bid, but in no event more than ten thousand dollars, shall be filed with the bid. The bidders' bond shall be prepared on the form specified in the specifications and signed by a bonding company authorized to do business in the State of Alabama.

Performance and Labor and Material Payment Bonds, proof of insurance, verification of E-Verify enrollment, and a complete list of subcontractors and suppliers will be required prior to the signing of the Contract. A Performance Bond in an amount equal to one hundred percent (100%) of the contract costs and Labor and Material Payment Bond in an amount of one hundred percent (100%) of the contract cost in the form and terms approved by the Town of Wedowee will be required at the signing of the contract. In addition, the Contractor must furnish to the Town of Wedowee at the time of the signing of the contract a certificate of insurance coverage as provided in the specifications. The right is reserved to reject any and/or all bids to waive informalities and to furnish any item of material or work to change the amount of said Contract.

No bids will be considered unless the bidder, whether resident or non-resident of Alabama, is properly qualified to submit a bid for this construction in accordance with all applicable laws of the State of Alabama. This shall include evidence of holding a current license from the State Licensing Board for General Contractors, Montgomery, Alabama, as required by Chapter 8 of Title 34 of the Code of

Alabama, 1975. In addition, non-residents of the State, if a corporation, shall show evidence of having qualified with the Secretary of State to do business in the State of Alabama.

The bidder shall show evidence by clearly displaying the current license number on the outside of the sealed envelope in which the bid is delivered. In addition, bids shall be clearly identified on the exterior of the package with the bidder's name, address, the name of the project being bid, and the time and place of the bid opening. No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of sixty (60) days. The Owner reserves the right to reject any or all bids and to waive technical errors if the best interest of the Owner will thereby be promoted. All bids received after the date and time of the bid opening noted above will be returned unopened.

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## INSTRUCTIONS TO BIDDERS

### ARTICLE 1 - DEFINED TERMS

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- 1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below, which are applicable to both the singular and plural thereof:
- A. *Bidder*--The individual or entity who submits a Bid directly to OWNER.
  - B. *Sub-bidder*—The individual or entity that submits a bid to a Bidder.
  - C. *Issuing Office*--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
  - D. *Successful Bidder*--The lowest, qualified, responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.
  - E. *Bidding Documents*—The Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Conditions, the Bid Form, the Contract Documents (including all Addenda issued prior to receipt of Bids), and the Technical Specifications.

### ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

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- 2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from Alabama Graphics. The deposit will be non-refundable.
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 OWNER and ENGINEER, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

### ARTICLE 3 - QUALIFICATIONS OF BIDDERS

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- 3.01 At the time of the bid, each bidder must submit evidence of the **Bidder's Alabama Licensing Board for General Contractor's license with a major classification of MU (Municipal & Utility).**
- 3.02 CONTRACTOR will supply the OWNER and ENGINEER with a minimum of five (5) references and validation of performing similar size and type of municipal sewer system improvements.

- 3.03 To demonstrate Bidder’s qualifications to perform the Work, within five days of OWNER’s request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be requested by the Owner. Each Bidder must submit evidence of Bidder’s qualifications to do business in the State of Alabama.
- 3.04 According to Alabama law, “As a condition of the award of any contract, grant, or incentive by the state, any political subdivision, or any state-funded entity to a business entity or employer that employs one or more employees WITHIN THE STATE OF ALABAMA, the business or employer shall provide documentation establishing that the business or employer is enrolled in eVerify. During the performance of the contract, the business or employer shall participate in the eVerify program and shall verify every employee that is required to be verified according to the applicable federal rules and regulations.” eVerify: <https://verify.alabama.gov>
- 3.05 At the time of bid, the bidding Contractor **MUST** provide proof of enrollment in the Alabama eVerify program and **MUST** continue to use eVerify to check employees as directed by the eVerify system. This enrollment proof is a copy of the eVerify Memorandum of Understanding (MoU) the contractor receives when registration on eVerify is finalized. The affidavit is no longer required.
- 3.06 Any subcontractor that works on the project **MUST** also provide to the contractor and OWNER/ENGINEER the proof of enrollment in eVerify and must also use the system to verify employees.
- 3.07 At the time of bid, the bidding Contractor **MUST** provide proof of active registration with the System for Award Management (SAM) website.
- 3.08 The contractor that the contract is awarded to **MUST** (at the time of the bid if possible, but before the contract is awarded) provide the Beason-Hammon Alabama Taxpayer and Citizen Protection Act certification form.
- 3.09 Any subcontractor that works on the project **MUST** also provide to the contractor and OWNER/ENGINEER the Beason-Hammon Alabama Taxpayer and Citizen Protection Act certification form.
- 3.10 The contractor that the contract is awarded to **MUST** (at the time of the bid if possible, but before the contract is awarded) provide the State of Alabama Disclosure Form.
- 3.11 Any subcontractor that works on the project **MUST** also provide to the contractor and OWNER/ENGINEER the State of Alabama Disclosure Form.
- 3.12 The contractor the contract is awarded to **MUST NOT BE** listed on the Federally Debarred List.
- 3.13 Davis Bacon Prevailing Wage Rates for Randolph County are required.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA,  
AND SITE

4.01 Subsurface and Physical Conditions

- A. The Supplementary Conditions identify:
  - 1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that the Engineer has used in preparing the Bidding Documents, if any.
  - 2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Bidding Documents.
- B. Copies of reports and drawings referenced in paragraph 4.01.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in paragraph 4.02 of the General Conditions has been identified and established in paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

- A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities, including OWNER or others. The information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site are based upon information and data furnished to the owner and Engineer by others of such Underground Facilities or others, and Owner does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary conditions.

4.03 Hazardous Environmental Condition

- A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.
- B. Copies of reports and drawings referenced in paragraph 4.03.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in paragraph 4.06 of the General Conditions has been identified and established in paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data,

interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

- 4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.
- 4.05 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. The bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.
- 4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.
- 4.07 It is the responsibility of each Bidder before submitting a Bid to:
- A. Examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;
  - B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, quantities, and Site conditions that may affect the cost, progress, and performance of the Work;
  - C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect the cost, progress, or performance of the Work;
  - D. Carefully study all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions;
  - E. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect

- of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
- F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for the performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
  - G. Become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;
  - H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
  - I. Promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and
  - J. Determine that the Bidding Documents are generally sufficient to indicate and convey an understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception, the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey an understanding of all terms and conditions for performing and furnishing the Work.

#### ARTICLE 5 - PRE-BID CONFERENCE

1. A non-mandatory pre-bid conference will be held virtually **at 1:00 P.M. CST on Thursday, September 7, 2023, via Zoom. You can join from your computer, tablet or smartphone using this link, <https://bit.ly/3s5R1Ec>. You can also dial in using your phone, +1 (305) 224-1968, using Meeting ID 849 4027 2425 and Passcode: 963557.** The purpose of the meeting is to answer all questions the contractor may have prior to submitting his bid. The nonattendance of the pre-bid conference will not relieve the contractor from any additional stipulations discussed and or added to the project during the pre-bid meeting. Topics that cannot be covered or answered in entirety during the pre-bid will be answered afterward by written statement. All questions should be addressed in writing to Jessica Mandrell, Project Manager, [jessica@kelleynetwork.com](mailto:jessica@kelleynetwork.com), and Bart Taft, P.E., at [bart@kelleynetwork.com](mailto:bart@kelleynetwork.com).

2. Verbal questions and/or answers will not be binding. Unless expressly mentioned and noted for additional comment during the pre-bid conference, no additional questions will be fielded/answered prior to the bid opening.

#### ARTICLE 6 - SITE AND OTHER AREAS

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- 6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

#### ARTICLE 7 - INTERPRETATIONS AND ADDENDA

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- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than *five* days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

#### ARTICLE 8 - BID SECURITY

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- 8.01 A Bid must be accompanied by Bid security made payable to OWNER in an amount of 5% of Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond on the form attached issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, OWNER may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earlier of seven days after the Effective Date of the Agreement or 60 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.
- 8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

## ARTICLE 9 - CONTRACT TIMES

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- 9.01 The number of days within which, or the dates by which, the Work is to be completed and ready for final payment are set forth in the Agreement.

## ARTICLE 10 - LIQUIDATED DAMAGES

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- 10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

## ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

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- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in the General Conditions and may be supplemented in the General Requirements.

## ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

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- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. If ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, ENGINEER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the contract award.
- 12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.
- 12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

- 12.04 **The Owner and the prime contractor shall use the necessary resources to identify and directly solicit no less than 3 certified DBE/MBE firms and 3 WBE firms to bid in each expected contract/subcontract area. If a diligent and documented search of ALDOT, SBA, and MBDA directories does not identify 3 potential certified DBE/MBE firms and 3 potential certified WBE firms, then the prime contractor shall post an advertisement in at least 1 of the other online or print resources. Whenever possible, post solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date. If Prime Contractor is not utilizing subcontractors, solicitation is not necessary. A letter must be provided by prime contractor stating no subcontractors will be used within 10 days of award. Solicitation of DBE/MBE/WBE subcontractor is required, utilization of DBE/MBE/WBE is not required.**

The documentation of these good faith DBE/MBE/WBE solicitation efforts must be detailed in order to allow for satisfactory review. Such documentation might include fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with at least 1 logged phone call.

#### ARTICLE 13 - PREPARATION OF BID

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- 13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from ENGINEER.
- 13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each Bid item listed therein, or the words “No Bid,” “No Change,” or “Not Applicable” entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.
- 13.06 A Bid by an individual shall show the Bidder’s name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.



- 13.08 All names shall be typed or printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.
- 13.10 The address and telephone number for communications regarding the Bid shall be shown.
- 13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid form.
- 13.12 Bids must be priced on a Unit Cost of Lump Sum basis for the base contract and include a separate price for each alternative described in the Specifications as provided for in the Bid Form.
- 13.13 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances named in the Contract Documents.

#### ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS

- 14.01 Unit Price
- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.
  - B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.
  - C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.
- 14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in paragraph 11.02 of the General Conditions.
- 14.03 Bid prices will be compared after adjusting for differences in the time designated by Bidders for Substantial Completion. The adjusting amount will be determined at the rate set forth in the Contract Documents for liquidated damages for failing to achieve Substantial Completion for each day before or after the desired date appearing in Article 9.

## ARTICLE 15 - SUBMITTAL OF BID

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- 15.01 Each prospective Bidder is furnished one copy of the Bidding Documents with one separate unbound copy each of the Bid form, and, if required, the Bid Bond. The unbound copy of the Bid form is to be completed and submitted with the Bid security.
- 15.02 Contractor will supply the OWNER and ENGINEER with a minimum of five (5) references and validation of performing similar size and type of municipal sewer system improvements. The information will be included in the Contractors bid package for review by the OWNER and ENGINEER in considering the Contractor's bid.
- 15.03 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, Contractor License Number and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to **Attention: Mayor Tim Coe, Town of Wedowee, 24 Main Street, Wedowee, Alabama 36278.**

## ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

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- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid at the discretion of OWNER, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

## ARTICLE 17 - OPENING OF BIDS

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- 17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

## ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

## ARTICLE 19 - AWARD OF CONTRACT

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- 19.01 OWNER reserves the right to reject any or all Bids, including without limitation, non-conforming, non-responsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER may also reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.
- 19.06 If the Contract is to be awarded, OWNER will award the Contract to the Bidder whose Bid is in the best interests of the Project.

## ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

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- 20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds.

## ARTICLE 21 - SIGNING OF AGREEMENT

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- 21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER with the required Bonds. Within ten days thereafter, OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

**SECTION 00 22 13**  
**OWNER'S INSTRUCTIONS CONCERNING**  
**BONDS AND INSURANCE FOR CONSTRUCTION**

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PROJECT: Wedowee Sewer System Improvements  
CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021

DESCRIPTION: The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.

OWNER: Town of Wedowee  
24 Main Street  
Wedowee, Alabama 36278

TO: (ENGINEER) The Kelley Group  
P.O. Box 45  
Tuscumbia, AL 35674

ATTENTION: CONTRACTORS

---

The following are your instructions with respect to the requirements for Bonds and insurance to be included in the Contract Documents for the above Project.

**I. BONDS**

- A. Bid Security is to be provided by each Bidder in the amount of 5% of the bid price and will be in the form of:
1. Bid Bond; the prescribed type of Bid Bond is attached. **YES**
  2. Certified or bank cashier's check drawn to the order of Owner. **YES**
- B. Construction Performance Bond in an amount equal to the Contract Price and construction Payment Bond in an amount equal to the Contract Price. **YES**

**II. LIABILITY INSURANCE**

The limits of liability for the liability required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law or regulations and the coverage under paragraph 5.04 shall be as follows:

- A. Workers' Compensation, etc. under paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:

- |                                              |               |
|----------------------------------------------|---------------|
| 1. State:                                    | Statutory     |
| 2. Applicable Federal (e.g. Longshoreman's): | Statutory     |
| 3. Employer's Liability:                     | \$500/500/500 |
- B. Comprehensive or Commercial General Liability under paragraphs 5.04.A.3 through 5.04.A.7 of the General Conditions (including Premises-Operations; Independent Contractors' Protection; Products Liability -- Completed Operations; Broad Form Property Damage):
- |                                                                                                              |                     |
|--------------------------------------------------------------------------------------------------------------|---------------------|
| 1. General Aggregate<br>(Except Products-Completed Operations)                                               | \$ <u>2,000,000</u> |
| 2. Products-Completed Operations Aggregate                                                                   | \$ <u>2,000,000</u> |
| 3. Personal and Advertising Injury (per Person/Organization)                                                 | \$ <u>1,000,000</u> |
| 4. Each Occurrence (Bodily Injury and Property Damage)                                                       | \$ <u>1,000,000</u> |
| 5. Personal Injury Liability Coverage will include Claims arising out of Employment.                         | <b>NO</b>           |
| 7. Exclusions of Property in Contractor's Care, Custody or Control will be eliminated.                       | <b>NO</b>           |
| 8. Property Damage Liability Insurance will Provide Coverage for Explosion, Collapse and Underground Damage. | <b>YES</b>          |
- C. Contractual Liability under paragraph 5.04.B.4 of the General Conditions (Bodily Injury and Property Damage).
- |                      |                     |
|----------------------|---------------------|
| 1. General Aggregate | \$ <u>2,000,000</u> |
| 2. Each Occurrence   | \$ <u>1,000,000</u> |
- D. Automobile Liability under paragraph 5.04.A.6 of the General Conditions:
- |                     |                                                                                    |
|---------------------|------------------------------------------------------------------------------------|
| 1. Bodily Injury:   | <u>\$1,000,000</u> Each Person<br><u>\$1,000,000</u> Each Accident                 |
| 2. Property Damage: | <u>\$500,000</u> Each Accident<br>or a combined single limit of <u>\$1,000,000</u> |
- E. Liability coverage for OWNER, ENGINEER, ENGINEER's Consultants and others listed in the Supplementary Conditions will be provided, subject to customary exclusions for professional liability:
- |                                                                                                                                                                                                                                                                |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1. By endorsement as additional insureds on Contractor's Liability Policy.                                                                                                                                                                                     | <b>YES</b>  |
| 2. By a separate Protective Liability Policy covering all of them issued by CONTRACTOR's general liability carrier. (Indicate amounts of coverages \$_____)                                                                                                    | <b>NO</b>   |
| 3. List here by name and address any additional individuals or entities (in addition to OWNER, ENGINEER and ENGINEER'S Consultants) to be identified in the Supplementary Conditions as insureds or additional insureds under the required liability policies: | <b>NONE</b> |
- F. Excess Liability **YES**

- 1. Umbrella Form: YES
- 2. General Aggregate \$ 2,000,000
- 3. Each Occurrence \$ 2,000,000

III. PROPERTY INSURANCE (BUILDER'S RISK)

**APPLICABLE**

A. Property insurance to the full replacement cost of the Work (subject to deductible amount per paragraph 3.B herein) in accordance with paragraph 5.06 of the General Conditions will be provided by (select one):

OWNER \_\_\_\_\_  
 CONTRACTOR   X  

B. Such insurance will be subject to the following deductible amount \$\_\_\_\_\_ in accordance with paragraph 5.06.D of the General Conditions. **(Applies only when OWNER provides Property Insurance).**

C. Boiler and machinery insurance in accordance with paragraph 5.06.B of the General Conditions will be provided by OWNER: **NO**  
 and will provide coverage for the following objects subject to the following limits:

- 1. Objects to be insured (identify):
- 2. Limits \$\_\_\_\_\_.

D. Other Property Insurance

Provided by	Type of Coverage	Amount
-------------	------------------	--------

E. List here by name and address all individuals or entities (in addition to OWNER, CONTRACTOR, Subcontractors, ENGINEER, and ENGINEER's Consultant) to be identified in the Supplementary Conditions as insureds or additional insureds under property insurance policies: **The Kelley Group; Town of Wedowee.**

BY: Tim Coe DATE: 08/01/23  
 (OWNER)

**SECTION 00 41 43  
BID FORM**

Project Identification: **Wedowee Sewer System Improvements**  
**CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

**The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.**

This Bid is Submitted to:

**Town of Wedowee  
24 Main Street  
Wedowee, Alabama 36278**

- 1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.
  
- 2.01 The Bidder declares that he understands that when quantities of Work for which unit price bids are requested are shown in the Advertisement Invitation for Bids, and in the Proposal, such quantities are approximate only and are subject to either increase or decrease, that, should the quantities of any of the Work items increase, the Bidder proposed to perform the additional Work at the unit prices bid by him, that should the quantities of any of the Work items be decreased, payment will be made only for the actual quantities of Work performed and such payment will be based upon the unit prices bid by him, and that he shall make no claim for profits anticipated on the decrease in quantities of Work. Actual quantities will be paid for as the Work progresses, in accordance with the provisions of the Contract Agreement, and such quantities shall be subject to final measurements and determinations made upon completion of the Work.
  
- 3.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 60 days after the Bid opening or for such a longer period of time that Bidder may agree to in writing upon request of OWNER.
  
- 4.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:
  - A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all of which is hereby acknowledged.

Addendum No.                      Addendum Date

\_\_\_\_\_

- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect the cost, progress, and performance of the Work.
  - C. Bidder is familiar with and is satisfied with all federal, state, and local Laws and Regulations that may affect the cost, progress, and performance of the Work.
  - D. Bidder has carefully studied all the following if supplied: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazardous Environmental Condition, if any, which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.
  - E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.
  - F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for the performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
  - G. Bidder is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.
  - H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
  - I. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.
  - J. The Bidding Documents are generally sufficient to indicate and convey an understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- 5.01 Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or



induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

6.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

BASE BID					
Item #	ITEM	UNIT	QTY	Unit Price	Total Price
1	Mobilization/Demobilization including, but not limited to, insurance, bonds, permits, submittals, existing site documentation, and site cleanup (Limited to 5% of the construction total: 2.5% for Mobilization, 2.5% for Demobilization).	LS	1		
2	Dredging of Sewer Lagoon, including but not limited to, providing all Sludge Pumps; Polymer Makeup Tank, Dosing Pumps, Piping, Geomembrane Bags, Erosion Control; Dry Cake Transportation to Licensed Landfill; Sludge Testing of metals levels for Landfill Disposal; Removal of all Dredging Equipment and Restoring Workplace back into Original Condition.	LS	1		
3	Demolition of Existing Recycle Educator Pumps, Piping, and associated Electrical; Pumps to remain in possession of the Owner and to be transported and offloaded with proper storage at the location selected and as directed by the Owner.	LS	1		
4	Demolition, Removal, and Disposal of Existing 553 LF & 482 LF of Lagoon Curtains and Cabling. Existing end anchors may remain in place.	LS	1		
5	Demolition, Removal, and Disposal of Existing V-notch Weir.	LS	1		
6	Demolition, Removal, and Disposal of Existing Effluent Pumps, Base, Rails, Riser Piping, and electrical system.	LS	1		
7	Demolition, Removal, and Disposal of Existing Chlorination and Dechlorination System; Abandonment of related effluent piping.	LS	1		
8	Removal and Relocation of Existing Fencing at each lagoon levee extension.	LF	300		
9	Furnish and install all labor, materials, and incidentals to install new fencing at each levee extension.	LF	400		
10	Install New Vertical Cylindrical Micro-Screen Headworks with Screenings Discharge, Vector Control Bag Containment System, Roll Off Hopper, Return Drain to Lagoon, Concrete Pad, Manhole, Associated Piping, Control Panel, Disconnect, and Electrical Connections to make complete the Headworks Screening system at the manufacturer's direction.	LS	1		
11	Install New Package Influent Sewage Lift Station with Polymer Wet Well, Associated Piping, and Electrical Connections to make complete the Influent Sewage Lift Station at the manufacturer's direction.	LS	1		
12	Install One (1) 6' x 560' Floating Baffle Curtain and One (1) 6' x 500' Floating Baffle Curtain as described in Section 46 60 01 Lagoon Wastewater Treatment Equipment System and noted on the plan set., including but not limited to, baffle curtain, floats, cables, concrete anchors, anchor posts and cabling.	LF	1060		

BASE BID					
Item #	ITEM	UNIT	QTY	Unit Price	Total Price
13	Install Seven (7) 8' x 35' x 35' Floating Baffle Curtains enclosing the Floating Nitrification Rotors and the Lagoon Outfall Structure, as described in Section 46 60 01 Lagoon Wastewater Treatment Equipment System and noted on the plan set, including but not limited to, baffle curtain, floats, cables, concrete anchors, anchor posts and cabling.	EA	7		
14	Install Eight (8) 20Hp Horizontal Rotor Floating Aerators, including Disconnects, Control Panel, Anchoring and Install Erosion Protection Rip-Rap and Electrical Connections to make a complete aeration/mixing system at the manufacturer's direction.	EA	8		
15	Install Six (6) 10Hp Floating Nitrification Rotors, Control Panels, Disconnects, Electrical, and Bioflos Curtains with anchoring to make a complete Nitrification system at the manufacturer's direction.	EA	6		
16	Furnish all Labor and Materials to Install New 60° V-Notch Weir at the Effluent Structure. Re-calibrate the existing Greyline Flow Meter and transducer to accurately read flow through the new 60-degree v-notch weir.	LS	1		
17	Install Two (2) New Effluent Pumps in the Lagoon Effluent Structure, including but not limited to Bypass Pumping Base and Anchors, Quick Connect Flange, Stainless Rails, Riser Piping, Lifting Chain, Level Sensor, Electrical Control Panel, Disconnect, and Wiring, and Hoist to make complete the New Effluent Lift Station system at the manufacturer's direction.	EA	2		
18	Install Electromagnetic Flowmeter with Grounding Rings, HMI Totalizer with non-volatile memory, and Vault with Aluminum Hatch, including but not limited to associated fittings, pipe stands, valves, electrical, piping, excavation, and grading to make complete the effluent flow measurement system.	LS	1		
19	Install Cloth Filter Disk Assembly and Associated Fittings and Piping, Concrete Pad, Electrical Connections, and Disconnect to make complete the Cloth Filter Disk system at the manufacturer's direction.	LS	1		
20	Install Ultraviolet Disinfection Assembly, including but not limited to Concrete Pad, Associated Piping and fittings, Control Panel and Disconnect, and Electrical Connections to make a complete and operational UV Disinfection System at the manufacturer's direction.	LS	1		
21	Coordinating with Alabama Power for relocation of existing and installation of all new wiring and poles for infrastructure required to provide 3-Phase Power around the Lagoon with power drops as described in the electrical sections of these specifications to all Process Equipment, including but not limited to Headworks Micro Screens, Influent Lift Station, 20 HP Aeration/Mixers, 10 HP Nitrification Rotors, Effluent Pump, Cloth Disk Filter, and UV Disinfection Equipment.	LS	1		
22	Hauling, Installation, and Construction of all Fill Material and Providing all Equipment and Labor to Construct the Headworks Screening, New Lift Station, and Generator Set Pad Extension to the Lagoon Levee, including but not limited to, Compaction, Grading, and Erosion Control.	CY	435		
23	Hauling, Installation, and Construction of all Fill Material and Providing all Equipment and Labor to Construct the Cloth Disk Filter and U.V. Disinfection Pad Extension to the Lagoon Levee, including but not limited to, Compaction, Grading, and Erosion Control.	CY	290		

BASE BID					
Item #	ITEM	UNIT	QTY	Unit Price	Total Price
24	Maintenance of the Existing Creek Ford Entrance to the Lagoon Site for the Duration of the Project.	LS	1		
25	Reconnect Existing Outfall Line to New UV Disinfection System, including but not limited to By-Pass Pumping, all required Piping and Fittings.	LS	1		
26	Furnish and Install all Piping, Valves, and Connections to construct Potable Wash Down Water piping and install (1) Frost Proof Yard Hydrant at Headworks Screening & Influent Lift Station, and (1) Frost Proof Yard Hydrant at the Cloth Disk Filter and UV Disinfection Assembly, as shown on the plans.	LS	1		
27	Furnish and Install Erosion Control, including but not limited to silt fencing, stakes, hay bales, straw wattles, stilling basins, etc.	LS	1		
28	Seeding and Grassing for Erosion Control	LF	1500		
<b>Total Base Bid:</b>					

Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions.

- 7.01 Bidder acknowledges that estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents.
- 8.01 Bidder agrees that the Work will be substantially complete within **180** calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions within **210** calendar days after the date when the Contract Times commence to run.
- 9.01 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be stated in the Agreement.
- 10.01 Bidder will submit with his bid package references stating his qualifications to perform the work required and provide a minimum of five (5) references and validation of performing similar size and type of municipal sewer system improvements.**
- 11.01 The following documents are attached to and made a condition of this Bid:
- A. Required Bid security in the amount of 5% of the bid price or the form of the bid bond provided in this Project Manual; and
  - B. A tabulation of Subcontractors, Suppliers and other individuals and entities required to be identified in this Bid; and

C. Required bidder qualifications statement with supporting data as detailed in the Instruction to Bidders.

The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SUBMITTED on \_\_\_\_\_, 20\_\_\_\_\_.

If Bidder is:

An Individual

Name (typed or printed): \_\_\_\_\_

By: \_\_\_\_\_ (SEAL)  
*(Individual's signature)*

Doing business as: \_\_\_\_\_

Business address: \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ FAX No.: \_\_\_\_\_

Email: \_\_\_\_\_

A Partnership

Partnership Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature of general partner -- attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Business address: \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ FAX No.: \_\_\_\_\_

Email: \_\_\_\_\_

A Corporation

Corporation Name: \_\_\_\_\_ (SEAL)

State of Incorporation: \_\_\_\_\_

Type (General Business, Professional, Service, Limited Liability): \_\_\_\_\_

By: \_\_\_\_\_  
*(Signature -- attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_ (CORPORATE SEAL)

Attest \_\_\_\_\_  
*(Signature of Corporate Secretary)*

Business address: \_\_\_\_\_  
\_\_\_\_\_

Phone No.: \_\_\_\_\_ FAX No.: \_\_\_\_\_

Email: \_\_\_\_\_

Date of Qualification to do business is \_\_\_\_\_.

A Joint Venture

Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature of joint venture partner -- attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

Business address: \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ FAX No.: \_\_\_\_\_

Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature -- attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

Business address: \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ FAX No.: \_\_\_\_\_

Email: \_\_\_\_\_

Phone and FAX Number, and Address for receipt of official communications:

\_\_\_\_\_

\_\_\_\_\_

**SECTION 00 43 13  
BID BOND**

**BIDDER** (Name and Address):

\_\_\_\_\_

\_\_\_\_\_

**SURETY** (Name and Address of Principal Place of Business):

\_\_\_\_\_

\_\_\_\_\_

Contact Person: \_\_\_\_\_ Email: \_\_\_\_\_

Tel. No.: \_\_\_\_\_

**OWNER:**

**Town of Wedowee  
24 Main Street, Wedowee, Alabama 36278**

**BID**

BID DUE DATE: \_\_\_\_\_

PROJECT (Brief Description Including Location):

**Wedowee Sewer System Improvements**

The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.

**BOND**

BOND NUMBER: \_\_\_\_\_

DATE (Not later than Bid due date): \_\_\_\_\_

PENAL SUM: \_\_\_\_\_

(Words)

(Figures)

IN WITNESS WHEREOF, Surety, and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

\_\_\_\_\_(Seal)

\_\_\_\_\_(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By: \_\_\_\_\_

By: \_\_\_\_\_

Signature and Title

Signature and Title

(Attach Power of Attorney)

Attest: \_\_\_\_\_

Attest: \_\_\_\_\_

Signature and Title

Signature and Title

Note: (1) Above addresses are to be used for giving required notice.



(2) Any singular reference to Bidder, Surety, OWNER or other party shall be considered plural where applicable.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
  - 3.1 OWNER accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents, or
  - 3.2 All Bids are rejected by OWNER, or
  - 3.3 OWNER fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer or proposal as applicable.

**SECTION 00 51 00  
NOTICE OF AWARD**

Dated: \_\_\_\_\_

TO: \_\_\_\_\_  
(BIDDER)

ADDRESS: \_\_\_\_\_

OWNER: **Town of Wedowee**

CONTRACT: **Wedowee Sewer System Improvements  
CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

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You are notified that your Base Bid dated \_\_\_\_\_ for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for the:

**Wedowee Sewer System Improvements  
CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

The Contract Price of your Contract is \_\_\_\_\_, (\$ \_\_\_\_\_), based on unit prices.

3 copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. 3 sets of Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 15 days of the date you receive this Notice of Award.

1. Deliver to the ENGINEER 3 fully executed counterparts of the Contract Documents. [Each of the Contract Documents must bear your signature on page 8].
2. Deliver with the executed Contract Documents the Contract security (Bonds) as specified in the Instructions to Bidders (Article 20), and General Conditions (paragraph 5.01).
3. (List other conditions precedent).

**Please provide the necessary Powers of Attorney. The Certificates of Insurance must show:**

- a) Town of Wedowee and The Kelley Group as additional insureds.
- b) Town of Wedowee as Certificate Holder

- c) Provisions for “Waiver of Subrogation” against the owner, engineer(s), and their consultants by the contractor, subcontractors, and their insurers.
- d) Explicitly, that appropriate coverage is provided for the explosion, collapse, and underground damage.
- e) Insurance cancellation notice will be given 30 days in advance, signed acknowledgment acquired, and strike out “endeavor to” and the last two lines in the cancellation block.

**Please provide your insurance company with a copy of this Notice of Award with the enclosed bonds and insurance requirements documents to aid them in properly preparing their paperwork.**

Failure to comply with these conditions within the time specified will entitle OWNER to consider your Bid in default, to annul this Notice of Award, and to declare your Bid security forfeited.

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

**Town of Wedowee  
(OWNER)**

By: \_\_\_\_\_  
**Mayor Tim Coe**

Copy to ENGINEER  
(Use Certified Mail, Return Receipt Requested)

**STANDARD FORM OF AGREEMENT  
BETWEEN OWNER AND CONTRACTOR  
ON THE BASIS OF A STIPULATED PRICE**

**THIS AGREEMENT** is by and between the     **TOWN OF WEDOWEE**     (hereinafter called OWNER) and \_\_\_\_\_ (hereinafter called CONTRACTOR). OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 – WORK

1.01 CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

**The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.**

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

**Wedowee Sewer System Improvements  
CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by:

The Kelley Group  
P.O. Box 45  
Tuscumbia, AL 35674

who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Days to Achieve Substantial Completion and Final Payment

- A. The Work will be substantially completed within **180** calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within **210** calendar days after the date when the Contract Times commence to run.

4.03 Liquidated Damages

- A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expenses, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER, and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay OWNER **\$500** for each day that expires after the time specified in paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR neglects, refuses, or fails to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER **\$500** for each day that expires after the time specified in paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

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5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 5.01.A below:

- A. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in this paragraph 5.01.A:

TOTAL OF ALL UNIT PRICES \_\_\_\_\_ (\$ \_\_\_\_\_)

- B. As provided in paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by ENGINEER as provided in paragraph 9.08 of the General Conditions. Unit prices have been computed as provided in paragraph 11.03 of the General Conditions.

ARTICLE 6 - PAYMENT PROCEDURES

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6.01 Submittal and Processing of Payments

- A. CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

## 6.02 Progress Payments; Retainage

- A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment during performance of the Work as provided in paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured on the number of units completed:
1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions:
    - a. **95%** of Work completed (with the balance being retainage). If the Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER, on recommendation of ENGINEER, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no retainage on account of Work subsequently completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed less the aggregate of payments previously made; and
    - b. **95%** of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
  2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to **97.5%** of the Work completed, less such amounts as ENGINEER shall determine in accordance with paragraph 14.02.B.5 of the General Conditions and less **100%** of ENGINEER's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

## 6.03 Final Payment

- A. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

## ARTICLE 7 – INTEREST

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- 7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of **5%** per annum.

## ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

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- 8.01 In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- B. CONTRACTOR has visited the Site and become familiar with and is satisfied with the general, local, and Site conditions that may affect the cost, progress, and performance of the Work.
- C. CONTRACTOR is familiar with and is satisfied with all federal, state, and local Laws and Regulations that may affect the cost, progress, and performance of the Work.
- D. CONTRACTOR has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site (if available) and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.
- E. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto
- F. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- I. CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.
- J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.



ARTICLE 9 - CONTRACT DOCUMENTS

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9.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 7, inclusive);
2. Performance Bond (pages 1 to 5, inclusive);
3. Payment Bond (pages 1 to 5, inclusive);
4. General Conditions (pages 1 to 58, inclusive);
5. Supplementary General Conditions (pages 1 to 4, inclusive);
6. ADEM SRF Supplemental General Conditions (pages 1 to 39, inclusive);
7. Contract Provisions for Non-Federal Entity Contracts Under Federal Awards (pages 1 to 3, inclusive);
8. Beason-Hammon/E-Verify Certification (pages 1 to 1, inclusive);
9. Beason-Hammon Clause (page 1 to 1, inclusive);
10. Specifications as listed in the table of contents of the Project Manual;
11. Drawings as listed in the table of contents of the Project Manual and contained therein
12. Addenda (numbers \_\_ to \_\_, inclusive);
13. Exhibits to this Agreement (enumerated as follows):
  - a. Notice to Proceed (pages 1 to 1, inclusive);
  - b. CONTRACTOR's Bid (pages 1 to 9, inclusive);
  - c. Documentation submitted by CONTRACTOR prior to Notice of Award (pages \_\_ to \_\_, inclusive);
  - d. \_\_\_\_\_;
14. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
  - a. Written Amendments;
  - b. Work Change Directives;

- c. Change Order(s).
- B. The documents listed in paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.05 of the General Conditions.

## ARTICLE 10 – MISCELLANEOUS

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### 10.01 Terms

- A. Terms used in this Agreement will have the meanings indicated in the General Conditions.

### 10.02 Assignment of Contract

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

### 10.03 Successors and Assigns

- A. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

### 10.04 Severability

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate.

One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or on their behalf.

This Agreement will be effective on \_\_\_\_\_ (which is the Effective Date of the Agreement).

OWNER:

CONTRACTOR:

**TOWN OF WEDOWEE**

\_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

**Mayor Tim Coe**

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest \_\_\_\_\_

Attest \_\_\_\_\_

Address for giving notices:

Address for giving notices:

P.O. Box 270  
Wedowee, Alabama 36278  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Designated Representative:

Designated Representative:

Name: Bart Taft, P.E.

Name: \_\_\_\_\_

Title: Engineer

Title: \_\_\_\_\_

Address: P.O. Box 45  
Tuscumbia, Alabama 35674

Address: \_\_\_\_\_  
\_\_\_\_\_

Phone: 256-248-7030

Phone: \_\_\_\_\_

Facsimile: 1-866-225-7488

Facsimile: \_\_\_\_\_

**SECTION 00 55 00  
NOTICE TO PROCEED**

Dated: \_\_\_\_\_

TO: \_\_\_\_\_  
(BIDDER)

ADDRESS: \_\_\_\_\_

OWNER: **Town of Wedowee**

CONTRACT: **Wedowee Sewer System Improvements  
CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

You are notified that the Contract Times under the above contract will commence to run on \_\_\_\_\_. By that date, you will start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is \_\_\_\_\_, and the date of readiness for final payment is \_\_\_\_\_.

Before you may start any Work at the Site, paragraph 2.05.C of the General Conditions provides that you and Owner must each deliver to the other (with copies to the Engineer and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:

Notify the Owner and Engineer of the date that you plan to start; verify existing utilities; provide the Owner and Engineer with any agreements the Contractor has made with individuals concerning this project; and coordinate construction activities with the Town of Wedowee and the Engineer.

**Town of Wedowee  
(OWNER)**

By: \_\_\_\_\_  
**Mayor Tim Coe**

Copy to ENGINEER  
(Use Certified Mail, Return Receipt Requested)

**SECTION 00 61 13  
PERFORMANCE BOND**

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):  _____  _____  _____	SURETY (Name and Address of Principal Place of Business):  _____  _____  _____  Contact: _____ Tel: _____ Email: _____
-----------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------

OWNER: **Town of Wedowee**  
**24 Main Street, Wedowee, Alabama 36278**

CONTRACT: **Wedowee Sewer System Improvements**  
**CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

Date: \_\_\_\_\_  
Amount: \$ \_\_\_\_\_ (based on unit prices)  
Description (Name and Location):

**Wedowee Sewer System Improvements**

The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.

BOND:  
  
Date (Not earlier than Contract Date): \_\_\_\_\_  
Amount: \$ \_\_\_\_\_  
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:

SURETY  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:  
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:

SURETY  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.
  - 3.3.1 The Surety in accordance with the terms of the Contract;
  - 3.3.2 Another contractor selected pursuant to paragraph 4.3 to perform the Contract.
2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.
4. When the OWNER has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
  - 4.1 Arrange for the CONTRACTOR, with consent of the OWNER, to perform and complete the Contract; or
  - 4.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
  - 4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default; or
  - 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;
3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:
  - 3.1 The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the OWNER, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER's right, if any, subsequently to declare a CONTRACTOR Default; and
  - 3.2 The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3.1; and
  - 3.3 The OWNER has agreed to pay the Balance of the Contract Price to:

- 4.4.1 After investigation, determine the amount for which it may be liable to the OWNER and, as soon as practicable after the amount is determined, tender payment therefor to the OWNER; or
  - 4.4.2 Deny liability in whole or in part and notify the OWNER citing reasons therefor.
5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond, and the OWNER shall be entitled to enforce any remedy available to the OWNER. If the Surety proceeds as provided in paragraph 4.4, and the OWNER refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER.
  6. After the OWNER has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract. To a limit of the amount of this Bond, but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:
    - 6.1 The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;
    - 6.2 Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and
    - 6.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.
  7. The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs, executors, administrators, or successors.
  8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.
  9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.



10. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.
11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
12. Definitions.
- 12.1 Balance of the Contract Price: The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made, including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled, reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract.
- 12.2 Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.
- 12.3 CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 12.4 OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

**SECTION 00 61 14  
LABOR & MATERIAL PAYMENT BOND**

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SURETY (Name and Address  
of Principal Place of Business):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Contact: \_\_\_\_\_

Tel: \_\_\_\_\_

Email: \_\_\_\_\_

OWNER: **Town of Wedowee**  
**24 Main Street, Wedowee, Alabama 36278**

CONTRACT: **Wedowee Sewer System Improvements**  
**CWSRF #CS010883-02 & CS010883-04; ARC #AL-20358-2021**

Date: \_\_\_\_\_

Amount: \$ \_\_\_\_\_ (based on unit prices)

Description (Name and Location):

**Wedowee Sewer System Improvements**

The project consists of demolition of existing sewer lagoon infrastructure, dredging of municipal sewer sludge and disposal, installation of new electrical 3 phase power, installation of new headworks screening, lift station and generator, lagoon aeration/mixers, removal of existing lagoon curtains and installation of new lagoon curtains, nitrification, effluent pumpstation, metering, filters, and UV disinfection.

BOND:

Date (Not earlier than Contract Date): \_\_\_\_\_

Amount: \$ \_\_\_\_\_

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:

SURETY  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:  
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title

SURETY  
Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title

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

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

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

2.2. Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with the CONTRACTOR:

4.2.1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after

having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

4.2.2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and

4.2.3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

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

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance

Bond. By the CONTRACTOR furnishing and the OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

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

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date

received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.

## 15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

**SECTION 00 65 00  
CERTIFICATION BY OWNER**

I, the undersigned, \_\_\_\_\_, the duly authorized and acting official representative of the \_\_\_\_\_, do hereby certify as follows:

This contract is let in compliance with the provisions of Title 39, Code of Alabama (1975, as amended), and all other applicable provisions of law.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

**SECTION 00 65 01  
CERTIFICATE OF OWNER'S ATTORNEY**

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of \_\_\_\_\_, do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**STANDARD GENERAL CONDITIONS  
OF THE  
CONSTRUCTION CONTRACT**

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## GENERAL CONDITIONS

### ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

---

#### 1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract

Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications

and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order*--A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project*--The total construction of which the Work to be performed under the

Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as

applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices.

48. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

## 1.02 Terminology

### A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper,"

“satisfactory,” or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. *Day*

1. The word “day” shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. *Defective*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. *Furnish, Install, Perform, Provide*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.

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

ARTICLE 2 - PRELIMINARY MATTERS

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2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to

OWNER such Bonds as CONTRACTOR may be required to furnish.

## 2.02 *Copies of Documents*

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

## 2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

## 2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

## 2.05 *Before Starting Construction*

A. *CONTRACTOR's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification

from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which



CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

#### 2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

#### 2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

### ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

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#### 3.01 *Intent*

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

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

### 3.02 *Reference Standards*

#### A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies*

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any

Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

#### B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

### 3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

## ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDI- TIONS; REFERENCE POINTS

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### 4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

### 4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGI-

NEER has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Except for such reliance on such “technical data,” CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER’s Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

#### 4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any “technical data” on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER’s Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the necessity of OWNER’s obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER’s findings and conclusions.

#### C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

#### 4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, including OWNER, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in

the Contract Price of Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

4.05 *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that

have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Except for such reliance on such “technical data,” CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER’s Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors,

Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be

deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other

professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 5 - BONDS AND INSURANCE

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### 5.01 *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as 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 Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All



Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

#### 5.02 *Licensed Sureties and Insurers*

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

#### 5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

#### 5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

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

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

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

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

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

6. claims for damages because of bodily injury or death of any person or property damage arising out of the

ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverage's and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to

whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07; and

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

#### 5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

#### 5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the

Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified

deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

#### 5.07 *Waiver of Rights*

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property

insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused.

None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect

that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

#### 5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

#### 5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

#### 5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

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6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

C. The CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Owner has the right to have impaired persons or dangerous material/equipment removed from the site at the CONTRACTOR's expense.

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall

be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

#### 6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be

submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

#### 2. *Substitute Items*

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not

incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

*B. Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

*C. Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an



approved Shop Drawing for an “or equal.” ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR’s expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER’s Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER’s Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER’s Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR’s Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or “or-equal” at CONTRACTOR’s expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors,

Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER’s acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR’s own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If

the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

#### 6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining

such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

#### 6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if

any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

#### 6.10 *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 6.11 *Use of Site and Other Areas*

##### A. *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all

claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

#### 6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written

Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, **and** Shop Drawings will be delivered to ENGINEER for OWNER.

#### 6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect

them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

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

#### 6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or

among employers at the Site in accordance with Laws or Regulations.

#### 6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which

intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

*D. Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

*E. ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents)

or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1.

F. *Resubmittal Procedures*

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and

CONTRACTOR may otherwise agree in writing.

6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or
2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;
2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;
4. use or occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

#### 6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity

indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

#### ARTICLE 7 - OTHER WORK

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7.01 *Related Work at Site*

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of

CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 - OWNER'S  
RESPONSIBILITIES

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8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's

responsibility in respect thereof will be as set forth in the Supplementary Conditions.

## ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

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### 9.01 *OWNER'S Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

### 9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on

ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

### 9.03 *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

### 9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that

should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

#### 9.05 *Authorized Variations in Work*

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

#### 9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

#### 9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

#### 9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

#### 9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision

rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of

any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

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10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the

Work and adhere to the progress schedule as provided in paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

## 10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or
2. if no such dispute resolution procedures have been set forth in Article

16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

## ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

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### 11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional

or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates

and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the



Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or

for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch

office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined

pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

#### 11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

#### 11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit

price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
2. there is no corresponding adjustment with respect any other item of Work; and
3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

## ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

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### 12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03 ); or
2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or
3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. *CONTRACTOR's Fee:* The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee;  
or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease

in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

## 12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

## 12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods,

epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or
2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

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13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;
2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and
3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if

requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

#### 13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the

Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

### 13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

### 13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

### 13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or

Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this

paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

#### 13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

#### 13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the



Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefor as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

## ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

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### 14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

### 14.02 *Progress Payments*

#### A. *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and

equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to pro-gress payments will be as stipulated in the Agreement.

#### B. *Review of Applications*

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment

will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties that

might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

#### C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

#### D. *Reduction in Payment*

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

#### 14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

#### 14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and

ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and

warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that

CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

#### 14.06 *Final Inspection*

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will promptly make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 14.07 *Final Payment*

##### A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise

satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 - SUSPENSION OF WORK  
AND TERMINATION

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15.01 OWNER May Suspend Work

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 OWNER May Terminate for Cause

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against

CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

#### 15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### 15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

### ARTICLE 16 - DISPUTE RESOLUTION

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#### 16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and



procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

## ARTICLE 17 - MISCELLANEOUS

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### 17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### 17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### 17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in

connection with each particular duty, obligation, right, and remedy to which they apply.

### 17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

### 17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

**SECTION 00 73 00  
SUPPLEMENTARY GENERAL CONDITIONS**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1996 Edition) and other provisions of the Contract Documents as indicated below. All provisions, which are not so amended or supplemented, remain in full force and effect. The enumeration of the Supplementary General Conditions corresponds to the amended sections of the General Conditions.

SC-2.02.A Copies of Documents

Delete 2.02.A and insert the following in its place: Owner shall furnish to CONTRACTOR up to three copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

SC-4.04 Underground Facilities

Delete 4.04B and insert the following in its place: It is the CONTRACTOR's responsibility to contact the various utility owners and determine the exact location of ALL existing utilities on the project, whether shown on the plans or not.

SC-5.04 Concerning Contractors Liability Insurance

In addition to SC-5.04B.1 include The contractor will be required to include the following as additional insured: Town of Wedowee; The Kelley Group, LLC

Add the following new paragraph immediately after paragraph 5.04.B:

**C. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:**

**1. Workers' Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:**

- |                                               |               |
|-----------------------------------------------|---------------|
| a. State:                                     | Statutory     |
| b. Applicable Federal (e.g., Longshoreman's): | Statutory     |
| c. Employer's Liability:                      | \$500/500/500 |

**2. Contractor's General Liability under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product**

liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:

- a. General Aggregate \$2,000,000
- b. Products – Completed Operations Aggregate \$2,000,000
- c. Personal and Advertising Injury \$1,000,000
- d. Each Occurrence (Bodily Injury and Property Damage) \$1,000,000
- e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.
- f. Excess or Umbrella Liability
  - 1) General Aggregate \$2,000,000
  - 2) Each Occurrence \$2,000,000

3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions:

- a. Bodily Injury:
  - Each person \$1,000,000
  - Each Accident \$1,000,000
- b. Property Damage:
  - Each Accident \$500,000
- c. Combined Single Limit of \$1,000,000

4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

- a. Bodily Injury:
  - Each Accident \$1,000,000
  - Annual Aggregate \$2,000,000
- b. Property Damage:
  - Each Accident \$1,000,000
  - Annual Aggregate \$2,000,000

5. Additional named insureds shall be the Owner, the Engineer and their Consultants.

6. Liability coverage for Owner, Engineer, Engineer's Consultants and other will be provided, subject to customary exclusions for professional Liability:

a. By endorsement as additional insureds on Contractor's Liability Policy.  
YES

7. Excess Liability:	YES
Umbrella Form:	YES
General Aggregate:	\$2,000,000
Each Occurrence:	\$2,000,000

SC-6.01 Contractor's Responsibilities

Add the following new paragraph immediately after paragraph 6.01.B:

**C. The CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Owner has the right to have impaired persons or dangerous material/equipment removed from the site at the CONTRACTOR's expense.**

SC-6.06 Concerning Subcontractors, Suppliers, and Others

Addition to SC-6.06B to include **The contractor will be required to submit a list of Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) to the Owner in advance of the specified date prior to the Effective Date of the Agreement. The prime contractor is required to have an executed contract with all subcontractors establishing scope of services and the costs associated. The contracts must be submitted for review prior to the Notice to Proceed is issued.**

SC-6.10 Taxes

Add the following new paragraph immediately after paragraph 6.10.A:

**B. This project is being bid excluding taxes, and requires the Contractor comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The Contractor and the Owner will be required to apply for Certificates of Exemption with the Alabama Department of Revenue which will handle administration of the Certificates. The Contractor shall account for the tax savings on the Proposal Form.**

SC-14.02 Progress Payments

**Monthly estimates for payment shall be submitted to the office of the Engineer by the Friday nearest the 25<sup>th</sup> of each month. Payment amounts will be verified by the Engineer and then processed by the Owner to provide payment within 10 days following approval of request. Owner retains the right to inspect invoice of materials and financial items. Owner has 30 days from receipt of Engineer's approval to make payment.**

Add the following new paragraph immediately after paragraph 6.12 A:

- B. Contractor is required to keep all project related records in addition to the Record Documents for three years. Contractor to provide Owner and Engineer access to the records.**

**State of Alabama**  
**Alabama Department of Environmental Management**  
**State Revolving Fund (SRF) Loan Program**



SRF Section  
Permits and Services Division  
Alabama Department of Environmental Management  
Post Office Box 301463  
Montgomery, Alabama 36130-1463

(334) 271-7793  
(334) 271-7950 FAX

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**Supplemental General Conditions**  
**for SRF Assisted**

Public Drinking Water and Wastewater  
Facilities Construction Contracts



SRF Project Number: CS010883-02 & CS010883-04

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## I – ADEM Special Conditions

1. Construction within State rights-of-way shall be in accordance with the Alabama Department of Transportation policies and procedures.
2. Construction is to be carried out in compliance with applicable NPDES permits and in a manner that prevents bypassing of raw wastewater flows during construction. If bypassing is anticipated, the ADEM NPDES Enforcement Branch (334-271-7975) shall be advised in advance and the contractor shall take all necessary steps to minimize the impacts of bypassing.
3. Siltation and soil erosion shall be minimized during construction. The contractor shall obtain an NPDES storm water permit for construction if required.
4. The owner shall provide and maintain competent and adequate supervision and inspection.
5. ADEM and EPA shall have access to the site and the project work at all times.
6. These Special Conditions shall supersede any conflicting provisions of this contract.
7. **A project sign is required.** See **Parts XVII and XVIII, pages SGC-36 – SGC-37**, for more information.

## II – Bonds and Insurance

Bonding requirements shall comply with Alabama Act No. 97-225. Provisions of the Act are summarized below:

1. Bid Bond – Not less than 5% of either the owner's estimated cost or of the proposed prime contractor's bid up to a maximum of \$10,000. The bid guarantee shall consist of a cashier's check drawn on an Alabama bank or a bid bond executed by a surety company duly authorized and qualified to make bonds in the State of Alabama.
2. Performance Bond – In an amount not less than 100% of the contract price.
3. Payment Bond – Payable to the awarding authority, shall be executed in an amount not less than 50% of the contract price.

In addition to the insurance requirements elsewhere in the specifications, the owner or the contractor, as appropriate, must acquire any flood insurance made available by the Federal Emergency Management Agency as required by 40 CFR 30.600 (b), if construction will take place in a flood hazard area identified by the Federal Emergency Management Agency.

## III – Utilization of Disadvantaged Businesses Enterprises (DBEs)

It is the policy of the State Revolving Loan Fund (SRF) to promote a "fair share" of sub-agreement awards to **small, minority, and/or women-owned businesses** for equipment, supplies, construction, and services. Compliance with these contract provisions is required in order for project costs to be eligible for SRF funding. *The "fair share" objective is a goal, not a quota.* DBE (Disadvantaged Business Enterprise) is an all-inclusive business classification, which includes MBE (minority business enterprises and/or WBE (women business enterprises) and is used synonymously when these entities are referenced individually or collectively.



Failure on the part of the apparent successful bidder to submit required information to the Loan Recipient (Owner) may be considered (by the Loan Recipient (Owner)) in evaluating whether the bidder is responsive to the bid requirements. The project objectives for utilization of Minority Business Enterprises (MBEs) and Women's Business Enterprises (WBEs) are as follows:

Commodities (Supplies)	MBE 4%	WBE 11%
Contractual (Services)	MBE 8%	WBE 30%
Equipment	MBE 5%	WBE 20%
Construction	MBE 2.5%	WBE 3%

For purposes of clarification:

- This objective applies to any Federally assisted procurement agreement in excess of \$10,000.
- This objective necessitates three responsibilities; separate solicitations must be made of small and minority and women's business enterprises.
- A minority business is a business, at least 51 percent of which is owned and controlled by minority group members (Black; Hispanic; Asian American; American Indian; and, any other designations approved by the Office of Management and Budget).
- A women's business is a business, at least 51 percent of which is owned and controlled by one or more women.
- The control determination will revolve around the minority or woman owner's involvement in the day-to-day management of the business enterprise.
- Solicitation should allow adequate time for price analysis. ADEM recommends that contact be made no later than 15 days before bid opening.
- Efforts taken to comply with this objective must be documented in detail; maintain records of firms contacted, including any negotiation efforts to reach competitive price levels, and awards to the designated firms.
- ADEM recommends that the Loan Recipient (Owner) or proposed Prime Contractor utilizes the services of the Minority Business Development Service Centers. These Centers are funded by the U.S. Department of Commerce to provide technical, financial and contracting assistance to minority and women's business enterprises. These Centers are located in a number of Regional cities.
- Use of the services provided by these Centers does not absolve the Loan Recipient (Owner) or proposed Prime Contractor from pursuing additional efforts to meet this objective.

#### IV – Six Affirmative Steps for Good Faith DBE (MBE-WBE) Solicitation

The Loan Recipient (Owner) shall follow the six affirmative steps found in the SRF application when using loan funds to procure sources of supplies, construction and services.

If the successful bidder plans to subcontract a portion of the project, the bidder must submit to the owner within 10 days after bid opening, evidence of the affirmative steps taken to utilize small, minority and women's businesses. These six affirmative steps or 'good faith efforts' are required methods to ensure that DBEs have the opportunity to compete for procurements funded by EPA financial assistance dollars. Such affirmative steps are described as follows:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This will include placing DBEs on solicitation lists and soliciting them whenever there are potential sources.

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
5. Use the resources, services, and assistance of the AL Department of Transportation (ALDOT), Small Business Administration (SBA), and the Minority Business Development Agency of the Department of Commerce (MBDA).
6. If the Contractor awards subcontracts, it must take the steps described in items (1) through (5) listed above.

## V – Documentation Required from Loan Recipient (Owner) and Contractor

The low, responsive, responsible bidder must forward the following items, in duplicate, to the loan recipient (owner) no later than 10 days after bid opening. The Loan Recipient (Owner) shall transmit one (1) copy of its DBE documentation of the prime contractor solicitation and one (1) copy of the prime contractor's/bidder's DBE documentation of all subcontractor solicitation to the SRF Section within 14 days after bid opening.

1. SRF project number and project name/loan name\*. (\*not contract name)
2. List of **all** subcontractors (**DBE and non-DBE**) with name, address, telephone number, estimated contract dollar amount and duration. If there are to be no subcontractors, please indicate such in a letter on company letterhead.
3. List of any subcontract work yet to be committed with estimate of dollar amount and duration of contract.
4. MBE-WBE (DBE) Documents - See **Part V, page SGC-6**.
5. Debarred Firms Certification – See **Part XIV, page SGC-25**.
6. Certification Regarding Equal Employment Opportunity – See **Part XIII, page SGC-24**.

The Loan Recipient (Owner) shall submit annual MBE/WBE Utilization Reports (EPA Form 5700-52A, **pages SGC-16 - SGC-17**) within 30 days of the end of the annual reporting period (**October 30<sup>th</sup>, i.e. by November 30<sup>th</sup>**). Submit reports directly to:

Laketa Ross, Accountant  
 Administrative Section  
 Fiscal Branch  
 Alabama Department of Environmental Management  
 Post Office Box 301463  
 Montgomery, Alabama 36130-1463

**The proposed Prime Contractor must submit the following items to the Loan Recipient (Owner):**

**1) DBE Compliance Form.** The Loan Recipient (Owner) must submit this information to the SRF Section to demonstrate compliance with the DBE requirements. ADEM's approval is required prior to award of the construction contract and commencement of any SRF-funded construction. **(Page SGC-8)**

**2) Certification Regarding Equal Employment Opportunity.** This form is required of the proposed prime contractor (re: all subcontracts executed) and should be submitted with the prime proposed contractor's MBE-WBE solicitation submittal to the Loan Recipient (Owner). **(Page SGC-24)**

**3) Debarred Firms Certification.** This form is required of the proposed prime contractor (re: all subcontracts executed) and should be submitted with the prime proposed contractor's MBE-WBE solicitation submittal to the Loan Recipient (Owner). **(Page SGC-25)**

**4) EPA Form 6100-2 DBE Subcontractor Participation Form.** This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the proposed prime contractor, how much the DBE subcontractor was paid, and any other concerns the DBE subcontractor might have. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-10)**

**5) EPA Form 6100-3 DBE Subcontractor Performance Form.** This form captures an intended DBE subcontractor's description of work to be performed for the proposed prime contractor and the price of the work. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-12)**

**6) EPA Form 6100-4 DBE Subcontractor Utilization Form.** This form captures the proposed prime contractor's intended use of all identified DBE subcontractors and the estimated dollar amount of the work. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-14)**

**7) EPA Form 5700-52 A MBE/WBE Utilization Reports (DBE Annual Report), if applicable.** The Loan Recipient (Owner) must submit this information to the SRF Section within 30 days of the end of the annual reporting period (October 30th), i.e., **by November 30th**. **(Pages SGC-16 - SGC-17)**

**8) Changes to Approved DBE Compliance Form, if applicable.** If any changes, substitutions, or additions are proposed to the subcontractors included in previous Department approvals, the Owner must submit this information to the Department for prior approval in order for the affected subcontract work to be eligible for SRF funding. **(Page SGC-23)**

**9) Certified Payrolls.** These should be submitted to the Loan Recipient (Owner), at least, monthly for the prime contractor and all subcontractors. The Loan Recipient (Owner) must maintain payroll records and make these available for inspection

Please note that DBEs, MBEs, and WBEs must be certified in writing by EPA, SBA, or DOT (or by state, local, Tribal, or private entities whose certification criteria match EPA's). Depending upon the certifying agency, a DBE may be classified as a Disadvantaged Business Enterprise (DBE), a Minority Business Enterprise (MBE), or a Women's Business Enterprise (WBE). Written certification as a DBE (MBE or WBE) is required in order to be counted toward the Loan Recipient/Owner's MBE-WBE accomplishments.

The documentation of these good faith solicitation efforts must be detailed in order to allow for satisfactory review. Such documentation might include fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The proposed prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with, at least, 1 logged phone call.

The proposed prime contractor must employ the six affirmative steps to subcontract with DBEs, even if the proposed prime contractor has achieved its fair share objectives.

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The prime contractor must employ the six affirmative steps to subcontract with DBEs, even if the proposed prime contractor has achieved its fair share objectives. If a DBE subcontractor fails to complete work under the subcontract for any reason, the proposed prime contractor must notify the Loan Recipient (Owner) in writing prior to any termination and must employ the six 'good faith efforts' described above if using a replacement subcontractor. Any proposed changes from an approved DBE subcontractor must be reported to the Loan Recipient (Owner) and to the SRF Section on the Changes to Approved Subcontractors Form prior to initiation of the action. EPA Forms Nos. 6100-3 and 6100-4 must also be submitted to the SRF Section for new DBE subcontracts.

-

## VI – Resources for Identifying MBE-WBE (DBE) Contractors/Subcontractors

The following organizations may provide assistance in soliciting DBE participation:

City of Birmingham  
Office of Economic  
Development  
ATTN: **Monique Shorts**,  
Economic Specialist  
710 20th Street North  
Birmingham, Alabama  
35203  
Ph: (205) 254-2799  
Fax: (205) 254-7741  
[Monique.shorts@birminghamal.gov](mailto:Monique.shorts@birminghamal.gov)

U.S. Small Business  
Administration  
<http://www.pro-net.sba.gov>

National Association  
of Minority  
Contractors (NAMC)  
<https://namcatlanta.org/>

Alabama Department  
of Transportation  
ATTN: **John Huffman**  
1409 Coliseum Boulevard  
Montgomery, Alabama  
36130  
Ph: (334) 244-6261  
<http://www.dot.state.al.us>

U.S. Department of  
Commerce  
Minority Business  
Development Agency  
ATTN: **Donna Ennis**  
75 5<sup>th</sup> Street NW,  
Suite 300  
Atlanta, Georgia 30308  
Ph: (404) 894-2096  
<http://www.mbd.gov/>

Governor's Office of  
Minority and Women's  
Business Enterprises  
**Hilda Lockhart**,  
STEP Project Director  
401 Adams Avenue  
Suite 360  
Montgomery, Alabama  
36130  
Ph: (334) 242-2220

Birmingham Construction  
Industrial Authority ATTN:  
**Ashley Orl** or **Kimberly  
Bivins**  
601 37<sup>th</sup> Street South  
Birmingham, Alabama  
35222  
Ph: (205) 324-6202  
[aorl@bcia1.org](mailto:aorl@bcia1.org)  
[kbaylorbivins@bcia1.org](mailto:kbaylorbivins@bcia1.org)

### **NOTE:**

- (1) The Loan Recipient (Owner) and the proposed Prime Contractor shall use the necessary resources to identify and directly solicit no less than three (3) certified DBE/MBE/WBE companies to bid in each expected contract/subcontract area. If a diligent and documented search of ALDOT, SBA, and MBDA directories does not identify three (3) potential certified DBE/MBE/WBE firms, then the proposed Prime Contractor shall post an advertisement in, at least, one (1) of the other online or print resources. Whenever possible, post solicitation for bids or proposals should be posted/advertised for a minimum of 30 calendar days before the bid or proposal closing date.**
- (2) Expenditures to a DBE that acts merely as a broker or passive conduit of funds, without performing, managing, or supervising the work of its subcontract in a manner consistent with normal business practices may not be counted.**
- (3) The proposed Prime Contractor should attempt to identify and first solicit DBEs in the geographic proximity of the project before soliciting those located farther away.**
- (4) In addition, our SRF DBE Compliance Staff is readily available for assistance, as follows: Laketa Ross at (334) 271-7727 or [laketa.ross@adem.alabama.gov](mailto:laketa.ross@adem.alabama.gov) OR Diane Lockwood (DBE Coordinator) at (334) 271-7815 or [dpl@adem.alabama.gov](mailto:dpl@adem.alabama.gov).**

## VII – DBE Compliance Form

**NOTE: FOR DBE COMPLIANCE, ONE (1) COPY OF THIS FORM (WITH ALL INFORMATION OUTLINED) IS REQUIRED (WITH THE LOAN RECIPIENT (OWNER)'S DBE SUBMITTAL) FOR EACH PR&CS REVIEW. THE LOAN RECIPIENT (OWNER) AND PROPOSED PRIME CONTRACTOR SHOULD ENSURE THAT THIS INFORMATION IS COMPLETE PRIOR TO THE PR&CS SUBMITTAL TO THE SRF SECTION.**

Loan Recipient: \_\_\_\_\_ SRF Loan (Project) Number: \_\_\_\_\_

### CERTIFICATIONS:

*I certify that the information submitted on and with this form is true and accurate and that this company has met and will continue to meet the conditions of this construction contract regarding DBE solicitation and utilization. I further certify that criteria used in selecting subcontractors and suppliers were applied equally to all potential participants and that EPA Forms 6100-2 and 6100-3 were distributed to all DBE subcontractors.*

\_\_\_\_\_  
(Proposed Prime Contractor Signature) Date \_\_\_\_\_

\_\_\_\_\_  
(Printed Name and Title)

*I certify that I have reviewed the information submitted on and with this form and that it meets the requirements of the Loan Recipient's/Owner's State Revolving Fund loan contract.*

**(\*\*Only ONE (1) signature required below.)**

\_\_\_\_\_  
(Signature of Loan Recipient (Owner)) Date \_\_\_\_\_

**OR\*\***

\_\_\_\_\_  
(Loan Recipient's (Owner's) Representative's Signature, (P.E.)) Date \_\_\_\_\_

\_\_\_\_\_  
(Printed Name and Title)

### GENERAL INFORMATION:

Loan Recipient (Owner) Contact: \_\_\_\_\_

Loan Recipient (Owner) Phone Number/Email: \_\_\_\_\_

Consulting Engineer Contact: \_\_\_\_\_

Consulting Engineer Phone Number/Email: \_\_\_\_\_

Proposed Prime Contractor: \_\_\_\_\_

Proposed Prime Contractor Contact: \_\_\_\_\_

Proposed Prime Contractor Phone Number/Email: \_\_\_\_\_

Proposed Prime Contract Amount: \$ \_\_\_\_\_

Proposed Total DBE/MBE Participation: \$ \_\_\_\_\_ Percentage: \_\_\_\_\_ % Goal: 2.5%

Proposed Total WBE Participation: \$ \_\_\_\_\_ Percentage: \_\_\_\_\_ % Goal: 3.0%

**Please ensure the following is submitted in the full DBE submittal (with the DBE COMPLIANCE FORM (page SGC-8)):**

- (1) **List of all committed and uncommitted subcontractors** by trade, including company name, address, telephone number, contact person, dollar amount of subcontract, and DBE/MBE/WBE status. Indicate in writing if no solicitations were made because the contractor intends to use only its own forces to accomplish the work.
- (2) **Proof of certification (certificate or letter)** by EPA, SBA, DOT (or by state, local, Tribal, or private entities whose certification criteria match EPA's) for each subcontractor listed as a DBE, MBE, or WBE.
- (3) **Documentation of solicitation effort for prospective DBE firms**, such as fax confirmation sheets, copies of solicitation letters/emails, printout of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with at least 1 logged phone call. Whenever possible, post solicitation for bids or proposals should be for a minimum of 30 calendar days before the bid or proposal closing date.
- (4) **Justification for not selecting a certified DBE subcontractor** that submitted a low bid for any subcontract area.
- (5) **Certification By Proposed Prime Contractor or Subcontractor Regarding Equal Opportunity Employment. (Page SGC-24)**
- (6) **Debarred Firms Certification. (Page SGC-25)**
- (7) **EPA Form 6100-2 DBE Subcontractor Participation Form** for **each** proposed **certified** DBE subcontractor.\* **(Page SGC-10)** (\*This form is completed by the proposed prime contractor. It is signed by **each** proposed subcontractor **only**.)
- (8) **EPA Form 6100-3 DBE Subcontractor Performance Form** for each DBE subcontractor.\*\* **(Page SGC-12)** (\*\*This form is completed by the proposed prime contractor and signed by each proposed certified subcontractor and the proposed prime contractor per subcontract.)
- (9) **EPA Form 6100-4 DBE Subcontractor Utilization Form** to summarize all DBE subcontracts/subcontractors.\*\*\* **(Page SGC-14)** (\*\*\*)This form is completed and signed by the proposed prime contractor **only**.)

**NOTE:**

**ALL DBE contractors selected must have a current DBE certificate or letter of certification by an approved certifying agency.**

**Loan Recipient (Owner) DBE Submittal**

**At minimum**, the Loan Recipient (Owner)'s DBE submittal should **always** consist of **a cover letter (preferred, but optional)** **and a VII - DBE Compliance Form (page SGC-8)** **and DBE solicitation documentation** (i.e., DBE solicitation list(s) with source(s) of list(s) clearly identified, contractor contact information **and** results/outcomes of each solicitation (or of the overall solicitation effort, if all results/outcomes were the same), documentation of solicitation method (i.e., copies of emails, phone logs, faxes, etc.).

**Prime Contractor DBE Submittal**

**At minimum**, the Prime Contractor's DBE submittal should **always** consist of **a cover letter (preferred, but optional)** **and DBE solicitation documentation** (i.e., DBE solicitation list(s) with source(s) of list(s) clearly identified, subcontractor contact information **and** results/outcomes of each solicitation (or of the overall solicitation effort, if all results/outcomes were the same), documentation of solicitation method (i.e., copies of emails, phone logs, faxes, etc.) **OR** a "No Subcontractors" Letter (if none will be utilized) **and** a List of **ALL (DBE/non-DBE) subcontractors contracted/yet to be contracted** **and ALL EPA 6100 Forms described above (DBE subcontractors selected or not)** **and** Certification Regarding Equal Employment Opportunity **and** Debarred Firms Certification.

# VIII - EPA Form 6100-2 DBE Subcontractor Participation Form



OMB Control No: 2090-0030

## Disadvantaged Business Enterprise (DBE) Program DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE<sup>1</sup> subcontractor<sup>2</sup> the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor

<sup>1</sup> A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

<sup>2</sup> Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**EPA FORM 6100-2 (DBE Subcontractor Participation Form)**

# VIII - EPA Form 6100-2 DBE Subcontractor Participation Form



OMB Control No: 2090-0030

## Disadvantaged Business Enterprise (DBE) Program DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

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<b>Subcontractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.



# IX - EPA Form 6100-3 DBE Subcontractor Performance Form



OMB Control No: 2090-0030

## Disadvantaged Business Enterprise (DBE) Program DBE Subcontractor Performance Form

This form is intended to capture the DBE<sup>1</sup> subcontractor's<sup>2</sup> description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: <input type="radio"/> DOT <input type="radio"/> SBA <input type="radio"/> Other: _____		Meets/ exceeds EPA certification standards? <input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> Unknown

<sup>1</sup> A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

<sup>2</sup> Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

IX - EPA Form 6100-3 DBE Subcontractor Performance Form



OMB Control No: 2090-0030

**Disadvantaged Business Enterprise (DBE) Program  
DBE Subcontractor Performance Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

<b>Prime Contractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

<b>Subcontractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

# X - EPA Form 6100-4 DBE Subcontractor Utilization Form



OMB Control No: 2090-0030

## Disadvantaged Business Enterprise (DBE) Program DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE<sup>1</sup> subcontractors<sup>2</sup> and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Issuing/Funding Entity:			

I have identified potential DBE certified subcontractors	<input type="radio"/> YES	<input checked="" type="radio"/> NO	
If yes, please complete the table below. If no, please explain:			
Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?

Continue on back if needed

<sup>1</sup> A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

<sup>2</sup> Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**EPA FORM 6100-4 (DBE Subcontractor Utilization Form)**

X - EPA Form 6100-4 DBE Subcontractor Utilization Form



OMB Control No: 2090-0030

**Disadvantaged Business Enterprise (DBE) Program  
DBE Subcontractor Utilization Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

<b>Prime Contractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.



U.S. ENVIRONMENTAL PROTECTION AGENCY
MBE/WBE UTILIZATION UNDER FEDERAL GRANTS
AND COOPERATIVE AGREEMENTS

PART I OF II
(PAGES SGC-16 & SGC-17)

FOR COOPERATIVE AGREEMENTS OR OTHER FEDERAL FINANCIAL ASSISTANCE WHERE THE COMBINED TOTAL OF FUNDS BUDGETED FOR PROCURING SUPPLIES, EQUIPMENT, CONSTRUCTION OR SERVICES EXCEED \$150,000.
PART 1: PLEASE REVIEW INSTRUCTIONS BEFORE COMPLETING

1A. FEDERAL FISCAL YEAR (Oct 1- Sep 30) 20\_\_\_\_
1B. REPORT TYPE
[ ] Annual [ ] Last Report (Project completed)

1C. REVISION OF A PRIOR YEAR REPORT? [ ] No [ ] Yes, Year \_\_\_\_\_
IF YES, BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:

2A. EPA FINANCIAL ASSISTANCE OFFICE ADDRESS (ATTN: DBE COORDINATOR)
3A. RECIPIENT NAME AND ADDRESS

2B. EPA DBE COORDINATOR
Name:
Email:
Phone:
Fax:
3B. RECIPIENT REPORTING CONTACT
Name:
Address:
Phone:
Email:

4A. FINANCIAL ASSISTANCE AGREEMENT ID NUMBER (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C)
4B. FEDERAL FINANCIAL ASSISTANCE PROGRAM TITLE OR CFDA NUMBER:

5A. TOTAL ASSISTANCE AGREEMENT AMOUNT
EPA Share: \$ \_\_\_\_\_
Recipient Share: \$ \_\_\_\_\_
[ ] N/A (SRF Recipient)/Loan Amount: \$ \_\_\_\_\_
5B. If NO procurements and NO accomplishments were made this reporting period (by the recipients, sub-recipients, loan recipients, and prime contractors), CHECK and SKIP to Block No. 7. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs. Accomplishments, in this context, are procurements made with MBEs and/or WBEs.) [ ]

5C. Total Procurements This Reporting Period (Only include amount not reported in any prior reporting period)
Total Procurement Amount \$ \_\_\_\_\_
(Include total dollar values awarded by recipient, sub-recipients and SRF loan recipients, including MBE/WBE expenditures.)

5D. Were sub-awards issued under this assistance agreement? Yes [ ] No [ ]
Were contracts issued under this assistance agreement? Yes [ ] No [ ]

5E. MBE/WBE Accomplishments This Reporting Period
Actual MBE/WBE Procurement Accomplished (Include total dollar values awarded by recipient, sub-recipients, SRF loan recipients and Prime Contractors.)
Table with columns: Construction, Equipment, Services, Supplies, Total. Rows: \$MBE, \$WBE.

6. COMMENTS: (If no MBE/WBE procurements, please summarize how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.)

7. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE TITLE
8. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE DATE

**If reporting DBE procurement, please enter the Loan Project Number and the information in the grid below, as applicable. If no additional DBE procurement to report, please enter the Loan Project Number and enter 'N/A' in the black box below.**

**PART II.**

**MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD**

**SRF Financial Assistance Agreement Number:**

**PART II OF II  
(PAGES SGC-16 & SGC-17)**

1. Procurement Made By Recipient Sub-Recipient and/or SRF Loan Recipient	2. Business Enterprise Minority Women	3. \$ Value of Procurement	4. Date of Procurement MM/DD/YY	5. Type of Product or Service (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor

Type of Product or Service Codes: 1 = Construction 2 = Supplies 3 = Services 4 = Equipment  
 Note: Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year the recipients receive the award, continuing until the project is completed.

## Instructions:

### A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33. The reporting requirement reflects the class deviation issued on November 8, 2013, clarified on January 9, 2014 and modified on December 2, 2014. EPA Form 5700-52A must be completed annually by recipients of financial assistance agreements where the combined total of funds budgeted for procuring supplies, equipment, construction or services exceeds \$150,000. This reporting requirement applies to all new and existing awards and voids all previous reporting requirements.

In determining whether the \$150,000 threshold is exceeded for a particular assistance agreement, the analysis must focus on funds budgeted for procurement under the supplies, equipment, construction, services or "other" categories, and include funds budgeted for procurement under sub-awards or loans

Reporting will also be required in cases where the details of the budgets of sub-awards/loans are not clear at the time of the grant awards and the combined total of the procurement and sub-awards and/or loans exceeds the \$150,000 threshold.

When reporting is required, all procurement actions are reportable, not just the portion which exceeds \$150,000.

If at the time of award the budgeted funds exceed \$150,000 but actual expenditures fall below, a report is still required.

If at the time of award, the combined total of funds budgeted for procurements in any category is less than or equal to \$150,000 and is maintained below the threshold, no DBE report is required to be submitted.

Recipients are required to report 30 days after the end of each federal year, per the terms and conditions of the financial assistance agreement.

Last reports are due October 30<sup>th</sup> or 90 days after the end of the project period, whichever comes first.

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement.

### B. Definitions:

**Procurement** is the acquisition through contract, order, purchase, lease or barter of supplies, equipment, construction or services needed to accomplish Federal assistance programs.

A **contract** is a written agreement between an EPA recipient and another party (also considered "prime contracts") and any lower tier agreement (also considered "subcontracts") for equipment, services, supplies, or construction necessary to complete the project. This definition excludes written agreements with another public agency. This definition includes personal and professional services, agreements with consultants, and purchase orders.

A **minority business enterprise (MBE)** is a business concern that is (1) at least 51 percent owned by one or more minority individuals, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority

individuals; and (2) whose daily business operations are managed and directed by one or more of the minority owners. In order to qualify and participate as an MBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

U.S. citizenship is required. Recipients shall presume that minority individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, or other groups whose members are found to be disadvantaged by the Small Business Act or by the Secretary of Commerce under section 5 of Executive order 11625. The reporting contact at EPA can provide additional information.

A **woman business enterprise (WBE)** is a business concern that is, (1) at least 51 percent owned by one or more women, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women and (2) whose daily business operations are managed and directed by one or more of the women owners. In order to qualify and participate as a WBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

Business firms which are 51 percent owned by minorities or women, but are in fact not managed and operated by minorities or females do not qualify for meeting MBE/WBE procurement goals. U.S. Citizenship is required.

### **Good Faith Efforts**

A recipient is required to make the following good faith efforts whenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These good faith

efforts for utilizing MBEs and WBEs must be documented. Such documentation is subject to EPA review upon request:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
5. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
6. If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.



### C. Instructions for Part I:

1A. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (**e.g. November 29, 2014 falls within Federal fiscal year 2015**)

1B. Specify report type. Check the annual reporting box. Also indicate if the project is completed.

1C. Indicate if this is a revision to a previous year and provide a brief description of the revision you are making.

2A-B. Please refer to your financial assistance agreement for the mailing address of the EPA financial assistance office for your agreement.

The "EPA DBE Reporting Contact" is the DBE Coordinator for the EPA Region from which your financial assistance agreement was originated. For a list of DBE Coordinators please refer to the EPA OSBP website at [http://epa.gov/osbp/dbe\\_cord](http://epa.gov/osbp/dbe_cord).

3A-B. Identify the agency, state authority, university or other organization which is the recipient of the Federal financial assistance and the person to contact concerning this report.

4A. Provide the Assistance Agreement number assigned by EPA. A separate report must be submitted for each Assistance Agreement.

**\*For SRF recipients:** In box 4a list numbers for ALL OPEN Assistance Agreements being reported on this form.

4B. Refer back to Assistance Agreement document for this information.

5A. Provide the total amount of the Assistance Agreement which includes Federal funds plus recipient matching funds and funds from other sources.

**\*For SRF recipients only:** SRF recipients will not enter an amount in 5a. SRF recipients should check the "N/A" box.

5B. Self-explanatory.

5C. Provide the total dollar amount of **ALL** procurements awarded this reporting period by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures, not just the portion which exceeds \$150,000. For example: Actual dollars for procurement from the procuring office; actual contracts let from the contracts office; actual goods, services, supplies, etc., from other sources including the central purchasing/ procurement centers).

**\*NOTE:** To prevent double counting on line 5C, if any amount on 5E is for a subcontract and the prime contract has already been included on Line 5C in a prior reporting period, then report the amount going to MBE or WBE subcontractor on line 5E, but exclude the amount from Line 5C. To include the amount on 5C again would result in double counting because the prime contract, which includes the subcontract, would have already been reported.

**\*For SRF recipients only:** In 5c please enter the total annual procurement amount under all of your SRF Assistance Agreements. The figure reported in this section is **not** directly tied to an individual Assistance Agreement identification number. (**SRF state recipients report state procurements in this section**)

5D. State whether or not sub-awards and/or subcontracts have been issued under the financial assistance agreements by indicating “yes” or “no”.

5E. Where requested, also provide the total dollar amount of all MBE/WBE procurement awarded during this reporting period by the recipient, sub-recipients, SRF loan recipients, and prime contractors in the categories of construction, equipment, services and supplies. These amounts include Federal funds plus recipient matching funds and funds from other sources.

6. If there were no MBE/WBE accomplishments this reporting period, please briefly how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.

7. Name and title of official administrator or designated reporting official.

8. Signature, month, day, and year report submitted.

#### **D. Instructions for Part II:**

For each MBE/WBE procurement made under this financial assistance agreements during the reporting period, provide the following information:

1. Check whether this procurement was made by the recipient, sub-recipient/SRF loan recipient, or the prime contractor.

2. Check either the MBE or WBE column. If a firm is both an MBE and WBE, the recipient may choose to count the entire procurement towards EITHER its MBE or WBE accomplishments. The recipient may also divide the total amount of the procurement (using any ratio it so chooses) and count those divided amounts toward its MBE and WBE accomplishments. If the recipient chooses to divide the procurement amount and count portions toward its MBE and WBE accomplishments, please state the appropriate amounts under the MBE and WBE columns on the form. **The combined MBE and WBE amounts for that MBE/WBE contractor must not exceed the “Value of the Procurement” reported in column #3**

3. Dollar value of procurement.

4. Date of procurement, shown as month, day, year. Date of procurement is defined as the date the contract or procurement was awarded, **not** the date the contractor received payment under the awarded contract or procurement, unless payment occurred on the date of award. **(Where direct purchasing is the procurement method, the date of procurement is the date the purchase was made)**

5. Using codes at the bottom of the form, identify type of product or service acquired through this procurement (e.g., enter 1 if construction, 2 if supplies, etc.).

6. Name, address, and telephone number of MBE/WBE firm.

\*\*This data is requested to comply with provisions mandated by: statute or regulations (40 CFR Parts 30, 31, and 33 and/or 2 CFR Parts 200 and 1500); OMB Circulars; or added by EPA to ensure sound and effective assistance management. Accurate, complete data are required to obtain funding, while no pledge of confidentiality is provided.

The public reporting and recording burden for this collection of information is estimated to average 1 hour per response annually. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclosure or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2136), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB Control number in any correspondence. Do not send the completed form to this address.

## XII – Changes to Approved DBE Compliance Form

**NOTE: THIS FORM IS REQUIRED OF THE LOAN RECIPIENT (OWNER) (WITH THE PRIME CONTRACTOR'S INPUT) FOR DBE COMPLIANCE ONLY IF A SUBCONTRACTOR/SUPPLIER/VENDOR IS SOUGHT AND/OR PROCURED AFTER THE CONTRACT ATA (APPROVAL-TO-AWARD) HAS BEEN ISSUED. IT IS SIMILAR TO THE DBE COMPLIANCE FORM (PAGE SGC-8) IN THAT IT IS THE COVER/SUMMARY FORM USED TO DOCUMENT THE ADDITIONAL DBE SOLICITATION AND/OR REVISE THE ORIGINAL DBE APPROVAL STATUS.**

Loan Recipient: \_\_\_\_\_ Loan (Project) Number: \_\_\_\_\_

### CERTIFICATIONS:

*I certify that the information submitted on and with this form is true and accurate and that this company has met and will continue to meet the conditions of this construction contract regarding DBE solicitation and utilization. I further certify that criteria used in selecting subcontractors and suppliers were applied equally to all potential participants and that EPA Forms 6100-2 and 6100-3 were distributed to all DBE subcontractors.*

\_\_\_\_\_  
(Prime Contractor Signature) Date \_\_\_\_\_

\_\_\_\_\_  
(Printed Name and Title)

*I certify that I have reviewed the information submitted on and with this form and that it meets the requirements of the Loan Recipient's/Owner's State Revolving Fund loan contract. (\*Only ONE (1) signature required below.)*

\_\_\_\_\_  
(Signature of Loan Recipient (Owner)) Date \_\_\_\_\_

**OR\***

\_\_\_\_\_  
(Loan Recipient's (Owner's) Representative's Signature, (P.E.)) Date \_\_\_\_\_

\_\_\_\_\_  
(Printed Name and Title)

### GENERAL INFORMATION: (Please attach additional pages to address 1 through 5, as needed.)

- (1) If an approved subcontractor is terminated or replaced, please identify this company and briefly state the reason.
- (2) For new or additional subcontractors, list name, trade, address, telephone number, contact person, dollar amount of subcontract and DBE status.
- (3) Attach proof of certification by EPA, SBA, DOT (or by state, local, Tribal or private entities whose certification criteria match EPA's) for each subcontractor listed as a DBE, MBE or WBE.
- (4) Attach documentation of solicitation effort for prospective DBE firms, such as fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each solicitation with, at least, one (1) logged phone call. Whenever possible, post solicitation for bids or proposals should be for a minimum of 30 calendar days before the bid or proposal closing date.
- (5) Provide justification for not selecting a certified DBE subcontractor that submitted a low bid for any subcontract area.

### XIII – Certification Regarding Equal Employment Opportunity

The prime contractor is required to comply with Executive Order 112-46 of September 24, 1965 entitled "Equal Employment Opportunity" as amended by Executive Order 11375 of October 13, 1967.

The contract for the work under this proposal will obligate the prime contractor and its subcontractors not to discriminate in employment practices.

The prime contractor shall not maintain or provide for his/her employees the facilities, which are segregated on a basis of race, creed, color or national origin, whether such facilities are segregated by directive or on a de facto basis.

The prime contractor must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain his/her eligibility to receive the award of the contract.

The prime contractor must be prepared to comply in all respects with any contract provisions regarding non-discrimination stipulated in conjunction with labor standards.

#### PRIME CONTRACTOR'S CERTIFICATION:

Prime Contractor's Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. Yes \_\_\_ No \_\_\_
2. Compliance Reports were required to be filed in connection with such contract or subcontract. Yes \_\_\_ No \_\_\_
3. Bidder has filed all compliance reports due under applicable contract requirements. Yes \_\_\_ No \_\_\_

If answer to item 3 is "No", please explain in detail on reverse side of this certification.

Certification - The information above is true and complete to the best of my knowledge and belief.

Signature of Prime Contractor: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

## XIV – Debarred Firms Certification

All prime construction contractors shall certify that Subcontracts have not and will not be awarded to any firm that is currently on the General Service Administration's Master List of Debarred, Suspended and Voluntarily Excluded Persons, in accordance with the provisions of ADEM Administrative Code 335-6-14-.35. Debarment action is taken against a firm for noncompliance with Federal Law.

All bidders shall complete this certification in duplicate and submit both copies to the Loan Recipient (Owner) with the bid proposal. The Loan Recipient (Owner) shall transmit one copy to the SRF Section within 14 days after the bid opening.

Project Name/Loan Name\*:

(\*not **Contract** Name)

\_\_\_\_\_

SRF Project No.:

\_\_\_\_\_

The undersigned hereby certifies that the firm of \_\_\_\_\_  
\_\_\_\_\_ has not and will not award a subcontract, in connection with any contract awarded to it as the result of this bid, to any firm that is currently on the General Service Administration's Master List of Debarred, Suspended, and Voluntarily Excluded Persons.

Signature of Prime Contractor:

\_\_\_\_\_

Title:

\_\_\_\_\_

Date:

\_\_\_\_\_

## XV – Davis-Bacon and Related Acts

### **Labor Standards Provisions for Federally Assisted Contracts**

#### **Wage Rate Requirements Under FY 2013 Continuing Appropriation**

##### **I. Requirements under the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) 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 FY 2013 Continuing Resolution 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 Cynthia Y. Edwards at [Edwards.Cynthiay@epa.gov](mailto:Edwards.Cynthiay@epa.gov) or at 404-562-9340 of EPA, Region 4 Grants and SRF Management Section, for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/whd/>

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

Under the FY 2013 Continuing Resolution, 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.

(i) While the solicitation remains open, the subrecipient shall monitor [www.wdol.gov](http://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.

(ii) 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](http://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](http://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 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 FY 2010 appropriation , 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](http://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 <https://www.dol.gov/agencies/whd/forms/wh347> 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. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information

indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary 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 noncompliance 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 <https://www.dol.gov/agencies/whd/contact/local-offices>.

***(Insert applicable wage rate determination here.)***

**Wage Rates are county specific for *Heavy Construction* and can be found at:**  
<https://sam.gov/content/wage-determinations>

## XVI – American Iron and Steel Requirement

**Section 4.13 Compliance with 2014 Appropriations Act.** (a) The Loan Recipient agrees to comply with all federal requirements applicable to the Authority Loan (including those imposed by P.L. 113-76, Consolidated Appropriations Act (the "2014 Appropriations Act") and related SRF Policy Guidelines) which the Loan Recipient understands includes, among other things, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel") unless (i) the Loan Recipient has requested and obtained a waiver from the U.S. Environmental Protection Agency pertaining to the Project or (ii) the Authority has otherwise advised the Loan Recipient in writing that the Buy American Requirement is not applicable to the Project. .

(b) The Loan Recipient also agrees to comply with all recordkeeping and reporting requirements under the Clean Water Act (codified generally under 33 U.S.C. §1251 et seq.) (the "Clean Water Act"), including any reports required by a federal agency or the Authority such as performance indicators of program deliverables, information on costs and Project progress. The Loan Recipient understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities, and (ii) failure to comply with the Clean Water Act and this Agreement may be an Event of Default hereunder that results in a repayment of the Authority Loan in advance of the maturity of the Evidence of Indebtedness and/or other remedial actions.

The Loan Recipient agrees to cause all contractors and subcontractors to comply with (through the inclusion of appropriate terms and conditions in all contracts, subcontracts and lower tiered transactions, such terms and conditions to be in substantially the form set forth in connection with the development and construction of the project

The Contractor acknowledges to and for the benefit of the \_\_\_\_\_, Alabama ("Purchaser"), and the Alabama Water Pollution Control Authority or the Drinking Water Finance Authority (the "State Authority") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State Authority 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 Purchaser or the State Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State Authority or any damages owed to the State Authority by the Purchaser). While the Contractor has no direct contractual privity with the State Authority, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State Authority.



XVII – Project Sign Detail - CWSRF



STATE OF ALABAMA

Honorable (name), Governor



ALABAMA WATER POLLUTION CONTROL AUTHORITY  
POLLUTION CONTROL PROJECT

(NAME OF OWNER)

**(NAME OF PROJECT)**



\$(amount) STATE REVOLVING FUND LOAN

(NAME OF CONTRACTOR) • CONTRACTOR  
(NAME OF ENGINEER) • CONSULTING ENGINEER

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
U.S. ENVIRONMENTAL PROTECTION AGENCY

1. Sign is to be constructed of ½” MDO plywood, 4’ x 8’. Alternate materials may be used if approved by ADEM prior to use.
2. Paint with two (2) coats oil-base enamel before lettering.
3. Background color white; lettering black.
4. Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.
5. Sign shall be attached to 4” x 4” x 8’ treated posts. Alternatives may be used if approved by ADEM prior to use.
6. Sign shall be placed in prominent location, easily readable from existing street or roadway.
7. Sign shall be maintained in good condition until completion of project.

XVIII – Project Sign Detail - DWSRF

 <p><b>ADEM</b> Alabama Department of Environmental Management</p>	<p><b>STATE OF ALABAMA</b> Honorable (Name), Governor</p>	
<p><b>ALABAMA DRINKING WATER FINANCE AUTHORITY INFRASTRUCTURE PROJECT</b></p>		
<p>(NAME OF OWNER) <b>(NAME OF PROJECT)</b></p>		
<p>\$(amount) STATE REVOLVING FUND LOAN</p>		
<p>(NAME OF CONTRACTOR) • CONTRACTOR (NAME OF ENGINEER) • CONSULTING ENGINEER</p>		
<p>ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT U.S. ENVIRONMENTAL PROTECTION AGENCY</p>		

Two vertical rectangular posts are shown below the sign frame, one on the left and one on the right, representing the support structure for the sign.

1. Sign is to be constructed of ½” MDO plywood, 4’ x 8’. Alternate materials may be used if approved by ADEM prior to use.
2. Paint with two (2) coats oil-base enamel before lettering.
3. Background color white; lettering black.
4. Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.
5. Sign shall be attached to 4” x 4” x 8’ treated posts. Alternatives may be used if approved by ADEM prior to use.
6. Sign shall be placed in prominent location, easily readable from existing street or roadway.
7. Sign shall be maintained in good condition until completion of project.

## XIX – Construction Contract Requirements

This checklist is to be completed by the Loan Recipient (Owner)/Engineer when submitting plans and specifications to the SRF Section for review. It affirms to the SRF reviewer that the Loan Recipient (Owner)/Engineer has addressed these items (in boilerplate form) within the specifications manual.

Contract Page No.	Satisfied Yes/No	
_____	_____	Bid Advertisement (including date, time, and location of bid opening).
_____	_____	Bid Bond.
_____	_____	Performance Bond (100%).
_____	_____	Payment Bond (Not less than 50%).
_____	_____	Contract Length.
_____	_____	Liquidated Damages.
_____	_____	Liability Insurance (including workman's comp, public liability, and builder's risk, if applicable).
_____	_____	Method of Award (i.e. lowest, responsive, responsible bidder).
_____	_____	Air testing of gravity sewers (if applicable).

Within 14 days after the bid opening, the Loan Recipient (Owner)/Engineer is to prepare the Project Review and Cost Summary (per the **PR&CS Checklist, page SGC-39**) and submit it to the SRF Section of ADEM. Upon completion of review, a written ATA (Approval-to-Award) will be issued.

**NOTE:**

***The Loan Recipient (Owner) assumes all financial risk, if the construction contract is awarded prior to the issuance of an ATA letter by the SRF Section.***

# XX – Project Review and Cost Summary

<h2 style="margin: 0;">ADEM</h2> <p style="font-size: small; margin: 0;">Alabama Department of Environmental Management</p>	<h2 style="margin: 0;">SRF Project Review and Cost Summary</h2>	Form Revised 07-2021
<p>This form is to be completed and submitted (with supporting documentation) to the SRF Section <u>within 14 days after bid opening</u>. Following satisfactory review, an ATA (Approval-to-Award) letter will be issued. After the ATA is issued/award of the contract, a pre-construction conference should be scheduled <b>(with the SRF Project Manager in attendance)</b>. <u>A complete, bound set of the executed contract documents manual should be forwarded to the SRF Section for review and written approval following the pre-construction conference.</u></p>		
Loan Recipient: _____ Project Number: _____ Project Name: _____ Contract Number: _____ Contract Name: _____		
1. Date of plans and specifications concurrence letter from ADEM-SRF Section: _____ Date of construction permit issuance from ADEM-DW Branch: _____		
2. Attach copies of the following documents:		
___ a. Bid advertisement with certification by publisher and date(s) of publication.		
___ b. Certified bid tabulation.		
___ c. Proposal of the selected bidder.		
___ d. Bid bond.		
___ e. Engineer’s letter to the loan recipient recommending award of the contract. If the award is made to other than the low bidder, provide justification.		
___ f. Site certificates for the project, if not previously submitted with the SRF loan application.		
___ g. <b><u>DBE Documentation from the loan recipient (owner) and the prime contractor.</u></b> Utilization, solicitation and documentation requirements (with a list of required documents) are discussed in detail in Parts III - V (pages SGC-3 - SGC-23) of the ADEM <i>SRF Supplemental General Conditions</i> for SRF Assisted Public Drinking Water and Wastewater Facilities Construction Contracts.		
___ h. Copy of the wage determination used in bidding.		
___ i. Any addenda that have been issued after ADEM review of the plans and specifications.		
Comments: _____ _____		

**SECTION 00 73 02**  
**Contract Provisions for Non-Federal Entity Contracts**  
**Under Federal Awards**

In addition to other provisions required by the Federal agency or non-Federal entity, all contracts made by the non-Federal entity under the Federal award must contain provisions covering the following, as applicable.

(A) Contracts for more than the simplified acquisition threshold currently set at \$150,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

(B) All contracts in excess of \$10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be effected and the basis for settlement.

(C) Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

(D) Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of \$2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work

Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

(E) Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

(F) Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of “funding agreement” under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.

(G) Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of \$150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

(H) Debarment and Suspension (Executive Orders 12549 and 12689)—A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of

parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

(I) Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding \$100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

**SECTION 00 73 33**  
**BEASON-HAMMON/ E-VERIFY CERTIFICATION**

GENERAL:

- A. Bidders hereby reminded that they are required to comply with requirements of Alabama Immigration Law, Act 2011-535 (also referred to as the “Beason-Hammon Alabama Taxpayer and Citizen Protection Act”, or H.B. 658), as amended by Act No. 2012-491, including in part and effective January 1, 2012, enrollment in the E-Verify Program of the United States Department of Homeland Security:
1. Contractor’s signed “E-Verify Memorandum of Understanding” will be required to be attached to any Contract awarded.
  2. General Contractors and Subcontractors shall be enrolled in, participate in and maintain compliance for the duration of this contract and as otherwise required by statute.
- B. The following statement shall and will be included in the Contract for Construction:

**“By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the state of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.”**

- C. Additional information and Guidance is available at the following websites:
1. E-Verify portal maintained by State of Alabama: <http://immigration.alabama.gov>
  2. Alabama Office of the Attorney General Website: <http://www.ago.alabama.gov/Page-Immigration>
  3. Alabama Building Commission: <http://www.bc.state.al.us/PDFs/Bulletins/GuidanceonAct2012-491-DatedMay-29-2012.pdf>
  4. U.S. Department of Homeland Security, E-Verify: <http://www.dhs.gov/E-Verify>



State of \_\_\_\_\_  
County of \_\_\_\_\_

CERTIFICATE OF COMPLIANCE WITH THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535, as amended by ACT 2012-491)

DATE: \_\_\_\_\_

RE Contract/Grant/Incentive (describe by number or subject):

\_\_\_\_\_ by and between  
\_\_\_\_\_ (Contractor/Grantee) and  
\_\_\_\_\_ (State Agency, Department or Public Entity)

The undersigned hereby certifies to the State of Alabama as follows:

1. The undersigned holds the position of \_\_\_\_\_ with the Contractor/Grantee named above, and is authorized to provide representations set out in this Certificate as the official and binding act of that entity and has knowledge of the provisions of THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535 of the Alabama Legislature, as amended by ACT 2012-491) which is described herein as "the Act."
2. Using the following definitions from Section 3 of the Act, select and initial either (a) or (b), below, to describe the Contractor/Grantee's business structure.

BUSINESS ENTITY. Any person or group of persons employing one or more persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood, whether for profit or not for profit.

a. Self-employed individuals, business entities filing articles of incorporation, partnerships, limited partnerships, limited liability companies, foreign corporations, foreign limited partnerships, and foreign limited liability companies authorized to transact business in this state, business trusts, and any business entity that registers with the Secretary of State.

b. Any business entity that possesses a business license, permit, certificate, approval, registration, charter, or similar form of authorization issued by the state, any business entity that is exempt by law from obtaining such a business license, and any business entity that is operating unlawfully without a business license.

EMPLOYER. Any person, firm, corporation, partnership, joint stock association, agent, manager, representative, foreman, or other person having control or custody of any employment, place of employment, or of any employee, including any person or entity employing any person for hire within the State of Alabama, including a public employer.

This term shall not include the occupant of a household contracting with another person to perform casual domestic labor within the household.

- \_\_\_ (a) The Contractor/Grantee is a business entity or employer, as those terms are defined in Section 3 of the Act.
- \_\_\_ (b) The Contractor/Grantee is not a business entity or employer, as those terms are defined in Section 3 of the Act.
3. As of the date of this Certificate, the Contractor/Grantee does not knowingly employ an unauthorized alien within the State of Alabama and hereafter, it will not knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama;
  4. The Contractor/Grantee is enrolled in E-Verify unless it is not eligible to enroll because of the rules of that program or other factors beyond its control.

Certified this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

\_\_\_\_\_  
Name of Contractor/Grantee/Recipient

By: \_\_\_\_\_

Its \_\_\_\_\_

The above Certification was signed in my presence by the person whose name appears above, on this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

WITNESS: \_\_\_\_\_

\_\_\_\_\_  
Printed Name of Witness

Company ID Number:

**THE E-VERIFY  
MEMORANDUM OF UNDERSTANDING  
FOR EMPLOYERS**

**ARTICLE I  
PURPOSE AND AUTHORITY**

The parties to this agreement are the Department of Homeland Security (DHS) and the \_\_\_\_\_ (Employer). The purpose of this agreement is to set forth terms and conditions which the Employer will follow while participating in E-Verify.

E-Verify is a program that electronically confirms an employee's eligibility to work in the United States after completion of Form I-9, Employment Eligibility Verification (Form I-9). This Memorandum of Understanding (MOU) explains certain features of the E-Verify program and describes specific responsibilities of the Employer, the Social Security Administration (SSA), and DHS.

Authority for the E-Verify program is found in Title IV, Subtitle A, of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (IIRIRA), Pub. L. 104-208, 110 Stat. 3009, as amended (8 U.S.C. § 1324a note). The Federal Acquisition Regulation (FAR) Subpart 22.18, "Employment Eligibility Verification" and Executive Order 12989, as amended, provide authority for Federal contractors and subcontractors (Federal contractor) to use E-Verify to verify the employment eligibility of certain employees working on Federal contracts.

**ARTICLE II  
RESPONSIBILITIES**

**A. RESPONSIBILITIES OF THE EMPLOYER**

1. The Employer agrees to display the following notices supplied by DHS in a prominent place that is clearly visible to prospective employees and all employees who are to be verified through the system:
  - a. Notice of E-Verify Participation
  - b. Notice of Right to Work
2. The Employer agrees to provide to the SSA and DHS the names, titles, addresses, and telephone numbers of the Employer representatives to be contacted about E-Verify. The Employer also agrees to keep such information current by providing updated information to SSA and DHS whenever the representatives' contact information changes.
3. The Employer agrees to grant E-Verify access only to current employees who need E-Verify access. Employers must promptly terminate an employee's E-Verify access if the employer is separated from the company or no longer needs access to E-Verify.

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4. The Employer agrees to become familiar with and comply with the most recent version of the E-Verify User Manual.
  5. The Employer agrees that any Employer Representative who will create E-Verify cases will complete the E-Verify Tutorial before that individual creates any cases.
    - a. The Employer agrees that all Employer representatives will take the refresher tutorials when prompted by E-Verify in order to continue using E-Verify. Failure to complete a refresher tutorial will prevent the Employer Representative from continued use of E-Verify.
  6. The Employer agrees to comply with current Form I-9 procedures, with two exceptions:
    - a. If an employee presents a "List B" identity document, the Employer agrees to only accept "List B" documents that contain a photo. (List B documents identified in 8 C.F.R. § 274a.2(b)(1)(B)) can be presented during the Form I-9 process to establish identity.) If an employee objects to the photo requirement for religious reasons, the Employer should contact E-Verify at 888-464-4218.
    - b. If an employee presents a DHS Form I-551 (Permanent Resident Card), Form I-766 (Employment Authorization Document), or U.S. Passport or Passport Card to complete Form I-9, the Employer agrees to make a photocopy of the document and to retain the photocopy with the employee's Form I-9. The Employer will use the photocopy to verify the photo and to assist DHS with its review of photo mismatches that employees contest. DHS may in the future designate other documents that activate the photo screening tool.
- Note: Subject only to the exceptions noted previously in this paragraph, employees still retain the right to present any List A, or List B and List C, document(s) to complete the Form I-9.
7. The Employer agrees to record the case verification number on the employee's Form I-9 or to print the screen containing the case verification number and attach it to the employee's Form I-9.
  8. The Employer agrees that, although it participates in E-Verify, the Employer has a responsibility to complete, retain, and make available for inspection Forms I-9 that relate to its employees, or from other requirements of applicable regulations or laws, including the obligation to comply with the antidiscrimination requirements of section 274B of the INA with respect to Form I-9 procedures.
    - a. The following modified requirements are the only exceptions to an Employer's obligation to not employ unauthorized workers and comply with the anti-discrimination provision of the INA: (1) List B identity documents must have photos, as described in paragraph 6 above; (2) When an Employer confirms the identity and employment eligibility of newly hired employee using E-Verify procedures, the Employer establishes a rebuttable presumption that it has not violated section 274A(a)(1)(A) of the Immigration and Nationality Act (INA) with respect to the hiring of that employee; (3) If the Employer receives a final nonconfirmation for an employee, but continues to employ that person, the Employer must notify DHS and the Employer is subject to a civil money penalty between \$550 and \$1,100 for each failure to notify DHS of continued employment following a final nonconfirmation; (4) If the Employer continues to employ an employee after receiving a final nonconfirmation, then the Employer is subject to a rebuttable presumption that it has knowingly

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employed an unauthorized alien in violation of section 274A(a)(1)(A); and (5) no E-Verify participant is civilly or criminally liable under any law for any action taken in good faith based on information provided through the E-Verify.

b. DHS reserves the right to conduct Form I-9 compliance inspections, as well as any other enforcement or compliance activity authorized by law, including site visits, to ensure proper use of E-Verify.

9. The Employer is strictly prohibited from creating an E-Verify case before the employee has been hired, meaning that a firm offer of employment was extended and accepted and Form I-9 was completed. The Employer agrees to create an E-Verify case for new employees within three Employer business days after each employee has been hired (after both Sections 1 and 2 of Form I-9 have been completed), and to complete as many steps of the E-Verify process as are necessary according to the E-Verify User Manual. If E-Verify is temporarily unavailable, the three-day time period will be extended until it is again operational in order to accommodate the Employer's attempting, in good faith, to make inquiries during the period of unavailability.

10. The Employer agrees not to use E-Verify for pre-employment screening of job applicants, in support of any unlawful employment practice, or for any other use that this MOU or the E-Verify User Manual does not authorize.

11. The Employer must use E-Verify for all new employees. The Employer will not verify selectively and will not verify employees hired before the effective date of this MOU. Employers who are Federal contractors may qualify for exceptions to this requirement as described in Article II.B of this MOU.

12. The Employer agrees to follow appropriate procedures (see Article III below) regarding tentative nonconfirmations. The Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify case. The Employer agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer agrees to provide written referral instructions to employees and instruct affected employees to bring the English copy of the letter to the SSA. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending. Further, when employees contest a tentative nonconfirmation based upon a photo mismatch, the Employer must take additional steps (see Article III.B. below) to contact DHS with information necessary to resolve the challenge.

13. The Employer agrees not to take any adverse action against an employee based upon the employee's perceived employment eligibility status while SSA or DHS is processing the verification request unless the Employer obtains knowledge (as defined in 8 C.F.R. § 274a.1(l)) that the employee is not work authorized. The Employer understands that an initial inability of the SSA or DHS automated verification system to verify work authorization, a tentative nonconfirmation, a case in continuance (indicating the need for additional time for the government to resolve a case), or the finding of a photo mismatch, does not establish, and should not be interpreted as, evidence that the employee is not work authorized. In any of such cases, the employee must be provided a full and fair opportunity to contest the finding, and if he or she does so, the employee may not be terminated or suffer any adverse employment consequences based upon the employee's perceived employment eligibility status

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(including denying, reducing, or extending work hours, delaying or preventing training, requiring an employee to work in poorer conditions, withholding pay, refusing to assign the employee to a Federal contract or other assignment, or otherwise assuming that he or she is unauthorized to work) until and unless secondary verification by SSA or DHS has been completed and a final nonconfirmation has been issued. If the employee does not choose to contest a tentative nonconfirmation or a photo mismatch or if a secondary verification is completed and a final nonconfirmation is issued, then the Employer can find the employee is not work authorized and terminate the employee's employment. Employers or employees with questions about a final nonconfirmation may call E-Verify at 1-888-464-4218 (customer service) or 1-888-897-7781 (worker hotline).

14. The Employer agrees to comply with Title VII of the Civil Rights Act of 1964 and section 274B of the INA as applicable by not discriminating unlawfully against any individual in hiring, firing, employment eligibility verification, or recruitment or referral practices because of his or her national origin or citizenship status, or by committing discriminatory documentary practices. The Employer understands that such illegal practices can include selective verification or use of E-Verify except as provided in part D below, or discharging or refusing to hire employees because they appear or sound "foreign" or have received tentative nonconfirmations. The Employer further understands that any violation of the immigration-related unfair employment practices provisions in section 274B of the INA could subject the Employer to civil penalties, back pay awards, and other sanctions, and violations of Title VII could subject the Employer to back pay awards, compensatory and punitive damages. Violations of either section 274B of the INA or Title VII may also lead to the termination of its participation in E-Verify. If the Employer has any questions relating to the anti-discrimination provision, it should contact OSC at 1-800-255-8155 or 1-800-237-2515 (TDD).

15. The Employer agrees that it will use the information it receives from E-Verify only to confirm the employment eligibility of employees as authorized by this MOU. The Employer agrees that it will safeguard this information, and means of access to it (such as PINS and passwords), to ensure that it is not used for any other purpose and as necessary to protect its confidentiality, including ensuring that it is not disseminated to any person other than employees of the Employer who are authorized to perform the Employer's responsibilities under this MOU, except for such dissemination as may be authorized in advance by SSA or DHS for legitimate purposes.

16. The Employer agrees to notify DHS immediately in the event of a breach of personal information. Breaches are defined as loss of control or unauthorized access to E-Verify personal data. All suspected or confirmed breaches should be reported by calling 1-888-464-4218 or via email at [E-Verify@dhs.gov](mailto:E-Verify@dhs.gov). Please use "Privacy Incident – Password" in the subject line of your email when sending a breach report to E-Verify.

17. The Employer acknowledges that the information it receives from SSA is governed by the Privacy Act (5 U.S.C. § 552a(i)(1) and (3)) and the Social Security Act (42 U.S.C. 1306(a)). Any person who obtains this information under false pretenses or uses it for any purpose other than as provided for in this MOU may be subject to criminal penalties.

18. The Employer agrees to cooperate with DHS and SSA in their compliance monitoring and evaluation of E-Verify, which includes permitting DHS, SSA, their contractors and other agents, upon

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reasonable notice, to review Forms I-9 and other employment records and to interview it and its employees regarding the Employer's use of E-Verify, and to respond in a prompt and accurate manner to DHS requests for information relating to their participation in E-Verify.

19. The Employer shall not make any false or unauthorized claims or references about its participation in E-Verify on its website, in advertising materials, or other media. The Employer shall not describe its services as federally-approved, federally-certified, or federally-recognized, or use language with a similar intent on its website or other materials provided to the public. Entering into this MOU does not mean that E-Verify endorses or authorizes your E-Verify services and any claim to that effect is false.

20. The Employer shall not state in its website or other public documents that any language used therein has been provided or approved by DHS, USCIS or the Verification Division, without first obtaining the prior written consent of DHS.

21. The Employer agrees that E-Verify trademarks and logos may be used only under license by DHS/USCIS (see [M-795 \(Web\)](#)) and, other than pursuant to the specific terms of such license, may not be used in any manner that might imply that the Employer's services, products, websites, or publications are sponsored by, endorsed by, licensed by, or affiliated with DHS, USCIS, or E-Verify.

22. The Employer understands that if it uses E-Verify procedures for any purpose other than as authorized by this MOU, the Employer may be subject to appropriate legal action and termination of its participation in E-Verify according to this MOU.

## **B. RESPONSIBILITIES OF FEDERAL CONTRACTORS**

1. If the Employer is a Federal contractor with the FAR E-Verify clause subject to the employment verification terms in Subpart 22.18 of the FAR, it will become familiar with and comply with the most current version of the E-Verify User Manual for Federal Contractors as well as the E-Verify Supplemental Guide for Federal Contractors.

2. In addition to the responsibilities of every employer outlined in this MOU, the Employer understands that if it is a Federal contractor subject to the employment verification terms in Subpart 22.18 of the FAR it must verify the employment eligibility of any "employee assigned to the contract" (as defined in FAR 22.1801). Once an employee has been verified through E-Verify by the Employer, the Employer may not create a second case for the employee through E-Verify.

a. An Employer that is not enrolled in E-Verify as a Federal contractor at the time of a contract award must enroll as a Federal contractor in the E-Verify program within 30 calendar days of contract award and, within 90 days of enrollment, begin to verify employment eligibility of new hires using E-Verify. The Employer must verify those employees who are working in the United States, whether or not they are assigned to the contract. Once the Employer begins verifying new hires, such verification of new hires must be initiated within three business days after the hire date. Once enrolled in E-Verify as a Federal contractor, the Employer must begin verification of employees assigned to the contract within 90 calendar days after the date of enrollment or within 30 days of an employee's assignment to the contract, whichever date is later.

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b. Employers enrolled in E-Verify as a Federal contractor for 90 days or more at the time of a contract award must use E-Verify to begin verification of employment eligibility for new hires of the Employer who are working in the United States, whether or not assigned to the contract, within three business days after the date of hire. If the Employer is enrolled in E-Verify as a Federal contractor for 90 calendar days or less at the time of contract award, the Employer must, within 90 days of enrollment, begin to use E-Verify to initiate verification of new hires of the contractor who are working in the United States, whether or not assigned to the contract. Such verification of new hires must be initiated within three business days after the date of hire. An Employer enrolled as a Federal contractor in E-Verify must begin verification of each employee assigned to the contract within 90 calendar days after date of contract award or within 30 days after assignment to the contract, whichever is later.

c. Federal contractors that are institutions of higher education (as defined at 20 U.S.C. 1001(a)), state or local governments, governments of Federally recognized Indian tribes, or sureties performing under a takeover agreement entered into with a Federal agency under a performance bond may choose to only verify new and existing employees assigned to the Federal contract. Such Federal contractors may, however, elect to verify all new hires, and/or all existing employees hired after November 6, 1986. Employers in this category must begin verification of employees assigned to the contract within 90 calendar days after the date of enrollment or within 30 days of an employee's assignment to the contract, whichever date is later.

d. Upon enrollment, Employers who are Federal contractors may elect to verify employment eligibility of all existing employees working in the United States who were hired after November 6, 1986, instead of verifying only those employees assigned to a covered Federal contract. After enrollment, Employers must elect to verify existing staff following DHS procedures and begin E-Verify verification of all existing employees within 180 days after the election.

e. The Employer may use a previously completed Form I-9 as the basis for creating an E-Verify case for an employee assigned to a contract as long as:

- i. That Form I-9 is complete (including the SSN) and complies with Article II.A.6,
- ii. The employee's work authorization has not expired, and
- iii. The Employer has reviewed the Form I-9 information either in person or in communications with the employee to ensure that the employee's Section 1, Form I-9 attestation has not changed (including, but not limited to, a lawful permanent resident alien having become a naturalized U.S. citizen).

f. The Employer shall complete a new Form I-9 consistent with Article II.A.6 or update the previous Form I-9 to provide the necessary information if:

- i. The Employer cannot determine that Form I-9 complies with Article II.A.6,
- ii. The employee's basis for work authorization as attested in Section 1 has expired or changed, or
- iii. The Form I-9 contains no SSN or is otherwise incomplete.

**Note:** If Section 1 of Form I-9 is otherwise valid and up-to-date and the form otherwise complies with

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Article II.C.5, but reflects documentation (such as a U.S. passport or Form I-551) that expired after completing Form I-9, the Employer shall not require the production of additional documentation, or use the photo screening tool described in Article II.A.5, subject to any additional or superseding instructions that may be provided on this subject in the E-Verify User Manual.

g. The Employer agrees not to require a second verification using E-Verify of any assigned employee who has previously been verified as a newly hired employee under this MOU or to authorize verification of any existing employee by any Employer that is not a Federal contractor based on this Article.

3. The Employer understands that if it is a Federal contractor, its compliance with this MOU is a performance requirement under the terms of the Federal contract or subcontract, and the Employer consents to the release of information relating to compliance with its verification responsibilities under this MOU to contracting officers or other officials authorized to review the Employer's compliance with Federal contracting requirements.

### **C. RESPONSIBILITIES OF SSA**

1. SSA agrees to allow DHS to compare data provided by the Employer against SSA's database. SSA sends DHS confirmation that the data sent either matches or does not match the information in SSA's database.

2. SSA agrees to safeguard the information the Employer provides through E-Verify procedures. SSA also agrees to limit access to such information, as is appropriate by law, to individuals responsible for the verification of Social Security numbers or responsible for evaluation of E-Verify or such other persons or entities who may be authorized by SSA as governed by the Privacy Act (5 U.S.C. § 552a), the Social Security Act (42 U.S.C. 1306(a)), and SSA regulations (20 CFR Part 401).

3. SSA agrees to provide case results from its database within three Federal Government work days of the initial inquiry. E-Verify provides the information to the Employer.

4. SSA agrees to update SSA records as necessary if the employee who contests the SSA tentative nonconfirmation visits an SSA field office and provides the required evidence. If the employee visits an SSA field office within the eight Federal Government work days from the date of referral to SSA, SSA agrees to update SSA records, if appropriate, within the eight-day period unless SSA determines that more than eight days may be necessary. In such cases, SSA will provide additional instructions to the employee. If the employee does not visit SSA in the time allowed, E-Verify may provide a final nonconfirmation to the employer.

Note: If an Employer experiences technical problems, or has a policy question, the employer should contact E-Verify at 1-888-464-4218.

### **D. RESPONSIBILITIES OF DHS**

1. DHS agrees to provide the Employer with selected data from DHS databases to enable the Employer to conduct, to the extent authorized by this MOU:

a. Automated verification checks on alien employees by electronic means, and



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- b. Photo verification checks (when available) on employees.
2. DHS agrees to assist the Employer with operational problems associated with the Employer's participation in E-Verify. DHS agrees to provide the Employer names, titles, addresses, and telephone numbers of DHS representatives to be contacted during the E-Verify process.
3. DHS agrees to provide to the Employer with access to E-Verify training materials as well as an E-Verify User Manual that contain instructions on E-Verify policies, procedures, and requirements for both SSA and DHS, including restrictions on the use of E-Verify.
4. DHS agrees to train Employers on all important changes made to E-Verify through the use of mandatory refresher tutorials and updates to the E-Verify User Manual. Even without changes to E-Verify, DHS reserves the right to require employers to take mandatory refresher tutorials.
5. DHS agrees to provide to the Employer a notice, which indicates the Employer's participation in E-Verify. DHS also agrees to provide to the Employer anti-discrimination notices issued by the Office of Special Counsel for Immigration-Related Unfair Employment Practices (OSC), Civil Rights Division, U.S. Department of Justice.
6. DHS agrees to issue each of the Employer's E-Verify users a unique user identification number and password that permits them to log in to E-Verify.
7. DHS agrees to safeguard the information the Employer provides, and to limit access to such information to individuals responsible for the verification process, for evaluation of E-Verify, or to such other persons or entities as may be authorized by applicable law. Information will be used only to verify the accuracy of Social Security numbers and employment eligibility, to enforce the INA and Federal criminal laws, and to administer Federal contracting requirements.
8. DHS agrees to provide a means of automated verification that provides (in conjunction with SSA verification procedures) confirmation or tentative nonconfirmation of employees' employment eligibility within three Federal Government work days of the initial inquiry.
9. DHS agrees to provide a means of secondary verification (including updating DHS records) for employees who contest DHS tentative nonconfirmations and photo mismatch tentative nonconfirmations. This provides final confirmation or nonconfirmation of the employees' employment eligibility within 10 Federal Government work days of the date of referral to DHS, unless DHS determines that more than 10 days may be necessary. In such cases, DHS will provide additional verification instructions.

### **ARTICLE III**

#### **REFERRAL OF INDIVIDUALS TO SSA AND DHS**

##### **A. REFERRAL TO SSA**

1. If the Employer receives a tentative nonconfirmation issued by SSA, the Employer must print the notice as directed by E-Verify. The Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify

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case. The Employer also agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer agrees to provide written referral instructions to employees and instruct affected employees to bring the English copy of the letter to the SSA. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending.

2. The Employer agrees to obtain the employee's response about whether he or she will contest the tentative nonconfirmation as soon as possible after the Employer receives the tentative nonconfirmation. Only the employee may determine whether he or she will contest the tentative nonconfirmation.
3. After a tentative nonconfirmation, the Employer will refer employees to SSA field offices only as directed by E-Verify. The Employer must record the case verification number, review the employee information submitted to E-Verify to identify any errors, and find out whether the employee contests the tentative nonconfirmation. The Employer will transmit the Social Security number, or any other corrected employee information that SSA requests, to SSA for verification again if this review indicates a need to do so.
4. The Employer will instruct the employee to visit an SSA office within eight Federal Government work days. SSA will electronically transmit the result of the referral to the Employer within 10 Federal Government work days of the referral unless it determines that more than 10 days is necessary.
5. While waiting for case results, the Employer agrees to check the E-Verify system regularly for case updates.
6. The Employer agrees not to ask the employee to obtain a printout from the Social Security Administration number database (the Numident) or other written verification of the SSN from the SSA.

**B. REFERRAL TO DHS**

1. If the Employer receives a tentative nonconfirmation issued by DHS, the Employer must promptly notify employees in private of the finding and provide them with the notice and letter containing information specific to the employee's E-Verify case. The Employer also agrees to provide both the English and the translated notice and letter for employees with limited English proficiency to employees. The Employer must allow employees to contest the finding, and not take adverse action against employees if they choose to contest the finding, while their case is still pending.
2. The Employer agrees to obtain the employee's response about whether he or she will contest the tentative nonconfirmation as soon as possible after the Employer receives the tentative nonconfirmation. Only the employee may determine whether he or she will contest the tentative nonconfirmation.
3. The Employer agrees to refer individuals to DHS only when the employee chooses to contest a tentative nonconfirmation.
4. If the employee contests a tentative nonconfirmation issued by DHS, the Employer will instruct the

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employee to contact DHS through its toll-free hotline (as found on the referral letter) within eight Federal Government work days.

5. If the Employer finds a photo mismatch, the Employer must provide the photo mismatch tentative nonconfirmation notice and follow the instructions outlined in paragraph 1 of this section for tentative nonconfirmations, generally.
6. The Employer agrees that if an employee contests a tentative nonconfirmation based upon a photo mismatch, the Employer will send a copy of the employee's Form I-551, Form I-766, U.S. Passport, or passport card to DHS for review by:
  - a. Scanning and uploading the document, or
  - b. Sending a photocopy of the document by express mail (furnished and paid for by the employer).
7. The Employer understands that if it cannot determine whether there is a photo match/mismatch, the Employer must forward the employee's documentation to DHS as described in the preceding paragraph. The Employer agrees to resolve the case as specified by the DHS representative who will determine the photo match or mismatch.
8. DHS will electronically transmit the result of the referral to the Employer within 10 Federal Government work days of the referral unless it determines that more than 10 days is necessary.
9. While waiting for case results, the Employer agrees to check the E-Verify system regularly for case updates.

## **ARTICLE IV SERVICE PROVISIONS**

### **A. NO SERVICE FEES**

1. SSA and DHS will not charge the Employer for verification services performed under this MOU. The Employer is responsible for providing equipment needed to make inquiries. To access E-Verify, an Employer will need a personal computer with Internet access.

## **ARTICLE V MODIFICATION AND TERMINATION**

### **A. MODIFICATION**

1. This MOU is effective upon the signature of all parties and shall continue in effect for as long as the SSA and DHS operates the E-Verify program unless modified in writing by the mutual consent of all parties.
2. Any and all E-Verify system enhancements by DHS or SSA, including but not limited to E-Verify checking against additional data sources and instituting new verification policies or procedures, will be covered under this MOU and will not cause the need for a supplemental MOU that outlines these changes.

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## B. TERMINATION

1. The Employer may terminate this MOU and its participation in E-Verify at any time upon 30 days prior written notice to the other parties.
2. Notwithstanding Article V, part A of this MOU, DHS may terminate this MOU, and thereby the Employer's participation in E-Verify, with or without notice at any time if deemed necessary because of the requirements of law or policy, or upon a determination by SSA or DHS that there has been a breach of system integrity or security by the Employer, or a failure on the part of the Employer to comply with established E-Verify procedures and/or legal requirements. The Employer understands that if it is a Federal contractor, termination of this MOU by any party for any reason may negatively affect the performance of its contractual responsibilities. Similarly, the Employer understands that if it is in a state where E-Verify is mandatory, termination of this by any party MOU may negatively affect the Employer's business.
3. An Employer that is a Federal contractor may terminate this MOU when the Federal contract that requires its participation in E-Verify is terminated or completed. In such cases, the Federal contractor must provide written notice to DHS. If an Employer that is a Federal contractor fails to provide such notice, then that Employer will remain an E-Verify participant, will remain bound by the terms of this MOU that apply to non-Federal contractor participants, and will be required to use the E-Verify procedures to verify the employment eligibility of all newly hired employees.
4. The Employer agrees that E-Verify is not liable for any losses, financial or otherwise, if the Employer is terminated from E-Verify.

## ARTICLE VI PARTIES

- A. Some or all SSA and DHS responsibilities under this MOU may be performed by contractor(s), and SSA and DHS may adjust verification responsibilities between each other as necessary. By separate agreement with DHS, SSA has agreed to perform its responsibilities as described in this MOU.
- B. Nothing in this MOU is intended, or should be construed, to create any right or benefit, substantive or procedural, enforceable at law by any third party against the United States, its agencies, officers, or employees, or against the Employer, its agents, officers, or employees.
- C. The Employer may not assign, directly or indirectly, whether by operation of law, change of control or merger, all or any part of its rights or obligations under this MOU without the prior written consent of DHS, which consent shall not be unreasonably withheld or delayed. Any attempt to sublicense, assign, or transfer any of the rights, duties, or obligations herein is void.
- D. Each party shall be solely responsible for defending any claim or action against it arising out of or related to E-Verify or this MOU, whether civil or criminal, and for any liability wherefrom, including (but not limited to) any dispute between the Employer and any other person or entity regarding the applicability of Section 403(d) of IIRIRA to any action taken or allegedly taken by the Employer.
- E. The Employer understands that its participation in E-Verify is not confidential information and may be disclosed as authorized or required by law and DHS or SSA policy, including but not limited to,

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Congressional oversight, E-Verify publicity and media inquiries, determinations of compliance with Federal contractual requirements, and responses to inquiries under the Freedom of Information Act (FOIA).

F. The individuals whose signatures appear below represent that they are authorized to enter into this MOU on behalf of the Employer and DHS respectively. The Employer understands that any inaccurate statement, representation, data or other information provided to DHS may subject the Employer, its subcontractors, its employees, or its representatives to: (1) prosecution for false statements pursuant to 18 U.S.C. 1001 and/or; (2) immediate termination of its MOU and/or; (3) possible debarment or suspension.

G. The foregoing constitutes the full agreement on this subject between DHS and the Employer.

**To be accepted as an E-Verify participant, you should only sign the Employer's Section of the signature page. If you have any questions, contact E-Verify at 1-888-464-4218.**

Company ID Number:

Approved by:

<b>Employer</b>	
Name (Please Type or Print)	Title
Signature	Date
<b>Department of Homeland Security – Verification Division</b>	
Name (Please Type or Print)	Title
Signature	Date

Company ID Number:

<b>Information Required for the E-Verify Program</b>	
<b>Information relating to your Company:</b>	
Company Name	
Company Facility Address	
Company Alternate Address	
County or Parish	
Employer Identification Number	
North American Industry Classification Systems Code	
Parent Company	
Number of Employees	
Number of Sites Verified for	









**SECTION 00 73 46**  
**DAVIS BACON WAGE RATES DETERMINATION**

General Decision Number: AL20230069 01/06/2023

Superseded General Decision Number: AL20220069

State: Alabama

Construction Type: Heavy  
Including Water and Sewer Line Construction

Counties: Chambers, Cherokee, Clay, Cleburne, Coosa, Jackson, Randolph, Talladega and Tallapoosa Counties in Alabama.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract.  . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract.  . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination,

	if it is higher) for all
	hours spent performing on
	that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023

ENGI0312-009 09/01/2011

	Rates	Fringes
Operating Engineers:		
Crane and Cherry Picker.....	\$ 25.90	10.65
Oiler.....	\$ 22.83	10.65
Cranes with 100 ft. or more boom receive \$0.25 extra per hour,		
Cranes with 200 ft. or more boom receive \$0.50 extra per hour,		
Cranes with 350 ft. or more boom receive \$1.10 extra per hour,		
Cranes with 500 ft. or more boom receive \$1.45 extra per hour,		
Tower Cranes, Derricks, Climbing Cranes, Ringer Cranes shall		
receive \$0.35 in addition to A-rate and boom pay per hour		

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 SUAL2007-154 11/28/2007

	Rates	Fringes
ELECTRICIAN.....	\$ 15.96 **	3.57
LABORER: Common or General.....	\$ 8.54 **	0.00
LABORER: Pipelayer.....	\$ 10.13 **	0.00
OPERATOR: Backhoe.....	\$ 13.46 **	0.00

OPERATOR: Bulldozer.....	\$ 16.60	2.64
OPERATOR: Drill.....	\$ 9.50 **	2.36
OPERATOR: Grader/Blade.....	\$ 12.59 **	1.33
OPERATOR: Loader (Front End)....	\$ 11.67 **	0.00
OPERATOR: Roller.....	\$ 9.45 **	0.00
OPERATOR: Scraper.....	\$ 9.78 **	0.18
OPERATOR: Trackhoe.....	\$ 12.00 **	0.00
TRUCK DRIVER.....	\$ 15.70 **	5.86

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

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\*\* Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

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)).

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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.

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#### 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 National Office because National Office has 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 01 11 13  
SUMMARY OF WORK**

PART 1 – GENERAL

1.01 CONTRACT DESCRIPTION

- A. Contract Type: Unit Price as described in Agreement – EJCDC
- B. The contract award, if made, will be made to the low-responsive bidder. A “responsive” bid shall be evidenced by: (1) A Bid form complete in accordance with the Instructions to Bidders and with instructions and/or requests contained in any other sections of the Contract Documents; (2) A Bid Form not evidencing any apparent unbalanced pricing for the performance of the Items of Work; (3) a Bid Form without excisions, special conditions or qualifications made by the Bidder; and (4) a Bid Form containing no alternative bids or offerings for any items unless such alternative bids or offerings are requested in the Technical Specifications or Contract Documents.
- C. The successful bidder must furnish a Performance Bond for one hundred (100%) percent of the bid amount and a Labor and Material Payment Bond for one hundred (100%) percent of the bid amount and must secure his bond from a bonding company’s representative or agent in the State of Alabama.
- D. The attention of bidders is called to provisions of State Law Governing General Conditions, as set forth in Chapter 4 (Section 65 to 82, inclusive) of Title 46 of the Code of Alabama of 1940, as amended; and bidders shall be governed by law insofar as it is applicable. The above-mentioned provisions of the Code make it illegal for the OWNER to consider a Bid from anyone who is not properly licensed under such code provisions. The OWNER, therefore, will not consider any bid unless the bidder produces evidence that he is so licensed. Neither will the OWNER enter into a Contract with a foreign corporation that is not qualified under State Law to do business in the State of Alabama. **The bidder must be licensed by the Alabama Licensing Board for General Contractors with a major classification of MU (Municipal & Utility). The CONTRACTOR must include his General Contractor’s license number and classification on the outside of the sealed bid envelope.**
- E. Unit Price
1. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.
  2. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.
  3. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any

column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

## 1.02 WORK UNDER THIS CONTRACT

- A. The Contract provides all labor to make improvements to the sewer system.
- B. The work to be performed, but not limited to, shall be in accordance with specifications prepared by The Kelley Group.
- C. The CONTRACTOR will notify the ENGINEER by 8 a.m. Friday of the next week's operations and promptly notify the ENGINEER of any work stoppages due to weather or other conditions preventing work, partial or complete days. The CONTRACTOR will provide the OWNER and ENGINEER with the lift stations to be worked on.
- D. **Line Item #1** - Mobilization/Demobilization to include, but not limited to, insurance, bonds, permits, submittals, existing site documentation, and site cleanup (Limited to 5% of the construction total: 2.5% for Mobilization, 2.5% for Demobilization).
- E. **Line Item #2 – Dredging of Sewer Lagoon**
  - 1. The sewer lagoon has been in operation for approximately 60 years and has built up solids. A lagoon sludge survey was performed and is included in these specifications. The report describes the dry tonnage of solids expected to be encountered.
  - 2. This Line item shall provide for all Labor, Materials, and incidentals required, including but not limited to providing all Sludge Pumps; Polymer, Polymer Makeup Tank, Dosing Pumps, Piping, Geomembrane Bags, Erosion Control; Dry Cake Transportation to Licensed Landfill; Sludge Testing of metals levels for Landfill Disposal; Removal of all Dredging Equipment and Restoring Workplace back into Original Condition.
  - 3. The existing lagoon baffles may be utilized along with additional baffles supplied by the dredging contractor to confine dredging operations into manageable segments allowing the lagoon to continue normal operation during dredging operations. All direct dredging operations are to be completed prior to the removal of existing baffle curtains or installation of new curtains and appurtenances.
  - 4. The option of utilizing geomembrane bags to hold pumped sludge mixed with polymer and allow drying has been proposed. The dredging contractor will be allowed to utilize his own means and methods to accomplish de-sludging the existing lagoon acknowledging that the lagoon shall remain in operation and all water associated with de-sludging operations will be confined to the site and returned to the lagoon for processing without contamination of adjacent streams.

## F. **Line Item #3 – Existing Recycle Eductor Pumps**

1. Past attempts to impart aeration and mixing in the first lagoon cell chamber utilized Recycling Educator pumps.
2. This line item includes all Labor and Materials for the Demolition of Existing Recycle Educator Pumps, Piping, and associated Electrical.
3. Pumps to remain in possession of the Owner and to be transported and offloaded with proper storage at the location selected and as directed by the Owner.
4. Coordinate the removal and or relocation of power as needed after consultation with Alabama Power for the establishment and supplying of 3-Phase Power around the lagoon to all Owner supplied equipment.

**G. Line item #4 – Existing Lagoon Curtains**

1. The existing lagoon curtains have been in service for a number of years, and the existing curtains and their construction are detailed in this project's plan set from Owner supplied record drawings.
2. This line item includes all Labor, Equipment, and fees for the Demolition, Removal, and Disposal of Existing 553 LF & 482 LF of Lagoon Curtains, floats, anchors, and cabling.
3. Existing end anchors in the levee may remain in place where they do not conflict with the installation of new horizontal rotor floating aerators and associated appurtenances.

**H. Line item #5 – Removal of Existing V-notch Weir**

1. The existing V-notch weir is noted on record drawings as being a 15-degree v-notch. The existing v-notch weir angle is too small and becomes inundated during periods of high flow, causing the existing Greyline flow metering equipment to return a maximum flow of .34 MGD until flows recede, sometimes taking days.
2. The intent of this line item is to supply all materials and labor to remove the existing v-notch weir and ready the effluent structure for the installation of a new 60-degree v-notched weir.
3. The existing effluent box has a drain valve that can be used to lower the lagoon water level allowing access to all v-notch anchor bolts.
4. The engineer has not verified the operation of the drain. The contractor should exercise the drain prior to beginning the work to verify proper operation. The contractor is urged to take all necessary precautions to prevent dropping the existing v-notched weir plate in the lagoon and possibly blocking the effluent structure drain.
5. The intent of removing the existing 15-degree v-notch weir is to replace the weir with Bid Line item #16, a new 60-degree v-notch weir to allow the existing flow recording

equipment to be used. The Owner is requesting bids for a new electromagnetic flow meter and vault in Bid Line Item #18. The Owner reserves the right to value engineer Line Item #5 should submitted bids for the electromagnetic flow meter and vault benefit the Owner.

**I. Line Item #6 – Existing Effluent Pumps**

1. The effluent lagoon box houses the existing dual effluent pumps. Line Item #6 shall provide all labor, materials, and bypass pumping required for the demolition, removal, and disposal of the existing effluent pumps, base, rails, riser piping, electrical connections, and associated level and electrical controls.
2. The centerline elevation of the effluent piping is not reported on record drawings. The Contractor shall record the centerline elevation of the existing pipe before removal and report that elevation to the Engineer.
3. As noted in Line Item #5, the effluent box has a drain valve, but the operability of the valve has not been verified. The contractor should verify this valve can be closed prior to beginning the work.

**J. Line Item #7 – Existing Chlorination & Dechlorination System**

1. The existing lagoon achieves disinfection with passive flow-through chlorination and dechlorination boxes located in the existing effluent piping from the effluent structure. To date, the existing chlorination and dechlorination equipment has operated without numerous E. Coli violations. With the intent to increase the pump flow rate using new effluent pumps, the chlorine contact time will decrease.
2. The Owner has made a provision with Line Item #19 to receive bids for a new U.V. Disinfection assembly. However, the Owner reserves the right to value engineer Line Item #7 should the bids received for Line Item #19 not be beneficial to the Owner.

**K. Line Item #8 – Existing Fencing**

1. This line item shall include all labor and materials to remove and relocate existing security fencing in the areas shown on the plans. The intent is to remove the existing fencing to allow the Contractor working room for extension of the lagoon levee during the construction of an earthen pad.
2. Two locations are shown on the plans at opposite ends of the Lagoon. Remove existing fencing and store it in a safe location. Remove fencing to a point beyond the Contractor's limit of construction for the lagoon levee pad extension.
3. After completion of the work to build a pad, replace the stored existing fencing along the toe of the new earthen pad extension.

4. Line Item #9 below makes provisions for the installation of new fencing. The southernmost pad extensions provide areas for the new influent headworks screening and pump station, and a second northernmost levee pad extension provides a construction area for the cloth disk filter and UV Assembly.

**L. Line Item #9 – New Fencing**

1. Furnish and install all labor, materials, and incidentals to install new fencing at each levee extension.
2. The removed and replaced fencing mentioned in Line Item #8 will not complete the security fencing around the lagoon once the levee is extended. This line item is intended to cover all materials required to install complete fencing that mimics the existing.

**M. Line Item #10 – Vertical Cylindrical Micro-Screen Headworks**

1. The Owner is requesting Materials Only bids for the major process equipment to be installed. The Owner will arrange for direct payment to the Supplier for the new Vertical Cylindrical Micro-Screen Headworks. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
2. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations and has a thorough understanding of the Supplier's extent of material delivery and installation instructions.
3. The Contractor is responsible for providing all labor, materials, and incidentals to install the new screening's assembly, including but not limited to excavation, stone base, wet well, ballast concrete, cored and rubber booted connection of 40' extension of influent gravity sewer line with plug for future connection by the CDBG gravity sewer contractor, stone backfill of all excavation and beneath concrete site slab, concrete site base slab with  $\frac{3}{4}$ " chamfer all around, return drain to the lagoon, roll-off hopper for vector control bags and screenings collection, coordination with service within 30 miles to pick up and carry screenings hopper to a licensed landfill for disposal, pad drain line to return drainage to lagoon, core and boot effluent piping from the screenings headworks wet well and supply gravity sewer pipe to the new pump station, and coordinate and install all electrical connections to the supplied equipment with disconnects as stated in the electrical plans.
4. Coordinate electrical service to the screening's headworks during the coordination of 3-phase power around the lagoon.

5. The Engineer will host one Teams meeting between the Engineer, the Owner, the Supplier, and the Contractor to answer any questions after the delivery of the Supplier's approved shop plans. Additional meetings can be scheduled as needed.

**N. Line Item #11 – Package Influent Sewage Lift Station**

1. The Owner is requesting Materials Only bids for the major process equipment to be installed. The Owner will arrange for direct payment to the Supplier for the New Package Influent Sewage Lift Station with Polymer Wet Well and Associated Piping.
2. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
3. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid award. The Contractor is urged to discuss actual installation operations and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
4. The Contractor is responsible for providing all labor, materials, and incidentals to install the Owner purchased New Package Influent Sewage Lift Station with Polymer Wet Well and associated internal piping, rails, hatch, chain, hoist, and above-ground housed piping.
5. Furnish and install watertight connections and effluent piping from the pump station to the lagoon's gravity sewer influent manhole, core and boot connection to the manhole, and Electrical disconnect and connections to make complete the Influent Sewage Lift Station at the manufacturer's direction, including but not limited to excavation, stone base, ballast concrete, core and boot influent gravity sewer from the screenings headworks, stone backfill, coordinate power to the new pump station during installation of 3 phase power around the lagoon.
6. The Engineer will host one Teams meeting between the Engineer, the Owner, the Supplier, and the Contractor to answer any questions after delivery of the Supplier's approved shop plans. Additional meetings can be scheduled as needed.

**O. Line Item #12 – Floating Baffle Curtains**

1. The Owner is requesting Materials Only bids for the Baffle Curtains and associated hardware to be installed. The Owner will arrange for direct payment to the Supplier for the New 560' and 500' Baffle Curtains, cables, wiring, and floats.

2. The Contractor is responsible for all installation and anchoring of the new baffles. The Contractor will verify the slope of lagoon banks, the distance across the lagoon at the coordinates identified on the plan set, and the depth of the lagoon after the completion of sludge removal activities. Report the area of each zone to be created to the Supplier for verification of the process equipment sizing.
3. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
4. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
5. The Contractor is responsible for providing all labor, materials, and incidentals to install the Owner purchased baffle curtains, as shown on the plans to divide the lagoon into 3 cell operations.

**P. Line Item #13 – Seven Floating Baffle Curtains**

1. The Owner is requesting Materials Only bids for the Baffle Curtains and associated hardware to be installed. The Owner will arrange for direct payment to the Supplier for the new Seven (7) 8' x 35' x 35' Floating Baffle Curtains enclosing the Floating Nitrification Rotors and the Lagoon Outfall Structure.
2. The Contractor will be responsible for labor and incidental materials to install the baffles as described in Section 46 60 01 Lagoon Wastewater Treatment Equipment System and noted on the plan set.
3. The Contractor is responsible for all installation and anchoring of the new baffles.
4. The Contractor will verify the slope of lagoon banks, the distance across the lagoon at the coordinates identified on the plan set, and the depth of the lagoon after the completion of sludge removal activities.
5. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
6. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual

installation operations and has a thorough understanding of the Supplier's extent of material delivery and installation instructions.

7. The Contractor is responsible for providing all labor, anchoring materials, and incidentals to install the Owner purchased baffle curtains as shown on the plans and in these specifications.

**Q. Line Item #14 – Aeration/Mixing System**

1. The Owner is requesting Materials Only bids for the 20 Hp horizontal rotor floating aerators, equipment wiring, control panel, and associated hardware to be installed. The Owner will arrange for direct payment to the Supplier for the new 20 Hp horizontal rotor floating aerators.
2. The Contractor will be responsible for labor and incidental materials to install the baffles as described in Section 46 60 01 Lagoon Wastewater Treatment Equipment System and noted on the plan set. The Contractor is responsible for all installation and anchoring of the new aerators and providing electrical service and disconnects to the supplier's control panel.
3. The Contractor will provide the required erosion control riprap to the lagoon bottom beneath the horizontal rotors at the direction of the aerator manufacturer. Over-excavation may be required to achieve the thickness of erosion control specified by the manufacturer.
4. After placement of riprap, provide the engineer and the Owner with the minimum and maximum distance between the rip-rap and the tip of the horizontal rotors.
5. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment. The Supplier will provide delivery and offloading to the Contractor's control.
6. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
7. The Contractor is responsible for providing all labor to install the aeration equipment, anchoring, anchoring materials, coordinating electrical service, and disconnects to Supplier provided control panel as shown on the plans and in these specifications.

**R. Line Item #15 – Nitrification System**



1. The Owner is requesting Materials Only bids for the Six (6) 10Hp Floating Nitrification Rotors and Control Panels. The Owner will arrange for direct payment to the Supplier for the new 10Hp Floating Nitrification Rotors, Cabling, Wiring, and Control Panels.
2. The Contractor will be responsible for labor and incidental materials to install the Owner provided 10Hp Floating Nitrification Rotors complete, including but not limited to, anchoring, electrical disconnects wired to the supplied control panel, and providing electrical service to each floating nitrification rotor when coordinating 3 Phase power around the lagoon as described in Section 46 60 01 Lagoon Wastewater Treatment Equipment System and noted on the plan set.
3. The Contractor agrees to act as the Owner's agent to work with the Supplier on delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
4. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.

**S. Line Item #16 – Installation of New V-notch Weir**

1. This line item provides for all labor, materials, and incidentals to fabricate, construct, and install the new 60-degree v-notch weir after the removal of the existing 15-degree v-notch weir noted in Item H above.
2. As stated in item H, the Owner is requesting bids on a new electromagnetic flow metering structure and reserves the right to value engineer the 60-degree v-notch weir fabrication, construction, and installation should the bid for the electromagnetic flow meter and vault be in the Owner's best interests.
3. With the installation of the new 60-degree v-notch weir, the Contractor will be responsible for re-calibration of the existing Greyline Flowmeter and transducer to accurately read flow across the new 60-degree v-notch weir.

**T. Line Item #17 – Installation of New Effluent Pumps**

1. The Owner is requesting Materials Only bids for the Two (2) New Effluent Pumps, Base and Anchors, Quick Connect Flange, Stainless Rails, Riser Piping, Lifting Chain, Level Sensor, Electrical Control Panel, and Hoist. The Owner will arrange for direct payment to the Supplier for the new effluent pumps and equipment mentioned here.
2. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.

3. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
4. The Contractor will be responsible for labor and incidental materials to install the Owner provided Two (2) New Effluent Pumps, Base and Anchors, Quick Connect Flange, Stainless Rails, Riser Piping, Lifting Chain, Level Sensor, Electrical Control Panel, and Hoist, make any required modifications to the existing pipe penetrations, and provide by-pass pumping as necessary.
5. The contractor will be responsible for all labor, materials, and ancillary equipment to completely install the Owner purchased equipment, including but not limited to piping from the effluent structure to the valve vault, coring new or enlargement of existing wall penetrations in the effluent structure, electrical disconnect and coordinating electrical service to the new pump control panel to make complete the New Effluent Lift Station system at the manufacturer's direction.

**U. Line Item #18 – Installation of Electromagnetic Flowmeter**

1. The Owner is requesting Materials Only bids for a new Electromagnetic Flowmeter with Grounding Rings, and HMI Totalizer with non-volatile memory. The Owner will arrange for direct payment to the Supplier for the new effluent pumps and equipment mentioned here.
2. The Contractor agrees to act as the Owner's agent to work with the Supplier on the delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
3. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
4. The Contractor will be responsible for labor and incidental materials to install the Owner provided Electromagnetic Flowmeter with Grounding Rings, and HMI Totalizer.
5. The Contractor will be responsible for furnishing all Labor, Materials and ancillary equipment, including but not limited to excavation for the concrete vault placing the flow meter in an inverted syphon condition allowing the meter to maintain a full wet barrel at all times, stone bedding, backfill, stone sump for vault drain, concrete vault with drain and aluminum hatch; excavation, stone bedding and pipe from the effluent valve pit to the flow meter; excavation, bedding, and pipe from the flow meter vault

to the cloth disk filter; coring vault penetrations and installing watertight boot joints; associated fittings; pipe stands; electrical connections; piping restraints and concrete kickers; and grading to make complete the effluent flow measurement system as shown on the plan set and in these specifications.

6. The Owner reserves the right to value engineer this line item if bids are not considered in the best interest of the Owner and rely on the removal of the existing 15-degree v-notch weir in Line Item #5 and installation of the fabricated 60-degree v-notch weir in Line Item #16.

#### **V. Line item #19 – Installation of Cloth Filter Disk Assembly**

1. The Owner is requesting Materials Only bids for a new Cloth Disk Filter Assembly. The Owner will arrange for direct payment to the Supplier for the new Cloth Filter Disk Assembly.
2. The Contractor agrees to act as the Owner's agent to work with the Supplier on delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
3. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
4. The Contractor will be responsible for labor and incidental materials to install the Owner provided Cloth Disk Filter Assembly.
5. The Contractor will be responsible for furnishing all Labor, Materials, and ancillary equipment, including but not limited to excavation for the concrete site pad, stone base, reinforced concrete pad with  $\frac{3}{4}$ " chamfer all around, anchoring of the Cloth Disk Filter to concrete pad as directed by the manufacturer, the connection of piping, piping to and from the cloth disk filter, stone bedding for pipe, backfill, associated fittings; joint restraint and concrete kickers, electrical service to the Cloth Disk Filter, disconnect and electrical connections to the Cloth Disk Filter control panel; backwash piping with return to the Lagoon, and grading to make complete and operational the Cloth Disk Filter system as shown on the plan set and in these specifications.

#### **W. Line item #20 – Installation of Ultraviolet Disinfection Assembly**

1. The Owner is requesting Materials Only bids for a new Ultraviolet Disinfection Assembly. The Owner will arrange for direct payment to the Supplier for the new Ultraviolet Disinfection Assembly.

2. The Contractor agrees to act as the Owner's agent to work with the Supplier on delivery schedule, delivery, and safe storage of equipment until such time the Contractor installs the Owner purchased equipment.
3. The Supplier will provide delivery and offloading to the Contractor's control. The Contractor will be provided with a copy of the Supplier's approved shop plans approximately 8 weeks after the bid closing. The Contractor is urged to discuss actual installation operations with the Supplier and have a thorough understanding of the Supplier's extent of material delivery and installation instructions.
4. The Contractor will be responsible for furnishing all Labor, Materials, and ancillary equipment, including but not limited to excavation for the concrete site pad, stone base, reinforced concrete pad with  $\frac{3}{4}$ " chamfer all around, anchoring of the Ultraviolet Disinfection Assembly to the concrete pad as directed by the manufacturer, the connection of piping, piping to and from the Ultraviolet Disinfection Assembly, stone bedding for pipe, backfill, associated fittings; joint restraint and concrete kickers, electrical service to the Ultraviolet Disinfection Assembly, disconnect and electrical connections to the Ultraviolet Disinfection Assembly control panel; backwash piping with a return to the Lagoon, and grading to make complete and operational the Ultraviolet Disinfection Assembly system as shown on the plan set and in these specifications.

**X. Line item #21 – 3-Phase Power**

1. The Contractor will be responsible for coordinating with Alabama Power to establish 3-phase power around the lagoon with disconnects and placing power at each 20 Hp horizontal mixer, each 10 Hp Floating Nitrification Rotor, Influent Headworks Screening, Influent pump Station, Electromagnetic Meter Vault, Cloth Disk Filter, and U.V. Disinfection Assembly as described in the electrical plans and specifications.
2. The Contractor will work with Alabama Power to establish the account in the Owner's name and provide all equipment not provided by Alabama Power to make all electrical connections to equipment as detailed in the plans and specifications.

**Y. Line item #22 – Construction of Headworks Screening & New Lift Station Pad**

1. This line item provides for all Labor, Materials, sourcing, and hauling of suitable fill material, erosion control, placement, and compaction of fill material to create the extension of the Lagoon levee for the placement of a pad for the Headworks Screening and New Lift Station Pad Extensions.

**Z. Line item #23 – Construction of Cloth Disk Filter & U.V. Disinfection Pad**

1. This line item provides for all Labor, Materials, sourcing, and hauling of suitable fill material, erosion control, placement, and compaction of fill material to create the extension of the Lagoon levee for the placement of a pad for the Cloth Disk Filter and UV Disinfection equipment.

**AA. Line Item #24 – Maintenance of Existing Creek**

1. One entrance to the Wedowee Lagoon has an existing Texas Ford Creek crossing. This line item provides for all Labor, Materials, and ancillary equipment required to maintain the crossing for the duration of the project.
2. The Contractor is not required to use this entrance, but if the entrance is used, the Contractor is expected to maintain the crossing and place it back in its original condition at the end of the project.

**BB. Line item #25 – Reconnection of Effluent Piping**

1. This line item provides for all Labor, Materials, by-pass pumping, and ancillary equipment to reconnect the effluent piping from the UV Disinfection Assembly to the existing sewer discharge line to the creek.
2. The contractor shall cap and abandon in place the eliminated portion of an effluent sewer line.

**CC. Line item #26 – Construction of Yard Hydrant**

1. This line item provides for all Labor, Materials, and ancillary items to tap the existing potable water main on AL 48, install the water meter provided by the Owner, meter box with check valve and curb stop, 1.5” water main along the Unnamed Lagoon Entrance Road, extend the water main to the screening and influent pump station, installing one (1) frost proof hydrant to serve the Screening Headworks and Influent pump station, make a connection of potable water to the Screening Headworks, extend the water main around the East side of the Lagoon in the shoulder of the levee pathway to the Cloth Disk Filter and UV Disinfection Assembly, and place one (1) frost proof hydrant to serve the Cloth Disk Filter and UV Disinfection Assembly.

**DD. Line Item #27 – Erosion Control**

1. This line item provides for the Labor, Materials, and all ancillary equipment required to install and construct Erosion Control for all disturbed areas and around all Sludge Dewatering Activities.

2. The Contractor shall monitor all Erosion Control on a daily basis and especially after each rainfall of 0.25” in a 24-hour period. Any Erosion Control found to be damaged shall immediately be corrected.
3. This line item also provides payment for the removal of all erosion control materials at the completion of the project and after proper stands of grass have been established.

**EE. Line item #28 – Seeding & Grassing**

1. This Line Item provides payment for all Seeding and Grassing of disturbed areas for the duration of the project. The contractor will be required to maintain all seeding and grassing efforts until a permanent stand of vegetation is established.

**1.03 PROJECT DESCRIPTIONS**

- A. Wedowee obtained assistance through the Alabama Department of Environmental Management (ADEM) Clean Water State Revolving Fund (CWSRF/ARPA-BIL) and a grant through the Appalachian Regional Commission (ARC) to make improvements to the sewer system.

**1.04 PROJECT OBJECTIVES**

- A. The project objective is to make improvements to the sewer system.

**1.05 SERVICES AND PRODUCTS**

**A. OWNER’s Responsibilities**

1. Review shop drawings and submittal data following approval by ENGINEER within ten (10) days following receipt.
2. Arrange for and deliver OWNER reviewed Shop Drawings, Product Data, and Samples to the CONTRACTOR.
3. Recipients are hereby notified that Buy America Provision must be adhered to. All steel, iron, and manufactured products used in this project are required to be produced in the United States.
4. Make payments on properly submitted and approved payment requests within 30 days of ENGINEER’s review of the submitted invoice.

**B. CONTRACTOR’s Responsibilities**

1. Provide detailed instructions for the construction process/timetable. Supply the OWNER and ENGINEER by 8 am each Friday with the planned location of work for the following week.

2. Schedule for delivery with Supplier; Receive and unload products at the site; inspect for completeness or damage and secure all materials until installation.
3. Handle, store, and install finished products in accordance with manufacturer instructions. Provide the engineer with written, planned execution of the work, including the plan for the handling, storage, and installation of the supplied products.
4. Provide ENGINEER with CONTRACTOR's invoice by the Friday nearest the 25<sup>th</sup> of each month.
5. Attend progress meetings that will be held monthly as close to the 20<sup>th</sup> of the month as possible, or as needed, to review installations prior to submitting an invoice.

#### 1.06 STORED MATERIALS (NOT USED)

#### 1.07 CONTRACTOR'S USE OF SITE

- A. Cooperate with OWNER and adjacent property OWNERS to minimize conflict.
- B. All attempts shall be made to keep all public roads and private drives open during construction. In the event a road closing is unavoidable, the road shall be open within a reasonable time approved by the OWNER, and an alternate route shall be provided during the interruption. All public services, i.e., police and fire, shall be notified by CONTRACTOR prior to any road closing.

#### 1.08 WORK SEQUENCE

- A. Coordinate construction schedule and operations with the OWNER and ENGINEER.

#### 1.09 LICENSES AND PERMITS

- A. The CONTRACTOR shall be responsible for securing from the Local Municipalities all permits, licenses and for paying all taxes required to perform the Contract Work.
- B. The CONTRACTOR shall be responsible for compliance with all Federal, State and local laws and ordinances regarding licenses and permits.

#### 1.10 PROTECTION OF THE OWNER, WORKMEN, AND THE PUBLIC

- A. The CONTRACTOR is responsible for the safe execution of the work.
- B. The ENGINEER and the OWNER shall not be required to act as Safety Engineers or Safety Supervisors.
- C. The CONTRACTOR is solely responsible for the safe prosecution of the work.
- D. It is the CONTRACTOR's responsibility to secure advice from the Safety officer from his insurance company.

1.11 LOCATION OF UNDERGROUND OBSTRUCTIONS.

- A. The CONTRACTOR shall be responsible for carefully protecting utilities during the execution of the work.
- B. Utilities that are damaged due to activities of the CONTRACTOR shall be repaired at no expense to the OWNER.

1.12 REGULATORY REQUIREMENTS

- A. Secure from the office of the Inspection Services, Division of the Public Works Department of the Local Municipalities, Information for regulatory licenses and permits required.
- B. Obtain permits and licenses from each Municipality.
- C. Requirements contained in each individual authority's permit shall become the provisions and requirements for completion of the work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION



**SECTION 01 21 43  
TIME ALLOWANCES**

**PART 1 – GENERAL**

**1.01 EXTENSIONS OF CONTRACT TIME**

- A. If the basis exists for an extension of time in accordance with the General Conditions, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.
- B. Reasonably anticipated days of adverse weather as set forth below shall not be cause for an extension of the Contract time unless such extension is agreed to in writing between CONTRACTOR and OWNER.
- C. The CONTRACTOR shall ask for total adverse weather days. The CONTRACTOR's request shall be considered only for days over the allowable number of days stated below.
- D. Contract is on a calendar day basis.

**1.02 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE**

- A. Standard Baseline shall be regarded as the normal and anticipatable number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for an extension of Contract Time.
- B. Standard Baseline is as follows:

<b><u>January</u></b> 11	<b><u>February</u></b> 10	<b><u>March</u></b> 8	<b><u>April</u></b> 7	<b><u>May</u></b> 5	<b><u>June</u></b> 6
<b><u>July</u></b> 6	<b><u>August</u></b> 5	<b><u>September</u></b> 4	<b><u>October</u></b> 3	<b><u>November</u></b> 5	<b><u>December</u></b> 8

**1.03 ADVERSE WEATHER and WEATHER DELAY DAYS**

- A. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevent exterior construction activity or access to the site within twenty-four (24) hours:
  - 1. precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure
  - 2. temperatures which do not rise above 32 degrees F by 10:00 a.m.

3. temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified.
4. sustained wind in excess of twenty-five (25) m.p.h.
5. standing snow in excess of one inch (1.00")

B. Adverse Weather may include, if appropriate, "dry-out" or "mud" days:

1. for rain days above the standard baseline;
2. only if there is a hindrance to site access or site work, such as excavation, backfill, and footings; and,
3. at a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the ENGINEER.
4. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the CONTRACTOR's scheduled work day, including a weekend day or holiday if CONTRACTOR has scheduled construction activity that day.

#### 1.04 DOCUMENTATION and SUBMITTALS

A. Weather Delay Report

1. Use a copy of Section 01 26 25 as a Weather Delay Report, indicating for each calendar month the days on which construction activity affecting the critical path of the Work was prevented by weather conditions. Mark the column for the general cause, and, under "Specifics," indicate the corresponding measurement of precipitation, temperature, wind, or other influencing factors and the construction activity that was scheduled and delayed. At the end of the month, add up the number of days delay, subtract the baseline number given in Section 01 21 43, and show the resulting claimable days. Submit a copy of the completed report with the next application for payment and with a subsequent claim for time extension. Claims for time extension based upon weather delays will be denied if a submitted report does not corroborate the claim or if no report was submitted when it was required in accordance with this paragraph.
- B. Submit daily jobsite work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.
- C. Submit actual weather data to support a claim for time extension obtained from the nearest NOAA weather station or other independently verified source approved by ENGINEER at beginning of project.

- D. Use Standard Baseline data provided in this Section when documenting actual delays due to weather in excess of the average climatic range.
- E. Organize claims and documentation to facilitate evaluation on the basis of calendar month periods and submit in accordance with the procedures for Claims established in the General Conditions.
- F. If an extension of the Contract Time is appropriate, it shall be implemented in accordance with the provisions of the General Conditions and the applicable General Requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 26 25  
WEATHER DELAY REPORT**

Project Number and Project Name					Month and Year reported below
Day of month	“X” if Work delayed by this cause				See Section 01 21 43 for instructions for this form.
Precip	Temp	Wind	Dryout	Specifics	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
					Total number of days this month with delay due to weather
					Baseline number from Section 01 21 43
					Total – Baseline = claimable days

*\*Attach Weather Data Reports as stated in Section 01 21 43\**

**SECTION 01 30 00**  
**ADMINISTRATIVE REQUIREMENTS**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Project record documents.
- E. Project inspections.
- F. Contract administration forms.
- G. Approved Permits and Approved Construction Plans required at site.

1.02 RELATED REQUIREMENTS

- A. SECTION 00 72 43 - General Conditions
- B. SECTION 00 73 00 - Supplementary Conditions
- C. SECTION 01 70 00 - Execution and Closeout Requirements

1.03 Administration of the Contract

- A. The ENGINEER's normal working hours are from 7:30 A.M. to 5:00 P.M. Monday through Thursday and 7:30 A.M. to 11:30 A.M. on Friday.
- B. The CONTRACTOR will be furnished free of charge three (3) copies of the Project Manual and will be furnished as many additional copies as he may require, at the cost of reproduction. An electronic pdf copy will also be provided.
- C. Contract time shall be based on calendar days. A calendar day is one of twenty-four (24) hours beginning at 12:00 midnight.
- D. The CONTRACTOR shall include verification of all necessary permits to the ENGINEER with the first payment request. A certified Release of Liens form shall be submitted with each following invoice for payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PRECONSTRUCTION MEETING

A. ENGINEER will schedule a meeting after the Notice of Award has been made, and ADEM's approval to award the project has been granted.

B. Attendance Required:

1. OWNER
2. ENGINEER.
3. CONTRACTOR.
4. SUBCONTRACTORS.

C. After notification that the contract has been executed, the ENGINEER will arrange with the OWNER and CONTRACTOR and conduct a pre-construction conference to be held at the project site. **The CONTRACTOR shall require attendance by his major Subcontractors and shall furnish to the ENGINEER and OWNER:**

- 1. List of Subcontractors and Material Suppliers**
- 2. List of Material Supplies**
- 3. Schedule of Values based on Scope of Work**
- 4. Change Orders**
- 5. Invoice Procedure**
- 6. Submittals for Review**
- 7. Submittals for Information**
- 8. Progress Meetings**
- 9. Pre-Close out Meeting**
- 10. Notification of Rain Days**
- 11. 48-hour notification before construction**

D. ENGINEER shall prepare and distribute minutes.

E. Agenda:

1. Designation of personnel representing the parties to Contract, OWNER,

CONTRACTOR, and ENGINEER.

2. CONTRACTOR shall furnish the following prior to his first payment and in accordance with the General Conditions within 10 days after the effective date of the agreement:
  - a. Cost breakdown (Schedule of Values) shall be in standard Construction Specifications Institute format.
  - b. List Sub-CONTRACTORS and major suppliers
  - c. Construction Schedule as defined in Paragraph 2.05 of General Conditions and Supplementary Conditions.
  - d. No payments to the CONTRACTOR shall be made until this information is provided.
3. Roles of Individuals:
  - a. ENGINEER - shall be solely responsible for the direction of the project. All instructions to CONTRACTOR shall come from the ENGINEER. All decisions and directions shall be in writing. Verbal instructions shall be immediately confirmed in writing.
  - b. OWNER - ENGINEER to receive instructions only from OWNER. Program or design changes shall be approved by the OWNER prior to any work being performed by the ENGINEER. Establish ground rules for the CONTRACTOR and his personnel while working on Owner's premises. If representatives of the OWNER find any discrepancies they believe to be contrary to the Contract Documents, they shall notify the ENGINEER. If it is thought that the discrepancy needs immediate attention, the individual discovering the discrepancy and the CONTRACTOR's representative should call the ENGINEER for immediate resolution. Provide staff throughout the project to make judgment calls.
  - c. CONTRACTOR - Work shall be according to the Contract Documents, not necessarily standard practice. The CONTRACTOR shall keep and distribute minutes of all meetings except for the Preconstruction meeting. Emergency action to protect life or property shall be taken immediately by the superintendent on the site. Less urgent action shall be resolved by telephone among the appropriate parties.
4. Change Orders:
  - a. All requests for a change in time and/or money shall be submitted to the ENGINEER, with proper backup data, for his review. The ENGINEER shall submit the Change Order to OWNER with his recommendation of action required. The Change Order shall be approved by OWNER prior to any

additional work being performed.

- b. Change Orders cannot be approved without the proper breakdown as required by the General Conditions, Section 11.01. The same requirements apply to time extension requests.
  - c. Change Orders should be rounded to the nearest whole dollar amount.
  - d. User-paid change orders are not allowed.
  - e. User-requested change orders are to be avoided.
  - f. Change order documents shall be transferred between the OWNER, CONTRACTOR, and ENGINEER using the process designated in the General Conditions.
5. Invoice Procedure:
- a. ENGINEER to provide acceptable invoice format to CONTRACTOR.
  - b. All invoices must include an original with original signatures in blue ink.
  - c. CONTRACTOR shall submit the original and electronic Excel file of the Certificate for Payment directly to the ENGINEER. A certificate for payment need not be notarized.
  - d. After review, the ENGINEER shall process the Certificates as promptly as possible, in any case, within ten (10) days. If a Certificate is held for any reason, a written notice stating the reason for delay should be given to the OWNER and the CONTRACTOR. If a Certificate is changed for any reason, changes will be made to all copies.
  - e. Distribution of copies shall be as follows:
    - (1) ENGINEER forwards original directly to OWNER with a transmittal letter/memo.
    - (2) ENGINEER forwards a copy of the transmittal letter and one (1) copy of the Certificate to CONTRACTOR. One (1) copy is retained for ENGINEER records. One (1) copy sent to OWNER.
  - f. If federal funds are involved, compliance with additional regulations are required, including but not limited to:
    - (1) Davis Bacon Act - Wage rate & payroll records.
    - (2) Drug-Free Workplace Act



(3) Civil Rights EOP poster with the name of EOP person shown.

6. Prior Approval:

- a. Only items as specified or prior approved in accordance with the Contract Documents will be incorporated into the project. Approval of shop drawings does not relieve CONTRACTOR of complying with the Prior Approval clause.

7. Testing Lab:

- a. The OWNER will engage and pay for the testing laboratory if required. If the CONTRACTOR obtains the services of a testing laboratory, he will be responsible for all costs for that laboratory.
- b. ENGINEER should furnish Testing Lab with written notice of types and frequency of required tests. Set up a procedure for Testing Lab notification.
- c. No off-site testing unless called for in the Contract Documents.
- d. OWNER will pay a minimum of standby time for outside testing personnel. CONTRACTOR may be billed if not well controlled.
- e. Testing Lab invoices must be an original with the original signatures of a Lab representative and the ENGINEER on the face of the invoice.

8. Project Sign:

- a. Project sign location to be agreed upon at the pre-construction meeting. Form and substance to match requirements in ADEM Supplemental General Conditions.

9. Meetings:

- a. Establish a time and place for the Monthly Meeting. Notify OWNER prior to and provide minutes of all other meetings.

10. General Correspondence:

- a. Project Number must be on all correspondence.
- b. CONTRACTOR shall copy OWNER on any correspondence if:
  - (1) It involves a controversial issue.
  - (2) It relates to information requests to the ENGINEER that had not been furnished in a timely manner.

11. Miscellaneous Items to be Discussed as Necessary:

- a. Outages/Interruptions of Services. CONTRACTOR is to request, in writing, all outages/interruptions to the user. The amount of advance notice is to be determined by the user. The coordination of outages or interruptions is the responsibility of the CONTRACTOR.
- b. CONTRACTOR use/access to pertinent buildings and facilities.
- c. CONTRACTOR is responsible for the disposal of all other materials in accordance with laws and regulations.
- d. Safety and First Aid. This is the CONTRACTOR's responsibility.
- e. Pictures or videos of existing conditions should be made.

12. Pre-Close Out Meeting

- a. When the project reaches 75 to 80% completion, the ENGINEER will schedule a meeting with the CONTRACTOR and the OWNER to review the requirements and procedures for the Final Inspection and Acceptance.

3.02 PROGRESS MEETINGS

- A. CONTRACTOR shall schedule and administer Project Meetings as necessary for proper and timely completion of the Project. The CONTRACTOR shall:
  1. Notify OWNER, ENGINEER, and those specified to attend.
  2. Prepare agenda.
  3. Record proceedings and distribute to OWNER, ENGINEER, all attendees, and other interested parties.
- B. ENGINEER will attend meetings in his capacity as the OWNER's representative to familiarize himself generally with the progress of the Work and to receive requests for interpretations necessary for the execution and the progress of the Work.
- C. Representatives of the OWNER may attend meetings.
- D. Progress Meetings shall be held monthly at a time agreed to by the ENGINEER prior to submitting each Request for Payment. Progress Meetings shall be held at the City or Town Hall and shall be attended by the CONTRACTOR's field and office representatives responsible for the Project and by representatives of the Subcontractors and major materials suppliers as warranted by the current status of the Work. Agenda for Progress Meetings shall be, but are not limited to, the following:

E. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede or will impede planned progress.
5. Review of RFI log, submittal log, and change order log.
6. Review off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during the succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to Work.

F. CONTRACTOR shall record minutes and distribute copies within two days after the meeting to participants, with two copies to ENGINEER, OWNER, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. **Within 14 days after the date established in Notice to Proceed, submit a preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for the remainder of Work. No Work will be allowed to proceed until the preliminary schedule has been accepted by the Owner and Engineer.**
- B. If the preliminary schedule requires revision after review, submit the revised schedule within 3 days.
- C. **Within 7 days after a joint review of the preliminary schedule, submit a draft of the proposed complete schedule for review.**
  1. Include written certification that major CONTRACTORS and SUBCONTRACTORS have reviewed and accepted the proposed schedule.
- D. **Submit an updated schedule with each Application for Payment.**

- E. Provide projected construction schedules for the entire work; revise periodically.
- F. Prepare a schedule in the form of a horizontal bar chart, with horizontal bars representing Project breakdown by various units of work. Superimpose on bar chart vertical lines representing months of the year and weeks of each month.
- G. Minimum sheet size: As required to fit all information rendered in a legible manner on one (1) sheet.
- H. Provide a complete sequence of construction by activity.
- I. Provide sub-schedules to define critical portions of the entire schedule.
- J. Update Schedule as required. Show all changes since the previous submission of the updated schedule.
- K. Indicate the progress of each activity; show start and completion dates. Revise with each update.

#### 3.04 PROJECT RECORD DOCUMENTS

- A. CONTRACTOR shall maintain documents at the site, as specified in General Conditions. Store record documents apart from documents used for construction.
- B. Provide files and racks for storage of documents.
  - 1. Drawings: Maintain one (1) complete set of blueline prints of Contract Drawings.
  - 2. **CONTRACTOR to include descriptive notes and comments of any issues on one dedicated set of plans to be transmitted to the ENGINEER at the close of the project.**

#### 3.05 PROJECT INSPECTIONS

- A. Where inspections of in-place work are specified, and ENGINEER's approval is required before further work can take place, or where records of procedures are specified; schedule inspection:
  - 1. With ENGINEER.
  - 2. Give no less than twenty-four (24) hours' notice.
- B. **Contractor to notify ENGINEER and ENGINEER's Representative to schedule a quantities inspection five days prior to submitting a monthly invoice.**
- C. Where inspection reveals project non-compliance, reschedule inspection by giving a further twenty-four (24) hours' notice.

3.06 CONTRACT ADMINISTRATION FORMS

A. The following forms will be provided at the pre-construction meeting:

1. Submittal Identification & Contractor's Approval Statement
2. Contractor's Application for Payment
3. American Iron & Steel (AIS) Compliance Form
4. Contractor's Release of Liens Form
5. Change Order Form
6. Contractor's Completion Certificate

B. These forms shall be used as applicable in the administration of the Contract.

3.07 APPROVED PERMITS AND APPROVED CONSTRUCTION PLANS REQUIRED AT SITE

A. CONTRACTOR shall have at the project site during construction all required permits and approved sets of plans as required by Federal, State and Local Law.

B. ADEM NPDES Permit (If Required)

END OF SECTION

**SECTION 01 32 00**  
**CONSTRUCTION PROGRESS DOCUMENTATION**

PART 1 – GENERAL

1.01 SUMMARY

- A. This section covers the requirements for establishing and updating the construction schedule(s) for the project. Wedowee is under Consent Decree with ADEM to complete the project by January 2024.

1.02 SUBMITTALS

- A. CONTRACTOR shall prepare a detailed construction schedule in a graphic format suitable for displaying the schedule and submit four (4) copies of each schedule to ENGINEER at the Preconstruction Conference for review and comment. ENGINEER will return one copy to CONTRACTOR with revisions suggested or necessary for coordination of the work.

1.03 FORMAT

- A. The construction schedule shall show the complete work sequence by activity and location, the dates for the beginning and completion of major task items, and the projected percentage of completion for each item as of the first day of the month. At a minimum, the following items shall be shown separately:

1. Show project-specific items including, but not limited to:
  - a. Mobilization.
  - b. Clearing and Grubbing.
  - c. Topsoil Removal, Stockpiling, and Replacement.
  - d. Pump station Replacement.
  - e. Screenings Headworks
  - f. Sludge Removal.
  - g. Effluent Pump replacement.
  - h. Utility Work (by CONTRACTOR and others).
  - i. Lagoon curtain removal and installation.
  - j. Aerator/mixer installation.

- k. Bioflos installation.
- l. Flow meter installation.
- m. Cloth disk filter installation.
- n. UV installation

B. CONTRACTOR may be required to include a critical path schedule for SHOP DRAWINGS, tests, and other submittal requirements for equipment and materials and show the delivery status of critical and major items of equipment and materials.

#### 1.04 UPDATES

##### A. Construction Schedule Revisions:

1. CONTRACTOR shall submit a revised construction schedule when changes occur when requested by OWNER or ENGINEER, and with each application for partial payment. The revised construction schedule shall show changes that occurred since the previous submission, including the actual progress of each item to date and revised projections of progress and completion.
2. CONTRACTOR shall provide a narrative report, as needed or as requested by OWNER or ENGINEER, to define anticipated problems and their effects on the schedule, recommended corrective actions, and the effect of changes on the schedules of others.

##### B. ENGINEER's Responsibility:

1. ENGINEER's review is only for the purpose of checking conformity with the CONTRACT DOCUMENTS.
2. ENGINEER's review does not relieve CONTRACTOR from any responsibility to determine the means, methods, techniques, sequences, and procedures of construction as provided in the CONTRACT DOCUMENTS.

#### PART 2 – PRODUCTS (NOT USED)

#### PART 3 – EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 33 00  
SUBMITTAL PROCEDURES**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Guidance for submission of Shop Drawings, Product Data, and Samples as required by Specification Sections.

1.02 REQUIRED SCHEDULES

- A. Dates for submission of Shop Drawings, Samples, and Product Data.
- B. Dates, when approved, Shop Drawings, Samples, and Product Data will be needed for each portion of the Project.

1.03 SHOP DRAWINGS

- A. Submit original drawings, prepared by the Contractor, subcontractor, supplier, or distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection details. The drawings must follow the guidelines below:
- B. Drawings must be prepared by a qualified detailer.
- C. Drawings shall identify details by reference to the sheet and detail numbers as shown on Contract Drawings.
- D. Reproducible prints made from Contract Drawings are not acceptable.

1.04 PRODUCT DATA

- A. Submit, where specified, the manufacturer's standard schematic drawings.
- B. Modify drawings to delete information that does not apply to Project.
- C. Supplement standard information to provide additional information applicable to Project.

1.05 Submit, where specified, manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data.

- A. Clearly mark each copy to identify pertinent materials, products, or models.
  - 1. Show dimensions and clearances required.
  - 2. Show performance characteristics and capacities.
  - 3. Show wiring diagrams and controls.



## 1.06 SAMPLES

- A. Submit, where specified, physical examples to illustrate materials, equipment, or workmanship and to establish standards against which completed work will be judged.
- B. Office Samples: Where size and quantity is not specified, submit sufficient to clearly illustrate:
  - 1. Functional characteristics of product or material, complete with integrally related parts and attachment devices.
  - 2. Full range of color samples.

## 1.07 CONTRACTOR'S RESPONSIBILITIES

- A. Review Shop Drawings, Product Data, and Samples in accordance with General Conditions prior to submission. Stamp and initial Shop Drawings, Product Data, and Samples to show Contractor's review prior to submission to ENGINEER for review.
- B. Verify:
  - 1. Field Measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
- C. Coordinate each submittal with requirements of work and Contract Documents.
- D. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by ENGINEER's review of submittals unless ENGINEER gives written acceptance of specific deviations. Identify all deviations in the submittal. Each deviation must be initialed by the ENGINEER for acceptance.
- E. Notify ENGINEER in writing at the time of submission of deviations in submittals from requirements of Contract Documents.
- F. Deliver all submittals to, and collect all reviewed submittals from, the ENGINEER's Office.
- G. Begin no work which requires submittals until submittals are approved.
- H. After ENGINEER's review, distribute copies.

## 1.08 SUBMISSION REQUIREMENTS

- A. Where an earlier date is not specified, schedule submissions and each resubmission to allow at least ten (10) days for ENGINEER's review.
- B. Where Specifications require submittals "For Record Purposes," "For Information Only," or similar wording, submit three (3) copies of each item or one (1) electronic copy. Such submittals will not be stamped and returned by the ENGINEER.
- C. Unless specified "For Record Purposes," "For Information Only," or similar wording, submittals shall be for ENGINEER's review and shall be submitted as follows:
  - 1. Submit six (6) bond copies of Shop Drawings. Two (2) copies will be retained by the ENGINEER, and four (4) copies will be returned to the Contractor for distribution OR submit one (1) electronic copy to the ENGINEER.
  - 2. Submit six (6) copies of Product Data; two (2) copies will be retained by ENGINEER, and four (4) copies will be returned to the Contractor for distribution OR submit one (1) electronic copy to the ENGINEER.
  - 3. Submit Samples in the number and size specified in each Specification Section.
- D. Unless previously agreed by ENGINEER and Contractor, each submission shall be complete and shall include all Shop Drawings, Product Data, and Samples necessary to fully describe each portion of the Project. Partial and incomplete submissions will not be considered.
- E. Accompany submittals with Appendix A: Submittal Identification & Contractor's Approval Statement, containing:
  - 1. Date
  - 2. Number of Copies
  - 3. Project title and number
  - 4. Contractor's name and address
  - 5. The number of each Shop Drawing, Product Datum, and Sample submitted
  - 6. Relation to adjacent structures or materials
  - 7. Field dimensions, clearly identified as such
  - 8. Specifications Section Number
  - 9. Applicable Standards, such as ASTM Number or Federal Specification
  - 10. A blank space, 4" x 5", for ENGINEER's stamp

11. Identification of deviation from Contract Documents (if any)

12. Contractor's stamp, initialed, certifying to review of submittal in accordance with 1.05 A.

#### 1.09 RESUBMISSION REQUIREMENTS

##### A. Shop Drawings:

1. Revise initial Drawings as required and resubmit as specified for initial submittal.
2. Indicate in transmittal letter writing any changes which have been made other than those requested by ENGINEER.

B. Product Data and Samples: Submit new and revised Data and Samples as specified for initial submission.

#### 1.10 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Run the required number of distribution prints from stamped and reviewed submittals. Distribute copies of Shop Drawings and Product Data which carry ENGINEER's stamp to:

1. Contractor's file
2. Job site file
3. Record Documents file
4. Subcontractors
5. Supplier/Fabricator
6. Distribute Samples as directed.

#### 1.11 ENGINEER'S DUTIES

A. Submittals will be reviewed within 10 days of receipt.

B. ENGINEER will review for:

1. Design concept of Project
2. Information given in Contract Documents

C. The ENGINEER's review will not extend to means, methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, or

procedure of construction is indicated or required by the Contract Documents) and will not extend to safety precautions or programs incident thereto.

- D. Review of a separate item shall not constitute a review of an assembly in which the item functions.
- E. ENGINEER will affix stamp and initials verifying his review of submittal.
- F. ENGINEER will return submittals to Contractor for distribution.
- G. ENGINEER will not stamp and return submittals required "For Record Purpose," "For Information Only," or similar wording. Failure of the ENGINEER to respond to such submittals which may not conform to Contract requirements shall not be construed as approval of deviations from the Contract and will not relieve the Contractor from responsibility for compliance with Contract requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 50 00**  
**TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Locations
- B. Access and Staging Area
- C. Temporary utilities.
- D. Temporary water and gas services.
- E. Temporary Electricity Services
- F. Temporary telecommunications services.
- G. Temporary sanitary facilities.
- H. Temporary Controls: Barriers, enclosures, fencing, and sheet piling.
- I. Security requirements.
- J. Fire Protection
- K. Pumping and Draining
- L. Vehicular access and parking.
- M. Waste removal facilities and services.
- N. Project identification sign.
- O. Field offices.

1.02 LOCATIONS

- A. Locate temporary facilities and signs in designated areas to avoid interfering with facility operations. All locations of temporary facilities must be approved by facility staff prior to the beginning of construction.

1.03 ACCESS AND STAGING AREA

- A. In accordance with the general conditions of the contract, it is understood that prior to bidding, the CONTRACTOR became familiar with the conditions existing at the site and accepts the site and conditions thereupon as they are.
- B. Staging Area: The CONTRACTOR and Subcontractors shall locate offices, materials storage and staging, equipment storage and maintenance areas, and similar major facilities in a staging area that does not interfere with operations required under the Contract.

1.04 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Use trigger-operated nozzles for water hoses to avoid waste of water.

#### 1.05 TEMPORARY WATER AND GAS SERVICES

- A. It shall be the responsibility of the CONTRACTOR to determine a source of water and gas service to be used for construction purposes and to make arrangements, pay deposits, furnish and install equipment, piping, valves, outlets, and hoses to provide construction water, and gas during the construction period.
- B. The CONTRACTOR shall pay all costs for water and gas service for construction purposes and shall pay all costs for water and gas used during construction until acceptance.
- C. Provide cold water and paper cups for drinking by Project workers.

#### 1.06 TEMPORARY ELECTRICITY SERVICES

- A. It shall be the responsibility of the CONTRACTOR to determine a source for electric power to be used for construction purposes and to make arrangements, pay deposits, and furnish and install equipment, poles, wiring, switches, and outlets to provide an adequate supply of electricity for lighting and power during construction. Meet applicable safety requirements.
- B. The CONTRACTOR shall pay all costs for providing electric service for construction purposes and shall pay for current use during construction until acceptance.

#### 1.07 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to the field office at the time of project mobilization.

#### 1.08 TEMPORARY SANITARY FACILITIES

- A. Provide adequate temporary toilet facilities for the use of persons working at the site, as determined by the size of the workforce on site and Local Sanitary Code Requirements.
- B. Maintain toilets in a clean and sanitary condition. Provide toilet tissue in a suitable holder. Provide natural or artificial light and ventilation to toilet compartments.
- C. Remove temporary toilets when construction is completed and accepted.
- D. Provide and maintain required facilities and enclosures. Provide at the time of project mobilization.
- E. Maintain daily in a clean and sanitary condition.
- F. At the end of construction, return facilities to the same or better condition as originally found.

#### 1.09 BARRIERS

- A. CONTRACTOR shall construct and maintain until construction is completed and accepted, fences, barricades, and other necessary items required to prevent injury to persons on or about the Project site, damage to property, and intrusion of unauthorized persons.
- B. Provide personal safety equipment for authorized visitors.
- C. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations from damage or displacement.
- D. The CONTRACTOR will be responsible for maintaining access at all times during the construction of the facility.
- E. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for OWNER'S use of the site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- F. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings.
- G. Provide protection for plants designated to remain. Replace damaged plants.
- H. Protect non-owned vehicular traffic, stored materials, sites, and structures from damage.
- I. Traffic Controls: CONTRACTOR shall provide a traffic control plan as needed.

#### 1.10 FENCING

- A. Construction: CONTRACTOR to provide gated access to the work site and remove at the completion of the project.

#### 1.11 SHEET PILING

- A. In addition to the work specified, provide sheet piling, should such be found necessary. All sheet pile designs must be signed by a licensed ENGINEER in the state where the work is being done.
- B. Type, thickness, shoring, bracing and other details in regard to sheet piling shall be CONTRACTOR's sole responsibility and shall be determined by him as necessitated by excavation depth, soil conditions, rainfall, traffic adjacent to site and other related factors.

#### 1.12 SECURITY

- A. Coordinate with OWNER to ensure premises remains secure during construction.

### 1.13 FIRE PROTECTION

- A. Provide general temporary fire protection during the construction period.
- B. Have immediately available suitable fire extinguishers in areas where welding, flame cutting, and other hazardous operations are underway.

### 1.14 PUMPING AND DRAINING

- A. Keep working and storage areas free from water that could damage or that could interfere with the progress of work.
- B. Slope ground to drain surface water away from excavations and structures.
- C. Pump or drain to designated points as determined by the ENGINEER. Distribute discharge to prevent excessive erosion. Replace eroded materials.

### 1.15 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to the use of streets and sidewalks, access to emergency facilities, and access to emergency vehicles. Load all trucks bringing materials to the site or removing earth and debris from the site in a manner to prevent dropping materials, earth, or debris on public streets, roads, and highways.
- B. Coordinate access and haul routes with governing authorities and OWNER. Confirm all local regulations regarding load limits.
- C. Provide and maintain access to fire hydrants free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets. Maintain an installation at all points where and when trucks enter or leave the site to remove materials, mud, or debris immediately from streets, roads, and highways.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- G. Do not allow vehicle parking on existing pavement.

### 1.16 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site Daily.



- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- E. Remove temporary work when need for its use has passed.
- F. Clean area that was occupied by temporary work. Remove debris, rubbish and excess materials from site on a daily basis.

#### 1.17 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on Drawings.
- B. Erect on site at location indicated.
- C. Signs, as necessary for safety and to meet insurance requirements will be required.
- D. No other signs are allowed without OWNER permission except those required by law.

#### 1.18 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.
- D. For exterior storage, provide suitable and sufficient enclosed covered structures with raised flooring, to protect materials and equipment subject to damage by weather or construction work.
- E. Provide weatherproof coverage for materials and equipment needing only limited protection.
- F. Allocate and designate storage areas and workspaces for various trades.
- G. Arrange temporary buildings and designate storage spaces to avoid interfering with operations, to avoid re-handling and to expedite progress of work.

#### 1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- 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.
- D. Restore existing facilities used during construction to original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 51 36  
PUMP STATION FLOW CONTROL**

PART 1 – GENERAL

1.01 SUMMARY

- A. This section addresses the work related to the control of sewage flow. The CONTRACTOR shall furnish all labor, materials, equipment, and supplies and shall perform all work related to the control of sewage flow. Flow control and routing methods shall be subject to review by the ENGINEER prior to work commencing on each portion of the system.

1.02 SUBMITTALS

- A. Submit shop drawings and manufacturer's data in accordance with the provisions of Section 01 33 00 – Submittal Procedures.
- B. **The CONTRACTOR shall submit flow control and sewage bypassing arrangement plans to the ENGINEER for review and approval at least 7 days prior to commencing work on each portion of the system.** Flow control includes, but is not limited to, plugging and bypass pumping or hauling as appropriate for the work to be performed. The plans must be specific and complete, and shall include, but not be limited to, the following details:
1. Capacities of equipment.
  2. Number and types of pump
    - a. Two minimum
    - b. Lead pump to be electric motor powered
    - c. Lag pump to be diesel engine powered.
  3. Road crossing details.
  4. Protection against pipe breaks.
  5. Sewer plugging methods and bypass time duration.
  6. Size, length, material, and method of installation for suction and discharge piping.
  7. Method of noise control for each pump and/or generator.
  8. Locations of bypass equipment, suction intake, and pump discharge.
  9. Alarm system with a monitoring and response plan
  10. List of emergency CONTRACTOR contact phone numbers

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 FLOW CONTROL

- A. Bypassed flows must be discharged to the sanitary sewer system Lagoon, appropriate watertight vehicle or appropriate watertight container.

- B. Flows shall be diverted, hauled, or otherwise handled to prevent flows from interfering with the work to be performed on that portion of the system.
- C. When pumping/bypassing is required, the CONTRACTOR shall supply the necessary pumps, conduits, engines, and other equipment to divert the flow of sewage as appropriate. The CONTRACTOR shall have backup equipment available should the primary system fail. The pumping/bypass system shall be adequate in size to handle the existing peak use flows and additional flows that occur with rainstorms.
- D. The CONTRACTOR shall furnish the labor and supervision to set up, operate, and maintain the pumping/bypass system.
- E. The CONTRACTOR shall select pumping/bypass equipment that will not have noise levels above sixty decibels (60 db) at a distance of 50 feet (50’).
- F. The CONTRACTOR may dispose of the sewage directly to the sewage lagoon.

### 3.02 FLOW CONTROL PRECAUTIONS

- A. When the flow in a sewer line is plugged, blocked, or bypassed, the CONTRACTOR shall take precautions to protect public health and to protect the sewer lines from damage that might result from sewer surcharging. Further, the CONTRACTOR shall take precautions to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. The CONTRACTOR shall be responsible for any damage resulting from his flow control operations.
- B. When the flow in a sewer line is plugged or blocked, the CONTRACTOR shall monitor the conditions upstream of the plug and shall be prepared to immediately start bypass pumping, if needed. No such liquid or solid matter shall be allowed to be discharged, stored, or deposited on the ground, swale, road, stormwater drainage system, or other open environment. The CONTRACTOR shall protect all pumps, conduits, and other equipment used for bypass from traffic.
- C. Should any liquid or solid matter from the sewer collection system be spilled, discharged, leaked, or otherwise deposited to the open environment as a result of the CONTRACTOR’S flow control operations, the CONTRACTOR shall immediately clean up and disinfect the affected area and assume all costs associated herewith. The CONTRACTOR shall also notify the Public Utilities Operations Division and appropriate regulatory agencies.

END OF SECTION

**SECTION 01 71 13  
MOBILIZATION**

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This work consists of preparatory work and operations, including those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; the establishment of offices, buildings, and other facilities necessary for work on the project; the cost of bonds and any required insurance; and other preconstruction expenses necessary for the start of the work, excluding the cost of construction materials.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

- A. Payment will be made at the contract lump sum price, subject to the following provisions:
- B. Partial payment for mobilization will be made in accordance with the following schedule up to a maximum of 5 percent of the original total contract amount, including this item, and payment of any remaining amount will be made up of the completion of all work under the contract.

<b>Percent of Total Contract Amount Earned</b>	<b>Allowable Percent of the Lump Sum Price for the Item</b>
1 <sup>st</sup> Partial Estimate	25
25	50
50	75
75	100

- C. Nothing herein shall be construed to limit or preclude partial payments otherwise provided by the contract.
- D. When the contract does not have a pay item for mobilization, no direct payment will be made for mobilization.

END OF SECTION

**SECTION 01 73 19  
EQUIPMENT INSTALLATION**

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers general installation requirements of new equipment units that have been purchased by the CONTRACTOR as part of this Work. Equipment-specific installation requirements are covered in the equipment sections.

1.02 GENERAL

- A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by ENGINEER.

1.03 COORDINATION

- A. When the manufacturer's field services are provided by the equipment manufacturer, CONTRACTOR shall coordinate the services with the equipment manufacturer. CONTRACTOR shall give ENGINEER written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials shall be as follows:
  - 1. Grout: As specified in the Grouting section.
  - 2. Anti-Seize thread lubricant for SS bolts: as specified in the Anchorage in the Concrete and Masonry section.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results.
- B. Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

- C. Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly. For equipment installed in drinking water facilities, the anti-seize lubricant shall meet the requirements of NSF-61.
- D. When specified in the equipment sections, the equipment manufacturer will provide installation supervision and installation checks. For installation supervision, the manufacturer's field representative will observe, instruct, guide, and direct the CONTRACTOR's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer's field representative will inspect the equipment installation immediately following installation by CONTRACTOR and observe the tests indicated in the equipment sections. The manufacturer's representatives will revisit the site as often as necessary to ensure installation is satisfactory to OWNER.
- E. All equipment shall be protected by the contractor after installation, prior to final acceptance by OWNER. Protection provisions shall be as recommended by the manufacturer and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.

### 3.02 STARTUP AND TESTING

- A. Startup requirements and tests associated with startup shall be as indicated in the equipment sections. Other field tests shall be as indicated in the specific equipment sections. The startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.
- B. Preliminary field tests shall be conducted on all equipment by CONTRACTOR on the equipment indicated in the equipment sections, and the tests shall be performed as indicated. When an installation check is specified in the equipment sections, the equipment manufacturer's representative will participate in these tests to the extent described in the equipment sections.
- C. These tests shall not be considered an acceptance test but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

END OF SECTION

**SECTION 01 75 11  
STARTUP REQUIREMENTS**

PART 1 – GENERAL

1.01 SCOPE

- A. This section includes the requirements for startup and testing all items of equipment and systems that form a part of this Contract and training of OWNER's personnel. The purpose of this section is to define the requirements for bringing individual equipment, systems, and facilities online and for proving proper operation and performance of that Work. CONTRACTOR is required to develop, submit, and maintain detailed plans, including the designation of management and staff, for these activities as specified herein.
- B. The startup, testing, and commissioning services referenced or specified herein include the following:
  - 1. Startup and Testing
    - a. Startup checks
    - b. Functional testing
  - 1. Functional acceptance testing
  - 2. Commissioning
  - 3. Operational acceptance testing

1.02 DEFINITIONS

- A. Startup and Testing is the transitional phase between the completion of construction and the start of commissioning and includes the following:
  - 1. Pre-Startup Activities and Checks - Inspections, tests, and other activities necessary to determine that equipment, systems, and subsystems have been properly manufactured and installed. Pre-startup activities shall include an audit of all factory testing of equipment and compiling the results for comparison to startup and commissioning testing.
  - 2. Functional Testing – Initial limited operation of equipment to demonstrate the capability of installed components to perform their intended functions, respond to controls, and safely interface with external systems, followed by operation of individual systems in manual and automatic mode to test the full functionality of individual systems.
  - 3. Commissioning - The establishment of the treatment processes for the



plant.

4. Operational Acceptance Testing - Continuous testing of complete the treatment processes under specified operating conditions in accordance with the technical Specifications and applicable regulations to demonstrate proper performance of the facility.

#### 1.03 GENERAL

- A. The CONTRACTOR shall be responsible for and furnish all labor, materials, instruments, incidentals, and equipment required for startup, testing, and commissioning. Temporary facilities required to carry out the specified testing, including temporary pipes, pumps, and other appurtenances, shall be furnished and installed, and removed when no longer required for startup, testing, and commissioning. Refer to Section 01 50 00 – Construction Facilities and Temporary Controls for requirements concerning water and power for startup and testing. Chemicals required for startup and testing will be provided by the CONTRACTOR.
- B. Startup and testing shall be conducted during normal working hours during the workweek of Monday through Friday unless otherwise approved by the OWNER. Where continuous long-term testing is required, testing may continue over the weekends and holidays with prior approval from the OWNER.

#### 1.04 CONSTRAINTS

- A. Startup and testing shall be conducted in a manner that does not compromise the operation of the existing facilities or the quality of treated products released from the facility. Any startup and testing activities affecting the operation of the existing facilities shall be coordinated with the OWNER and shall be shown on the Progress Schedule. The OWNER will cooperate with the CONTRACTOR to the extent possible but will have sole authority in decisions affecting existing operations.
- B. The minimum constraints for startup and testing include the following:
  1. Maintain the effluent permit limitations established for the lagoon. The facility NPDES permit is included in the appendix.
  2. Complete the startup checklist for each process equipment; provide the Owner and Engineer with a written report; review the report with Owner and Engineer and discuss findings.
  3. Notify Subs, Manufacturer, Owner, and Engineer of all startup and testing dates 21 days prior to activities.
  4. For each piece of process equipment that does not meet every expectation, schedule repeated attempts within 1 week of initial startup.
  5. Establish a single point of contact to act as the startup manager for startup

activities. Startup manager to be present at regular construction meetings. Startup activities are to only be performed in the presence of the startup manager.

6. Assure that all tests are completed in accordance with accepted testing procedures.
7. Ensure readiness for all testing by completing pre-test checks before scheduling the presence of the Owner and Engineer for the startup.
8. Assure all safety guidelines are established and followed.
9. Ensure the startup team is ready and prepared to perform immediate repairs to any equipment found to not pass the startup program.
10. Schedule a meeting to review Contractor's startup submittals and activities and receive written authorization to proceed.

1.05 STARTUP MANAGER, STARTUP TEAM, AND MANUFACTURER'S FIELD SERVICES REPRESENTATIVES

- A. The CONTRACTOR shall maintain a dedicated startup team led by a startup manager. The individual to be designated as startup manager shall be identified within 45 days of the Notice to Proceed and will be reviewed by OWNER and ENGINEER. Once accepted, the CONTRACTOR shall not change the startup manager throughout the full period of performance of the Work without written permission of the OWNER. Once engaged in the Project, the startup manager shall attend regular construction progress meetings. No startup activities shall begin until the startup manager has arrived at the job site.
- B. The startup manager shall be on Site full-time prior to any field startup and testing activities and shall remain on site until all startup, testing, and commissioning activities are complete.
- C. Startup Manager. The startup manager shall be a startup and testing expert with a minimum of 5 years of experience starting up equipment and systems of similar type, size, capacity, and complexity to the equipment and systems included in this Project. The startup manager shall have the necessary experience to fully understand all startup requirements, manage the CONTRACTOR's resources providing the startup services, and prepare all startup documentation, as specified. The startup manager's assigned duties and responsibilities are those specifically related to planning, supervising, and executing startup activities and shall include, but shall not be limited to, the following:
  1. Coordinating all testing and startup activities.
  2. Preparing all startup and field testing plans, documentation, and forms.

3. Liaising between the CONTRACTOR, ENGINEER, and OWNER for all startup and testing activities.
4. Developing a comprehensive schedule for all startup activities and providing regular schedule updates. The startup and testing schedule shall be incorporated into the Progress Schedule.
5. Scheduling and leading startup, testing, and commissioning planning meetings.
6. Conduct coordination meetings during startup, testing, and commissioning at least weekly.
7. Coordinating manufacturers' services and their certification of proper installation and/or operation of equipment as required by the Specifications.
8. Overseeing and administering all startup, testing, and commissioning activities, including either direct participation in the activities and/or oversight and monitoring of activities. It shall be the startup manager's responsibility to ensure that all tests have been completed in accordance with accepted testing procedures.
9. Ensuring readiness for and coordinating maintenance, repair, and adjustment of equipment and systems during startup testing and commissioning.
10. Conducting or overseeing pre-test checks to ensure readiness for testing. Verify all piping hydrostatic testing and flushing have been completed prior to field testing connected equipment.
11. Ensuring all testing equipment is in proper working order and has been calibrated to appropriate standards.
12. Develop safe work policies and procedures, including lockout/tagout procedures and personal protective equipment policies, that will be followed during all field startup and testing activities. At a minimum, the CONTRACTOR shall comply with OSHA and the OWNER's established safety guidelines. It shall be the startup manager's responsibility to ensure all safety procedures are followed at all times.
13. Reviewing and approving all equipment training sessions prior to submission to ENGINEER to assure that the training is compliant with the requirements of the Specifications and includes all applicable operation, maintenance, safety, functional, performance, and startup and testing information.
14. Organizing teams made up of qualified representatives of Suppliers,

Subcontractors, and others, as appropriate, to efficiently and expeditiously startup and test the equipment and systems installed and constructed under this Contract. The objective of this program shall be to demonstrate to the ENGINEER and OWNER that the structures, systems, and equipment constructed and installed under this Contract meet all performance requirements and that the facility is ready for operation as intended. In addition, the testing program shall produce baseline operating conditions for the OWNER to use in a preventive maintenance program.

15. Ensuring the development and maintenance of records documenting all startup, testing, and commissioning activity. The records shall be organized by a major process system into organized files/binders and turned over to the OWNER prior to applying for final payment. Testing records shall be accessible to the ENGINEER and OWNER at all times to allow monitoring of the progress.
  16. Ensuring the startup team is equipped and ready to make emergency repairs and adjustments to equipment installed and modified as part of the Project.
  17. Scheduling and conducting a one-day workshop with the OWNER and ENGINEER to resolve submittal review comments to the CONTRACTOR's startup, testing, and commissioning plan submittal.
  18. Notifying the OWNER and all respective equipment manufacturers at least 21 days prior to the date when each equipment system is scheduled for pre-startup activities and checks.
  19. Organize International Electrical Testing Association (NETA) acceptance testing in accordance with the Electrical Equipment Installation section.
- D. Startup Team. The startup team shall include the startup manager and all staff deemed necessary for the successful completion of startup, testing, and commissioning. This will typically include engineers, major equipment vendors, operators, and representatives from the Instrumentation and Control System Supplier. Additional trade representatives may be included as project requirements dictate.
- E. Manufacturer's Field Services Representative. The manufacturers shall provide a technically qualified field-service representative for the installation, startup, and testing of equipment furnished, as specified in the equipment sections. The manufacturer shall submit qualifications and experience records for all key personnel to be involved in startup activities.
1. The manufacturer's field services representative shall be employed full-time in installation, startup, and testing of similar equipment and facilities and work directly for the manufacturer.

2. The representative shall have conducted startup activities similar to those required herein on at least two other projects of similar complexity.
3. The OWNER or ENGINEER shall have the right to reject the manufacturer's field services representative at any time for immediate replacement by the manufacturer if the accepted qualifications are not representative of the actual experience or abilities of the representative, as determined by the OWNER or ENGINEER.

#### 1.06 SUBMITTALS

A. CONTRACTOR shall submit the following information in accordance with the requirements of the Submittals Procedures section.

1. Startup manager's qualifications and past project experience, including contact names, addresses, and current telephone numbers of OWNER representatives, can be used to verify the accuracy of the information. Submittal shall be made at the preconstruction conference.
2. Manufacturers' field services representative's qualifications and past project experience, including contact names, addresses, and current telephone numbers, can be used to verify the accuracy of the information.
3. Qualification submittals shall be made 3 weeks before the manufacturer's representative is scheduled to be on Site.
4. Manufacturer's certification of proper installation of all equipment as specified in the equipment sections.
5. Equipment and system startup, testing, and commissioning plans and schedule in accordance with the requirements of this section. The startup manager shall coordinate with Subcontractors and include their information in the startup and testing plan.
6. Unless otherwise specified in the equipment sections, preliminary copies of field calibration results. Submittal shall be made prior to the start of each test for associated systems.
7. Daily logs.

#### 1.07 STARTUP AND TESTING REQUIREMENTS

A. Startup Checks. Prior to field testing of all equipment, the CONTRACTOR shall perform the following:

1. Inspect and clean equipment, devices, and connected piping so they are free of foreign material.

2. Lubricate equipment in accordance with the manufacturer's instructions. Turn rotating equipment by hand.
  3. Open and close valves by hand and operate other devices to check for binding interference, or improper functioning.
  4. Test and commission related electrical system components in accordance with the requirements specified in the Electrical and the Electrical Equipment Installation sections.
  5. Calibrate all instruments associated with the equipment.
  6. Check for proper rotation, adjustment, alignment, balancing, mechanical and electrical connections, and any other conditions that may damage or impair equipment from functioning properly.
  7. Inspect and verify proper anchorage.
  8. Obtain manufacturer's certification of proper installation where specified in the equipment sections.
- B. All equipment shall be confirmed ready to test by the ENGINEER based on the following:
1. Acceptance of CONTRACTOR's startup and testing plan.
  2. Notification in writing by the startup manager that each piece of equipment or system is ready for testing.
  3. Verification by the ENGINEER and OWNER that all lubricants, tools, maintenance equipment, spare parts, and approved equipment operation and maintenance manuals have been furnished as specified.
  4. Cleanliness of equipment, devices, and connected work.
  5. Adequate completion of work adjacent to or interfacing with equipment to be tested.
  6. Confirmation of manufacturer's representative's availability to assist with testing, where specified, and satisfactory fulfillment of all other manufacturers' responsibilities as specified.
  7. ENGINEER's review of all related civil construction, mechanical, and electrical installations.
  8. Confirmation of completion of acceptable testing of all adjacent piping, ductwork, and other affected Work.

C. Functional Testing. All startup checks shall be completed prior to functional testing. Functional testing shall be in accordance with relevant standards and in accordance with the instructions of the manufacturers.

1. Ancillary and/or temporary facilities necessary to recycle, control, or discharge water, air, chemical, or gas from facilities being tested, shall be operational.
2. Functional testing shall include the functional operation of each piece of equipment. All moving parts of equipment and machinery shall be tested and adjusted so that they move freely and function satisfactorily. Functional testing shall demonstrate the correct operation of all hardwired interlocks and controls.
3. Functional testing of power-actuated valves shall include at least 4 full open-close operations. Testing shall demonstrate the maximum number of operations per hour as recommended by the actuator manufacturer without overheating.
4. Once functional testing of individual pieces of equipment is completed, individual systems' functional testing shall commence. Individual system functional testing shall include the startup of the complete system of mechanical, electrical, and instrumentation and control equipment as a functional process system. Field inspection prior to startup, as specified in the Instrumentation and Control System section, and other testing by the Instrumentation and Control System Supplier required to verify readiness for automatic operation of the individual system shall be completed before the commencement of individual system functional testing.
5. Individual system functional testing shall include operation in manual and automatic modes, startup operation, and shutdown in normal and emergency modes. Individual systems shall be tested over their entire operating range and for sufficient time to demonstrate the intended functionality of each piece of equipment and the system. If any part of a system shows evidence of unsatisfactory or improper operation during the test period, correction or repairs shall be made, and the functional testing shall be repeated until satisfactory results are obtained.
6. Functional testing of all process and pumping equipment and drive motors, including auxiliary equipment, shall be in accordance with the appropriate and approved test codes, such as those specified by the American Society of Mechanical Engineers, Hydraulic Institute Standards, and IEEE.
7. Qualified personnel from the electrical and mechanical trades responsible for installation of the equipment, shall be available during functional testing involving electrically operated equipment. Where appropriate, a

representative of the Instrumentation and Control System Supplier shall also be available.

D. Functional Acceptance Testing. Once the CONTRACTOR's functional testing is complete and associated documentation has been submitted and accepted by the ENGINEER, the CONTRACTOR shall conduct functional acceptance testing of each complete process system to demonstrate individual systems meet the specified requirements. Acceptance testing shall include the successful demonstration of all operating functions and conditions that are specified for the equipment, system, and controls. The manufacturer's representative shall be on Site during acceptance testing when specified in the equipment specifications. The Functional Acceptance Testing shall include the following submissions prior to commencement:

1. Prerequisite checklist, to be acknowledged by the ENGINEER prior to initiating the test, that demonstrates that all testing and other Work required to be completed prior to the test is complete.
2. Listing of OWNER's personnel necessary to operate the system and conduct any related monitoring of performance.
3. A listing of CONTRACTOR's personnel designated to supervise and direct the OWNER's operators as required herein.
4. Listing of standby personnel, equipment, and materials that will be available if needed during the test period.
5. Step-by-step procedures for the operation of the facility showing how local and remote control of equipment will be demonstrated.
6. Description of all data and other information to be reported in support of the completed test. Include any blank data logs that may be used for recording results.
7. Descriptions of all necessary calculations that must be completed to verify the specified results are being achieved, including formulas.
8. Blank sign-off form for the test acknowledging the CONTRACTOR's, ENGINEER's, OWNER's, and the equipment manufacturer's acceptance of the test.

E. CONTRACTOR shall provide OWNER and ENGINEER 14 days' notice prior to testing of any individual system. All testing shall be scheduled and conducted such that the specified testing duration can be completed without extending past regular working hours on a Friday.

F. Individual system acceptance testing shall continue for 48 hours without interruption for each system, and all parts shall operate satisfactorily in all respects



under a range of conditions to simulate the full operating range of the equipment or system. If there are multiple parallel components or trains, then the testing duration will be 48 hours for each individual train.

G. If any part of a system shows evidence of unsatisfactory or improper operation during the testing period, correction or repairs shall be made, and the test repeated until the test is successfully completed. Testing interrupted by power failure will not be required to be repeated, but the test shall be continued upon restoration of power and extended to the specified duration at no additional cost to the OWNER.

H. During this testing period, the CONTRACTOR shall operate all equipment.

#### 1.08 COMMISSIONING

A. Once startup and testing are complete, documentation of all startup and testing activities shall be submitted for review and accepted by the ENGINEER. After acceptance, commissioning of the constructed facilities shall be conducted by the CONTRACTOR working with the OWNER and ENGINEER. The facility shall be operated in accordance with the operating permit, laws, and regulations. The CONTRACTOR shall provide mechanics, electricians, and controls technicians during commissioning as required for troubleshooting and repair.

#### 1.09 OPERATION ACCEPTANCE TESTING

A. At the completion of the Individual System Acceptance Tests and when the overall process has stabilized sufficiently as determined by the ENGINEER, operational acceptance testing of the complete facility constructed or modified under the Contract shall be conducted. Operational acceptance testing shall not be conducted concurrently with other individual system acceptance or performance tests.

B. The test shall run for at least 7 days with the entire facility operating in the intended manner. The test shall demonstrate to the satisfaction of the ENGINEER that the facilities are complete and meet all specified requirements, and can be continuously operated for their full intended function. During the testing period, the plant shall operate under all control modes, including manual, remote-manual, and automatic. The OWNER's staff shall operate the facility.

C. Duty and standby equipment shall be alternated so that all equipment is selected for duty operation for a period of at least 2 days during the test. Unless indicated otherwise, if any item malfunctions or a defect is found during the test, the item shall be repaired and the test either extended a duration to be determined by the ENGINEER and OWNER depending on the severity of the malfunction or defect or restarted at time zero with no credit given for the operating time before the malfunction or the defect was found. Malfunctions or defects meeting both of the following conditions may, at the ENGINEER's discretion, be considered grounds for not requiring restarting the test at time zero:

1. Malfunctions that do not cause an interruption to the operation of the facility because standby equipment can be placed into service.
  2. Malfunctions that are corrected within four (4) hours of the time the malfunction is detected. Correction of a malfunction or defect will be considered complete only after the affected equipment is placed back into service and is operating as intended for a continuous period of 24 hours without additional failure.
- D. All malfunctions, defects in materials or workmanship, or other flaws, which appear during this test period, shall be immediately corrected by the CONTRACTOR. If spare parts from the specified spare parts inventory are used to make repairs, they shall be replaced immediately and must be replaced prior to application for final payment.
- E. The CONTRACTOR shall supply all oil, grease, lubricants, fuels, and ancillary equipment required for operational acceptance testing. All shall be filled to their properly full levels before testing.
- F. All plant control system coordination issues shall be resolved, and data trending requirements shall be functional during this period.
- G. During operational acceptance testing, treated water meeting regulatory requirements as determined by the OWNER, will be delivered to the distribution system.

1.10 PERFORMANCE TESTING (NOT USED)

1.11 STARTUP SCHEDULE AND STARTUP AND COMMISSIONING PLANS

- A. Plans and schedules shall be developed to facilitate coordinated and efficient startup, testing, and commissioning of the Project equipment and systems.
- B. The CONTRACTOR shall submit a startup, testing, and commissioning plan and schedule to the ENGINEER no later than 90 calendar days prior to the commencement of startup and testing. A minimum of 21 days shall be allowed for review by ENGINEER and OWNER. The schedule and plan must be accepted a minimum of 30 days prior to the commencement of startup and testing. The schedule and plan shall include sections for startup checks, functional testing, functional acceptance testing, commissioning, and operational acceptance testing.
- C. Forms for startup and testing shall include identification of equipment or system, startup/test date, nature of startup/test, startup/test objectives, startup/test prerequisites, startup/test results, instruments employed for the startup/test and signature spaces for the ENGINEER's witness (where applicable) and the CONTRACTOR's startup manager.

D. Startup Schedule. A startup schedule that provides an overall sequence and duration for all startup, testing, and commissioning activities shall be prepared and maintained. This schedule shall serve as a companion but shall not be a replacement for the startup plan. The startup schedule described in this section shall be integrated into the overall Progress Schedule and shall be prepared as specified for the Progress Schedule in the Construction Progress Schedule section. The Startup Schedule shall be updated weekly to during the startup, testing, and commissioning period.

E. Startup Plan. The Startup Plan shall include the following.

1. Introduction with a narrative description of the overall testing and startup program. The description shall include all contractual or regulatory treatment requirements to be demonstrated.
2. A summary of the objectives and approach for startup checks, functional testing, functional acceptance testing, commissioning, and operational acceptance testing.
3. List the instruments, equipment, and systems that will undergo startup and testing with references to the appropriate PIDs, equipment tags/identification numbers, Specification numbers, and standards for testing procedures.
4. Schedule for startup and field testing for each instrument, piece of equipment (including redundant equipment), and system.
5. Safety and emergency response plan, including a list of emergency and non-emergency contacts (email and phone).
6. Organization chart for CONTRACTOR's startup and testing personnel with assigned responsibilities for each.
7. Startup and testing record-keeping plan.
8. Plan for reuse and disposal of water/wastewater from startup, testing, and commissioning, including information on any required regulatory permits/approvals.
9. Description of temporary facilities that will be provided. List of chemicals to be provided.

F. Within 7 to 14 days of initial submittal of the startup plan, the CONTRACTOR shall schedule a workshop with the OWNER and ENGINEER to present the plan. The CONTRACTOR shall submit minutes of the workshop, including action items and a schedule for updating the startup plan, to the ENGINEER within 3 days of the workshop.

- G. Individual plans for each phase of startup, testing, and commissioning can be assembled as chapters in the startup plan or submitted as individual documents but should be correlated to ensure there is no disagreement between chapters or separate documents.
- H. Startup Checks Plan. The startup checks plan shall be subdivided into plans for each system and major component. Each system/major component plan shall include but not be limited to the following:
1. Identification of information for each component or piece of equipment to be inspected as part of the system. All applicable tag numbers shall be included.
  2. Specific activities to be completed on each component, piece of equipment, or system as required to demonstrate proper installation and connection.
  3. A tracking checklist of prerequisites for the checks and each step of the checking procedure, including any temporary facilities or utility requirements.
  4. Listing of manufacturer's representative(s) to be on-site during the check. Sign off forms for the CONTRACTOR's startup manager.
- I. Functional Testing and Functional Acceptance Testing Plans. The functional testing plan shall include procedures and reporting for functional testing. The functional testing plan shall be subdivided into testing plans for each system. Each system test plan shall include but not be limited to the following:
1. A narrative description of the purpose and goals of the test for each component, piece of equipment, or system, which should include all activities (including those required by vendors/suppliers) necessary to verify proper equipment and system functionality.
  2. Identification of each component or piece of equipment to be tested as part of the system. All applicable tag numbers shall be included.
  3. Schedule and duration for the tests.
  4. Prerequisites for each test, including any temporary facilities or utility requirements.
  5. Pass/fail criteria for the test.
  6. A checklist for tracking testing progress which includes prerequisites for the test and each step of the testing procedure. The checklist shall include specified performance criteria that are to be met.

7. A description of the test apparatus required to conduct the test.
8. Identification of all temporary facilities and chemicals required during startup. Listing of manufacturer's representative(s) to be on-site during the test.
9. Certificates of proper installation, as applicable to the test.
10. Step-by-step detailed procedure of the test. The level of detail shall be sufficient for a witness to be able to follow the steps during the test and be confident that the test is being performed as planned. All steps required to proceed through the test in an orderly manner are considered significant, and each of these steps shall be included in the procedure.
11. Copies of the data recording forms that will be used during the test.
12. Calculation methodologies to be used to evaluate the data and/or test criteria for the test.
13. Sample computations or analyses for the test with results in the same format as the final report. This item is intended to demonstrate how data collected will be used to generate final results. A sample shall be included for each type of computation required for the test and analysis of results.
14. Blank sign-off forms for the test acknowledging the startup manager's, ENGINEER's, OWNER's, and equipment manufacturer's acceptance of the test where applicable.
15. The functional testing plan shall identify constraints for individual systems start-up.

#### 1.12 REPORTS AND RECORDS

- A. Records of all startup and testing shall be compiled by the CONTRACTOR and submitted to the ENGINEER. Prior to being submitted to the ENGINEER, the startup manager shall certify that the results recorded and the tested systems comply with the Contract requirements. Records shall include all documentation assembled for each piece of equipment or system involved in the startup and testing, including all certifications, forms, and check lists completed during the startup and test, and sign-off forms.
- B. Records of all startup and testing shall be compiled as separate documents for each system tested and shall be submitted within 48 hours of completion of the startup and testing for each system. Testing samples that require analysis periods greater than 48 hours shall be clearly defined in the startup plan but shall not preclude delivery of the balance of the records within the 48 hour timeframe.

- C. The CONTRACTOR shall provide formal reporting and documentation of failures, malfunctions or defects, and repairs made during the startup and/or testing activities. A “System Problem Report” form is included as Appendix B and shall be used by the CONTRACTOR to document problems that arise during these tests and their resolution. Records submitted shall include “System Problem Report” forms completed during testing.

#### 1.13 GENERAL TRAINING REQUIREMENTS

- A. Training shall be provided for all equipment and shall be conducted by qualified factory service personnel. General requirements for equipment training are listed in this section, and all costs required thereof shall be included in the CONTRACTOR’s bid. Where specific training requirements are provided in the Equipment sections, any specific training requirements provided in the equipment specification shall be met in addition to the general training requirements provided herein.
- B. Qualified factory service personnel shall instruct the OWNER's operating personnel in correct operation and maintenance procedures. The instruction shall demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment. Such instruction shall be provided while the respective representative's equipment is fully operational. Onsite instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant.
- C. The CONTRACTOR shall have submitted and accepted the O&M Manuals (specified in the Submittals Procedures section) prior to the commencement of training.
- D. A resume of the training instructor and agenda for the training session(s) shall be provided to ENGINEER at least 2 weeks in advance of the training. The training session shall be organized into maintenance versus operation topics and identified as such on the agenda.
- E. CONTRACTOR shall maintain a log of training provided, including instructors, topics (attach agenda), dates, times, and attendance list.
- F. Training sessions shall be organized in a format compatible with video recording. Instructors shall have well-prepared instructional material. The use of visual aids, e.g. films, pictures, and slides, is recommended during the classroom training programs. At least 10 copies of the instruction material shall be made available to OWNER’s staff attending the training session.
- G. The CONTRACTOR shall provide a recording of all training sessions. Completed, labeled DVDs shall be provided to the OWNER for each type of training session. Recording may be done by CONTRACTOR’s staff, but recording shall be high quality and clearly audible and performed from a stable structure or tripod, allowing steady, non-shaking video.

- H. The CONTRACTOR shall notify the ENGINEER at least 28 days in advance of each equipment test or OWNER training session. Training shall be completed immediately after the equipment is placed in service and prior to proceeding to Operation Acceptance Testing.
- I. Training shall be provided on-site to all separate shifts of the OWNER's personnel between the hours of 6:00 a.m. and 9:00 p.m. as necessary.

#### 1.14 OPERATIONS TRAINING

- A. Operations training shall provide a complete overview of all equipment, testing, adjusting, operation, and maintenance procedures. Separate 4-hour operations training sessions shall be provided on-site to all separate shifts of the OWNER's personnel between the hours of 6:00 a.m. and 9:00 p.m. for up to 10 persons. Operations training shall take the form of classroom instruction and hands-on training and shall cover.
- B. Documentation in the final Operations and Maintenance Manuals.
- C. Equipment/system startup and shutdown procedures.
- D. System operation procedures and all modes of operations and safety precautions.
- E. Procedures for dealing with abnormal conditions and emergency situations for which there is a specified system response.
- F. Procedures for troubleshooting.

#### 1.15 MAINTENANCE TRAINING

- A. In addition to operations training, where applicable, hands-on maintenance training shall be provided in separate sessions for mechanical maintenance. Sessions shall run consecutively following the operations training. Each session shall consist of at least one 4-hour training session for mechanical maintenance.

END OF SECTION

**SECTION 01 78 36  
WARRANTIES AND BONDS**

PART 1 – GENERAL

1.01 SUMMARY

A. This section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including the manufacturer's standard warranties on products and special warranties.

B. Related Sections

1. SECTION 01 77 00 – Closeout Procedures

1.02 SUBMITTALS

A. Submit written warranties to the OWNER prior to the date fixed by the ENGINEER for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the OWNER.

B. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the CONTRACTOR or the CONTRACTOR and Subcontractor, supplier, or manufacturer. Submit a draft to the OWNER for approval prior to final execution.

C. Refer to individual Sections for specific content requirements and particular requirements for the submittal of special warranties.

D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8½- inch by 11-inch paper.

E. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the Section in which specified and the name of the product or work item.

F. Provide heavy paper dividers with celluloid-covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of the installer, supplier, and manufacturer.

G. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the project title or name, and the name, address, and telephone number of the CONTRACTOR.



- H. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

### 1.03 WARRANTY EQUIPMENT

- A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure, or that must be removed and replaced to provide access for correction of warranted work.
- B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The CONTRACTOR is responsible for the cost of replacing or rebuilding defective work regardless of whether the OWNER has benefited from the use of the work through a portion of its anticipated useful service life.
- D. OWNER's Recourse: Written warranties made to the OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the OWNER can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with the requirements of the contract Documents.
- F. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the CONTRACTOR.

### 1.04 MANUFACTURER'S CERTIFICATIONS

- A. Where required, the CONTRACTOR shall supply evidence, satisfactory to the ENGINEER, that the CONTRACTOR can obtain manufacturers' certifications as to the CONTRACTOR's installation of equipment.

### 1.05 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the OWNER.
- B. Special Warranties are written warranties required by or incorporated in the Contract

Documents, either to extend time limits provided by standard warranties or to provide greater rights for the OWNER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

**SECTION 02 56 14**  
**SLUDGE REMOVAL AND DISPOSAL**

PART 1 – GENERAL

1.01 DESCRIPTION OF THE WORK

- A. The Contractor shall be responsible for removing, land applying sludge, and/or transporting biosolids to other authorized treatment for disposal in a manner that complies with local, State, and Federal requirements.
- B. Contractor shall be responsible for staging sludge removal, polymer treatment, maintaining geo bags as sludge dries, transport to landfill, and removal of all equipment used in sludge removal.
- C. Any disturbed land, property, or other items shall be repaired to the previous condition.
- D. Soil sampling, sludge sampling, transporting biosolids, and land application shall be completed by the Contractor in accordance with the Alabama Department of Environmental Management requirements, acceptable standards, and Best Management Practices.
- E. Eight (8) grab samples shall be taken to form one (1) composite sample at the end of each work day to determine the percent solids, which shall be recorded to verify the amount of the solids being removed. The Contractor may propose an alternative method during preconstruction for evaluation by the Owner and the Engineer.
- F. Contractor shall be responsible for any additional testing except what is clearly identified as being costs borne by the Owner.
- G. Final reporting shall be completed by the Contractor as required by the United States Environmental Protection Agency (EPA) and Alabama Department of Environmental Management and copies of any reports and/or correspondence with the EPA or Alabama Department of Environmental Management shall be sent to the Owner.
- H. Contractor is responsible for obtaining agreements with licensed landfills and shall send proof of acceptance to the Owner and Engineer.
- I. Contractor shall be responsible for completing and providing to the Owner all necessary forms required by EPA and Alabama Department of Environmental Management for required record keeping and reporting requirements.
- J. Questions regarding the technical aspects of this specification should be directed to Bart Taft, P.E., The Kelley Group, at 256-248-7030 or emailed to Bart@kelleynetwork.com.
- K. Repairs and replacements shall be made by the Contractor at his expense and shall be made with a minimum of time lost.

- L. Time lost due to breakdown or replacement of parts shall not be considered as a basis for payment.
- M. The Owner reserves the right to reject any item of equipment when, in the opinion of the Department's Representative, the item is not in satisfactory operating condition.

PART 2 – SCOPE OF WORK

2.01 WORK REQUIRED

- A. The work required by this project shall consist of furnishing all labor, materials, operation of Contractors plant, equipment, and supervision, and performing all work necessary to complete the lagoon biosolids removal and disposal, all in accordance with this document. The work shall consist of, but not necessarily be limited to, performing the following work tasks where specified:
  - 1. Biosolids removal shall be performed by dredging and/or pumping to fully remove biosolids from the lagoon. The contractor shall remove all biosolids of each lagoon cell bottom, combine them with selected polymer, deposit them in geo bags for dewatering, maintain geo bags during the dewatering process, and transport liquid or dried biowaste to a licensed landfill.
  - 2. Transportation of removed biosolids to an authorized biosolids disposal facility shall comply with all EPA and the Alabama Department of Environmental Management regulations affecting the transport of liquid or dried biosolids.

2.02 BIOSOLIDS REMOVAL

- A. The Contractor shall provide all necessary dredging and/or pumping or biosolids removal equipment and appurtenances as necessary to fully remove biosolids from the designated cells of the lagoon. The following is the approximate volume/weight of biosolids to be removed. The owner performed a sludge survey identifying the solid content and preferred polymer for dewatering. The sludge report is included in the specifications.

Total Volume of lagoon in Cu/Ft	1,393,476
Estimated Depth of Sludge	1 Ft
Total Cu/Yds of Sludge	9,702 Cu/Yds
Percentage of Solids in Sludge	3.2%
Specific Gravity of Sludge	2.61
Calculated Bone-Dry Tons in Sludge	682.6

- B. The interior dikes have a 3:1 slope.
- C. The Contractor shall make himself familiar with the scope of services to be provided for under this contract, and it shall be the Contractor's sole responsibility to determine liquid biosolids, volumes, percent solids, and types to be removed.

- D. The plans and specifications present a suggested method of sludge removal. The Contractor shall determine the most effective method of removing liquid biosolids from the existing lagoons. Any methodology to be used must be in accordance with all EPA and the Alabama Department of Environmental Management regulations. Shop drawings must be submitted and approved prior to the start of contract work.
- E. If needed for the cleaning operation, the Contractor may decant portions of the existing cell to be cleaned only into the front end of the existing lagoon treatment facility by pumping. Care shall be taken not to transfer biosolids from the individual cells into the other portions of the lagoon. After decanting, the use of heavy equipment to remove biosolids increases the risk of damaging the existing lagoon bottom. Should the Owner, his representative, or the Alabama Department of Environmental Management determine that damage has been done to the lagoon seal, remedial work shall be required at the Contractor's expense.
- F. Biosolids shall be removed entirely from the lagoon bottoms. The Contractor shall re-probe each cell on a minimum of 20-foot grid intervals to verify biosolids removed from each cell. Also, biosolids samples will be taken at this level by the Contractor to verify total solids content. Sludge probing shall be by use of a transparent tube with a bottom entry and ball check valve (ie: sludge judge).
- G. Removed biosolids shall be polymer mixed prior to placement in geo bags for dewatering. Screening shall remove excess plastics, floatables, and other debris. Sludge shall be deposited in containers acceptable for disposal at the sanitary landfill. The contractor shall pay all costs associated with pumping, handling, and disposal.

## 2.03 TRANSPORTATION OF BIOSOLIDS

- A. Transportation of biosolids shall be in accordance with these specifications, with the exception that any EPA or the Alabama Department of Environmental Management regulations more stringent than those contained in these specifications shall supersede those contained herein.
- B. The Contractor shall comply with all Federal, State, county, and municipal requirements, regulations, laws, and ordinances. The Contractor, if required, shall be responsible for any traffic plan, signage, barriers, flagmen, etc., on public rights-of-way or additional testing as may be required for transportation and acceptance at a licensed landfill.
- C. The Contractor shall furnish all personnel, pumps, vehicles, testing, reporting, training, equipment, documentation, and safety equipment as necessary to remove, dewater and transport the removed biosolids to a licensed landfill.
- D. All vehicles shall comply with all Federal, State, county, and local transportation requirements and be properly registered and licensed to operate. Configuration of vehicles will be such that biosolids are not spilled from the vehicle while in route. All vehicles will

be cleaned of any biosolids outside of the load area prior to leaving the site and again prior to leaving the landfill transportation activities.

- E. If there are complaints about spillage from transportation equipment, the Contractor shall take the necessary steps to correct the complaints. The Contractor shall be responsible for the immediate cleanup of any spilled biosolids on the plant site and shall include the loading areas and roadways. Cleanup shall include sweeping, shoveling, or washing all equipment and/or road areas. Whenever possible, sweeping or shoveling shall be used for cleanup, with limited washing done so as to use as little water as possible. All cleanup equipment shall be provided by the Contractor.

## 2.04 LAND APPLICATION OF BIOSOLIDS

- A. Application of biosolids shall be in accordance with these specifications, with the exception that any EPA or Alabama Department of Environmental Management regulations more stringent than those contained in these specifications shall supersede those contained herein. Acceptance by a licensed landfill shall be pre-approved by the Engineer and/or the Alabama Department of Environmental Management.
- B. Dewatering activities shall be performed on the plant site and be designed to allow all water runoff to be directed back into the lagoon. No runoff or dewatering shall be allowed to leave the plant site without being directed through the lagoon.
- C. The Contractor shall be responsible for obtaining all necessary approvals for the selected landfill. The Contractor shall provide information to satisfy the Owner and Engineer that the site is approvable by the Alabama Department of Environmental Management
- D. The route for transporting dried solids from the plant site to the landfill shall be submitted to the Engineer for review. Prior to beginning biosolids removal from the lagoon, the Contractor shall indicate where geo bags will be located, how geo bag effluent will be directed back to the lagoon, and any locations for runoff prevention. Application areas to be utilized shall be designated in an approved manner by the Contractor.
- E. In accordance with all EPA and the Alabama Department of Environmental Management regulations, runoff of biosolids during the dewatering and transportation process shall be strictly prohibited. The Contractor shall use whatever means necessary to ensure that no surface drainage of biosolids occurs to downstream landowners, ponds, or waterways. The methods used shall be dependent upon existing site features and the chosen application method. Runoff prevention methods may include but are not limited to, straw bale barriers, silt fences, temporary embankment dikes, sediment traps, plastic sheeting, etc. Upon completion of the project, the runoff prevention measures shall be removed, and the waterways and site restored to the existing conditions. The Contractor shall keep an updated map showing placement of runoff prevention methods.
- F. Surface ponding of biosolids shall not be permitted.

- G. Loading operations and biosolids transport and application shall take place during the hours of 7:00 a.m. and 6:00 p.m., Monday through Saturday unless otherwise approved by the Owner and Engineer.
- H. The staging area (the area where biosolids are unloaded from the transport vehicle) must be acceptable to the licensed landfill.
- I. The Contractor shall provide information concerning the transportation, each type of vehicle, and/or equipment utilized. Further, the Contractor shall maintain a daily writing log of biosolids removed, including pounds (or tons) of dry solids and liquid volume. Solids sampling and testing reports shall be provided to the Engineer by the Contractor at no additional cost.
- J. At the conclusion of biosolids removal activities, ground cover, fences, and appurtenances that were removed or damaged to facilitate access must be replaced immediately to the owner's satisfaction. All equipment and materials shall be removed from the job site upon completion. Berms, haul routes, lagoon sites, and other surfaces damaged or disturbed by the contractors' operations shall be restored to their previous conditions.
- K. The Contractor shall keep equipment in good operating condition at all times. All maintenance will be done at the Contractor's expense.
- L. Cost of utilities and their installation and hook-up will be borne by the Contractor.
- M. The Contractor shall be responsible for maintaining the records of each landfill where biosolids were delivered. This data will be submitted on a form acceptable to the Engineering and the Alabama Department of Environmental Management. This information shall include, as a minimum, and shall be submitted with the shop drawings:
  1. Date(s) and time(s) of biosolids delivery
  2. Amount delivered on each date
  3. Landfill cell applied to
  4. Name of the landfill operator
  5. Any operating difficulties
  6. Number of loads delivered
  7. Weather, including temperature, wind, sun, etc.

## 2.05 SLUDGE DISPOSAL AT OTHER TREATMENT FACILITIES

- A. The Contractor may haul biosolids to other treatment facilities permitted for disposal. Information shall be provided regarding the receiving facility and the facility's anticipated method of biosolid disposal, such as land application, dewatering, and landfill disposal, sludge disposal lagoon, or incineration.
- B. Testing of sludge, other than total solids, is not required if sludge is hauled to a municipal wastewater treatment facility or other permitted wastewater facility unless it is required by the accepting facility.

- C. The Contractor shall provide the Owner the required documentation and records for hauling biosolids to other receiving facilities, final tonnage and/or volume of biosolids hauled, and record of person/company responsible for final sludge disposal.

## 2.06 MEASUREMENT AND PAYMENT

- A. Work performed under this contract shall be paid for as shown on the Bid Form.
- B. Payment of price bid shall constitute full compensation for furnishing all labor, materials, tools, equipment incidentals, and all costs required to fully complete the work.
- C. All work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor, and all costs in connection therewith shall be included in the price bid.
- D. Final payment will only be made for completed and accepted work.
- E. Payment will be made at the prices bid, and the price shall include lagoon cleaning; biosolids hauling; biosolids loading and unloading; any earthwork, excavation, compaction, and/or seeding required for restoration; erosion and sediment control materials and construction, signs, water, additional laboratory test, and any other incidentals necessary to complete the project in accordance with the plans and specifications.

END OF SECTION



**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Preparation
- B. Joints
- C. Installation of Embedded Items
- D. Concrete Placement
- E. Patching
- F. Defective Concrete
- G. Field Testing Concrete

1.02 RELATED SECTIONS

- A. Section 33 30 00 – Sanitary Sewerage

1.03 REFERENCE STANDARDS

- A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
- B. ACI 305 - Hot Weather Concreting
- C. ACI 306 - Cold Weather Concreting
- D. ACI 308 - Standard Practice for Curing Concrete
- E. ACI 318 - Building Code Requirements for Reinforced Concrete
- F. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal Weight Concrete
- G. ACI 347 - Recommended Practice for Concrete Form Work
- H. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures
- I. ACI 503.1 - Standard Specifications for Bonding Plastic Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive

- J. ASTM B-221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
- K. ASTM C-33 - Concrete Aggregates
- L. ASTM C-94 - Ready-Mixed Concrete
- M. ASTM C-150 - Portland Cement
- N. ASTM C-260 - Air Entraining Admixtures for Concrete
- O. ASTM C-330 - Light Weight Aggregates for Structural Concrete
- P. ASTM C-494 - Chemical Admixtures for Concrete
- Q. ASTM C-618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- R. ASTM C-948 - Test Method for Dry and Wet Bulk Density, Water Absorption and Apparent Porosity of Thin Sections of Glass-Fiber-Reinforced Concrete
- S. ASTM D-994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- T. ASTM D-1190 - Concrete Joint Sealer, Hot-Poured Elastic Type
- U. ASTM D-1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
- V. ASTM D-1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

#### 1.04 QUALITY ASSURANCE

- A. The CONTRACTOR shall perform Work in accordance with ACI 301 and ACI 318.
- B. The CONTRACTOR shall maintain one copy of documents on-site.
- C. The CONTRACTOR shall acquire cement and aggregates from the same source for all work.
- D. The CONTRACTOR shall conform to ACI 305 when concreting during hot weather.
- E. The CONTRACTOR shall conform to ACI 306 when concreting during cold weather.
- F. Testing Laboratory Services:

1. The OWNER will employ and pay for the services of an independent geotechnical testing laboratory to perform specific services and necessary tests as outlined below:
  - a. All mix designs shall be proportioned in accordance with Section 4.3 of ACI 318-83. Mix designs must be approved prior to placing the initial concrete at the job site. During concrete placement, an independent geotechnical laboratory technician shall make a set of five test cylinders for every 50 cubic yards, or fraction thereof, of each concrete pour placed each day. The independent geotechnical laboratory technician shall break a cylinder from each set on the 3rd, 7th, 14th, and 28th day.
  - b. CONTRACTOR to provide a minimum of 24 hours notice to ENGINEER prior to pouring concrete.
  - c. During concrete placement, an independent geotechnical laboratory technician shall make all concrete cylinders and slump test at the point where concrete is placed into the forms.

G. Tolerances:

1. The CONTRACTOR shall ensure that cured concrete meets the following tolerances:
  - a. Variations from plumb =  $\pm 3/8$ -in. per 10 ft. but not more than 1 inch total
  - b. Variations from level =  $\pm 3/8$ -in. per 10 ft. but not more than  $1/2$  inch total
  - c. Variations from horizontal =  $\pm 3/8$ -in. per 10 ft. but not more than  $1/2$  inch total
  - d. Variations in size and locations =  $\pm 1/4$  inch openings or sleeves
  - e. Reinforcing steel placement =  $\pm 3/8$  inch

1.05 SUBMITTALS

A. The CONTRACTOR shall submit product data.

1. Submit concrete mix design including the following:
  - a. Break down of material content per cubic yard of concrete.
  - b. Show the dry weight of cement.
  - c. Show saturated surface-dried weights of fine and coarse aggregate.
  - d. Show the weight of water.
  - e. List quantities, types, and names of admixtures.

2. Submit trial mix laboratory reports.
3. Submit product data on each admixture proposed.
4. Submit the certification of aggregate quality. Include a statement for an independent lab that the aggregates used are not reactive.

#### 1.06 STORAGE

- A. The CONTRACTOR shall store cement at the site in an approved manner to prevent the absorption of moisture or contamination.
- B. The CONTRACTOR shall store aggregates at the site in an approved manner to prevent the inclusion of foreign materials in the concrete.
- C. The CONTRACTOR shall store admixtures in an approved manner to prevent contamination, evaporation, or damage. The CONTRACTOR shall protect liquid admixtures from freezing and from harmful temperature ranges.

#### 1.07 QUALIFICATION FOR READY-MIX CONCRETE MANUFACTURER

- A. Concrete shall be manufactured and delivered to the project site by a ready-mix manufacturer experienced in ready-mix concrete.

#### 1.08 JOB CONDITIONS

- A. The CONTRACTOR shall follow methods outlined in ACI 306 if the concrete is to be placed when the atmospheric temperature is expected to be less than 40° F.
- B. Calcium chloride will not be considered for approval as an accelerating admixture during cold weather construction.
- C. The CONTRACTOR shall follow methods outlined in ACI 305 if the concrete is to be placed when the atmospheric temperature is expected to exceed 90° F.
- D. Manufacturer's recommendations shall be strictly followed in regard to atmospheric temperature limitations during the application of epoxy or acrylic polymer-modified concrete materials.

### PART 2 – PRODUCTS

#### 2.01 GENERAL

- A. Class A concrete shall be formed reinforced concrete having a 28-day minimum compressive strength of 4000 pounds per square inch. Class A concrete shall be cast-in-place in forms for foundations, pipe collars, footings, piers, sidewalks, curbs and gutters, headwalls, manholes, monolithic sewers, and similar structures.

- B. Class B concrete shall be non-formed, non-reinforced concrete having a 28-day minimum compressive strength of 3000 pounds per square inch. Class B concrete shall be used for bottom trench stabilization, pipe protection encasement, pipe collars, anchors, massive sections, and similar work.
- C. Other classes, types, or designs for cast-in-place concrete may be specified in the Plans or Special Conditions or approved by the ENGINEER as circumstances require.
- D. Concrete ingredients shall be selected, proportioned, and mixed to produce a workable, homogeneous concrete.
- E. Concrete components shall conform to the minimum requirements of this section.

## 2.02 CONCRETE MATERIALS

- A. Portland Cement shall conform to the following:
  - 1. All water-bearing structures shall conform to Type V ASTM C-150, including optional tables. Tri-calcium Aluminate shall not exceed 5%.
  - 2. Non-water bearing structures shall conform to the requirements of ASTM C-150, Type 1.
  - 3. The CONTRACTOR shall use one brand of cement throughout the project unless otherwise acceptable to the ENGINEER.
- B. Fly Ash, if permitted, shall conform to the requirements of ASTM C-618, Type F.
- C. Normal weight aggregates shall conform to the requirements of ASTM C-33 and as specified in this section. The CONTRACTOR shall provide aggregates from a single source for exposed concrete.
  - 1. For exterior exposed surfaces, the CONTRACTOR shall not use fine or coarse aggregates containing spall-causing deleterious substances.
  - 2. Local aggregates not in compliance with the soundness and durability requirements of ASTM C-33 shall not be used except with prior written approval of the ENGINEER and provided it can be shown by special testing or a record of past performance that these aggregates produce concrete of adequate strength and durability. Aggregate soundness testing for fine and coarse aggregates shall be in accordance with ASTM C-88 using a sodium sulfate solution.
- D. Fine aggregates shall conform to the requirements of ASTM C-330. The content of material passing a number 200 sieve shall not exceed 4 percent. The CONTRACTOR shall use only clean, sharp, natural sand.
- E. Coarse aggregates shall be crushed limestone conforming to the requirements of ASTM C- 33. Crushed limestone for coarse aggregate shall consist of uncoated particles of sound,

the durable rock of uniform quality containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension). Content of material passing a number 200 sieve shall not exceed 0.5 percent. No surface, yellow or soft stone shall be permitted. The specific gravity of the stone shall not be less than 2.56.

- F. Water shall be clean and potable.
- G. The CONTRACTOR shall provide concrete admixtures which contain not more than 0.1 percent chloride ions.
  - 1. Water-reducing admixture shall conform to requirements of ASTM C-494, Type A.
  - 2. Air-entraining admixture shall conform to requirements of ASTM C-260, certified by the manufacturer to be compatible with other required admixtures.
  - 3. High-range water-reducing admixture (Super Plasticizer) shall conform to requirements of ASTM C-494, Type F or Type G.
  - 4. Water-reducing, accelerating admixture shall conform to requirements of ASTM C-494, Type E.
  - 5. Water-reducing, retarding admixture shall conform to requirements of ASTM C-494, Type D.

## 2.03 RELATED MATERIALS

- A. Granular Base and/ or Sand Cushion: As shown and specified on the Construction Drawings.
- B. Vapor Retarder: The CONTRACTOR shall provide vapor retarder cover over prepared base material where indicated below slabs on grade. The CONTRACTOR shall use only materials that are resistant to deterioration when tested in accordance with ASTM E-154. Vapor retarder shall consist of a Polyethylene sheet not less than 6 mils thick.
- C. Absorptive Cover: The CONTRACTOR shall provide burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M-182, Class 2, where required.
- D. Moisture-Retaining Cover: During curing, the CONTRACTOR shall provide a moisture-retaining cover complying with ASTM C-171, where required.
- E. Liquid Membrane-Forming Curing Compound: The CONTRACTOR shall provide a liquid-type membrane-forming curing compound complying with ASTM C-309, Type I, Class A where required. Apply at 200 sq. ft./gal.
- F. Water-Based Acrylic Membrane Curing Compound: The CONTRACTOR shall provide a water-based acrylic membrane curing compound conforming to ASTM C-309, Type I, Class B.

- G. Bonding Compound: The bonding compound shall be polyvinyl acetate or acrylic base.
- H. Epoxy Adhesive: The CONTRACTOR shall provide epoxy adhesive conforming to ASTM C-881 two-component material suitable for use on dry or damp surfaces. The CONTRACTOR shall provide material Type, Grade, and Class to suit project requirements.
- I. Sealer: The CONTRACTOR shall provide a sealer conforming to the ALDOT Standard Specifications.
- J. Forms shall be new material at the project start. Undamaged forms meeting the requirements of allowable tolerances may be reused with approval from the ENGINEER. Forms shall be constructed of steel or finished lumber true to line and grade, mortar tight, and free from irregularities and holes. They shall be of sufficient strength to avoid displacement and held together with approved form clamps. Forms shall be coated with non-staining mineral oil or other ENGINEER-approved release agents. Forms shall be removed within 24 to 72 hours after placing concrete but shall not be removed until inspected and approved by the ENGINEER or his agent.

#### 2.04 PROPORTIONING AND DESIGN OF MIXES

- A. Concrete mix design for particular applications shall be submitted to the ENGINEER for approval.
- B. An independent testing laboratory acceptable to the ENGINEER for preparing and reporting proposed mix designs shall prepare design mixes for each type and strength of concrete by laboratory trial batch methods as specified in ACI 301.
- C. Design mixes shall provide normal weight, air-entrained concrete with the following properties, as indicated on the Plans, per ASTM C-94.
  - 1. Cement: Type V ASTM C-150 including optional tables. Tri-calcium Aluminate for all water-bearing structures and surfaces shall not exceed 5%. Type I may be used for non-water-bearing structures.
  - 2. Admixtures:
    - a. Air entraining shall conform to ASTM C-260.
    - b. Pozzolans shall conform to ASTM C-618.
    - c. Admixtures other than air-entraining agents and pozzolans shall be used only when authorized in writing by the ENGINEER.
  - 3. Coarse Aggregate shall be Number 57, conforming to ASTM C-33.
  - 4. Fine Aggregate shall conform to ASTM C-33.
  - 5. Slump shall be between 3 and 5 inches.

6. Air content shall be 6% ± 1%, conforming to ASTM C-94.		
7. Mix Proportioning: One Cubic Yard	Class A	Class B
a. Minimum 28 day compressive strength (psi)	4000	3000
b. Cement per cubic yard Concrete (lbs.).		
1. Minimum	517	423
2. Maximum	N/A	517
c. Pozzolan (fly ash) (lbs./cubic yard)	100	N/A
d. Volume of water per cu. ft. of cement – Maximum (Gal)	*	7.5
*Water to cement ratio for all water bearing structures and surfaces shall be in the range of 0.45 to 0.48.		
e. Amount of air entrained in fresh mix	ASTM C-0 94 (LR)	

2.05 CONCRETE MIXING

- A. Ready-mix concrete shall comply with the requirements of ASTM C-94, and as specified.
- B. Mix concrete only in quantities for immediate use.
- C. Do not retemper or use set concrete.
- D. Type V cement shall be used for all sewage-containing structures.

2.06 REINFORCING MATERIAL FOR CAST IN PLACE CONCRETE

- A. Reinforcing bars shall conform to the requirements of ASTM A-615, A-616, or A- 617. Reinforcing bars shall be grade 60 deformed bars.
- B. Welded wire fabric or cold-drawn wire for concrete reinforcement shall conform to the requirements of ASTM A-185 or ASTM A-82, respectively.

2.07 GROUT FOR FILLING OF VOIDS

- A. Grout shall be flowable fill material with a 1000 psi compressive strength at 28 days when using a 4" x 8" cylinder mold. The CONTRACTOR shall submit the design mix to the ENGINEER for approval prior to beginning work.

PART 3 – EXECUTION



### 3.01 PREPARATION

- A. The CONTRACTOR shall prepare previously placed concrete by cleaning it with a steel brush and applying a bonding agent in accordance with the manufacturer's instructions.
- B. In locations where new concrete is dowelled to existing work, the CONTRACTOR shall drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.
- C. The CONTRACTOR shall coordinate the placement of joint devices with the erection of concrete form work and placement of form accessories.
- D. The CONTRACTOR shall coat contact surfaces of forms with an approved, nonresidual, low-VOC form-coating compound before reinforcement is placed.
- E. The CONTRACTOR shall not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. The CONTRACTOR shall apply form-coating material in compliance with the manufacturer's instructions.
- F. The CONTRACTOR shall coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

### 3.02 JOINTS

- A. The CONTRACTOR shall locate and install construction joints as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable to the ENGINEER.
- B. The CONTRACTOR shall provide keyways shown in the Plans, in construction joints for walls, slabs, and between walls and footings as shown on the Plans.
- C. The CONTRACTOR shall place construction joints perpendicular to main reinforcement. The CONTRACTOR shall continue reinforcement across construction joints except as otherwise indicated. The CONTRACTOR shall not continue reinforcement through the sides of strip placements.
- D. The CONTRACTOR shall use a bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. The CONTRACTOR shall provide water stops in construction joints as indicated. The CONTRACTOR shall install water stops to form a continuous diaphragm in each joint. The CONTRACTOR shall make provisions to support and protect exposed water stops during the progress of Work. The CONTRACTOR shall field-fabricate joints in water stops in accordance with manufacturer's printed instructions.
- F. The CONTRACTOR shall construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as equipment bases and elsewhere as indicated.

### 3.03 INSTALLATION OF EMBEDDED ITEMS

- A. The CONTRACTOR shall set and build into Work anchorage devices and other embedded items required for other Work that is attached to or supported by cast-in-place concrete. The CONTRACTOR shall use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
- B. The CONTRACTOR shall set edge forms, bulkheads, and intermediate screed strips for slabs to obtain the required elevations and contours in finished surfaces. The CONTRACTOR shall provide and secure units to support screed strips using strike-off templates or compacting-type screeds.
- C. All exposed formed concrete edges shall have a 3/4" chamfer unless otherwise noted.

### 3.04 CONCRETE PLACEMENT

- A. Prior to placing an order for concrete, the CONTRACTOR shall inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. The CONTRACTOR shall notify other crafts to permit the installation of their work and cooperate with other trades in setting such work. In addition to other equipment required for placement, the CONTRACTOR shall provide standby vibrators (minimum of two (2) units) during all concrete placement.
- B. The CONTRACTOR shall comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.
- C. The CONTRACTOR shall deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, the CONTRACTOR shall provide construction joints as herein specified. The CONTRACTOR shall deposit concrete to avoid segregation at its final location.
- D. The concrete shall be placed in such a manner to produce solid concrete free of honeycomb, and sand streaks. Concrete shall not be allowed to drop freely a distance greater than 5 feet. Concrete shall be compacted with mechanical vibrating equipment supplemented by hand spading and tamping. It shall be placed upon clean, damp surfaces, free from water. Concrete that has contained its water content for more than 45 minutes shall not be placed unless a variance is approved by the ENGINEER. Freshly placed concrete shall be protected from washy rain, flowing water, or other injurious conditions and shall not be allowed to become dry from the time it is placed until the expiration of the 7-day curing period.
- E. The CONTRACTOR shall be required to have all necessary equipment and supplies on-site before starting a pour, including two vibrators, concrete buckets, pumps, cranes, and curing compounds as applicable.
- F. The CONTRACTOR shall deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of

several layers, the CONTRACTOR shall place each layer while the preceding layer is still plastic to avoid cold joints. When placing concrete, the use of aluminum pipe or other aluminum conveying devices will not be permitted. Maximum height of concrete free fall shall not exceed 5 feet. The CONTRACTOR shall use placement devices such as chutes, pouring spouts, and pumps as required. Concrete that has contained its water content for more than 60 minutes shall not be placed unless a variance is approved by the ENGINEER.

1. The CONTRACTOR shall consolidate placed concrete with hand-held mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. The CONTRACTOR shall use equipment and procedures for the consolidation of concrete in accordance with ACI 309. Form vibrators are prohibited.
  2. The CONTRACTOR shall not use vibrators to transport concrete inside forms. The CONTRACTOR shall insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effects of the machine. The CONTRACTOR shall place vibrators to rapidly penetrate the placed layer and at least 6" into the preceding layer. The CONTRACTOR shall not insert vibrators into lower layers of concrete that have begun to set. At each insertion, the CONTRACTOR shall limit the duration of vibration to the time necessary to consolidate concrete and complete the embedment of reinforcement and other embedded items without causing segregation of mix.
- G. The CONTRACTOR shall deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
1. The CONTRACTOR shall consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. The CONTRACTOR shall bring slab surfaces to the correct level with straightedge and strike-off. The CONTRACTOR shall use bull floats prior to beginning finishing operations.
  3. The CONTRACTOR shall maintain reinforcing in the proper position during concrete placement.
- H. The CONTRACTOR shall protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures in accordance with provisions of ACI 306.
- I. When air temperatures have fallen to or are expected to fall below 40°F (4°C), the CONTRACTOR shall uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27°C) at point of placement.

1. The CONTRACTOR shall not use frozen materials or materials containing ice or snow or place concrete on a frozen subgrade or on a subgrade containing frozen materials.
  2. The CONTRACTOR shall not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
  3. The CONTRACTOR shall maintain the concrete at a temperature of not less than 50°F and not more than 90°F for a period not less than 72 hours.
- J. When hot weather conditions exist that would seriously impair the quality and strength of concrete, the CONTRACTOR shall place concrete in compliance with ACI 305 and as herein specified.
1. The CONTRACTOR shall cool ingredients before mixing to maintain the concrete temperature at time of placement below 90°F (32°C).
- K. All permanently exposed concrete work inside and outside shall be thoroughly rubbed with Carborundum stones to remove from marks and other defects, and produce a smooth, uniform finish, no sooner than 24 hours, nor later than 72 hours after the placement of the concrete. In lieu of rubbing the unfinished concrete, the CONTRACTOR may seal the concrete with a sealing compound approved by the ENGINEER.
- L. After the concrete has been placed, it shall be protected against the loss of moisture and damage from other adjacent construction operations. The concrete shall be kept wet until forms have been removed. After forms have been removed, the concrete shall be rubbed as specified and then wetted and tightly covered with polyethylene film or other approved curing material for a period of twenty-one (21) days in accordance with ASTM C-309 for curing concrete. It shall be the responsibility of the CONTRACTOR to maintain moisture in the concrete during the specified curing period.

### 3.05 PATCHING

- A. Allow ENGINEER to inspect concrete surfaces immediately upon the removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.
- C. Patch imperfections as directed by the ENGINEER.

### 3.06 DEFECTIVE CONCRETE

- A. Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements shall be considered defective.

- B. The CONTRACTOR shall repair or replace defective concrete as directed by the ENGINEER.
- C. The CONTRACTOR shall not patch, fill, touch up, repair, or replace exposed concrete except upon the express direction of the ENGINEER for each individual area.

### 3.07 FIELD TESTING CONCRETE

- A. Strength Tests During the Work: The ENGINEER will make five concrete test cylinders for every 50 cubic yards poured or for each day pour, whichever amount of concrete is smaller. Cylinders will be made and tested in accordance with ASTM C-31, ASTM C-172, and ASTM C-39. The standard age of the test shall be 28 days. The first cylinder will be broken at 7 days. If the 7-day break exceeds the specified strength, then no further tests will be made until the 28th day. If the 7-day break does not meet the specified strength, then the second cylinder will be tested on the 14th day. In either event, the remaining cylinder(s) will be tested on the 28th day. When the test cylinders fail to conform to the compressive strength requirements, the ENGINEER shall have the right to order a change in the concrete mix for the remaining portions of the Work at no additional cost to the OWNER. The CONTRACTOR may wish to make additional cylinders at his own expense as verification.
- B. Test of Hardened Concrete in or Removed From the Structure: When the results of the strength tests of the control specimens indicate the concrete as placed does not meet specification requirements, or where there is other evidence that the quality of the concrete is below specification requirements, core-boring tests shall be made in conformance with ASTM C-42. Core specimens will be tested by the OWNER. All deficiencies shall be corrected, or if the CONTRACTOR elects, he may submit a proposal for approval that load tests be made. If the proposal is approved, the load test shall be made by the CONTRACTOR, and the test results evaluated by the ENGINEER. If any concrete shows evidence of failure during the load test or fails the core test as evaluated, the deficiency shall be corrected. Any deficiency shall be corrected in a manner approved by the ENGINEER, and at no additional cost to the OWNER.
- C. During the concrete placement, the OWNER's testing representative shall be responsible for making the test cylinders. The CONTRACTOR shall furnish the molds, and shall furnish a container suitable to the OWNER's testing representative for storing cylinders in a moist, or saturated condition, at the CONTRACTOR's expense. The OWNER's testing representative and/or the OWNER shall transport and test the cylinders at no expense to the CONTRACTOR. The cylinders will be tested at the OWNER's designated testing facility.

END OF SECTION

**SECTION 22 05 23**  
**GENERAL DUTY VALVES FOR PLUMBING PIPING**

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Valves, General
2. Gate Valves
3. Balancing Valves
4. Ball Valves
5. Swing Check Valves
6. Backflow Prevention Assemblies
7. Pressure Regulating Valve-Domestic Water
8. Thermostatic Master Mixing Valves (ASSE 1017 Rated)
9. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated)

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.

B. Valves, General

1. Apollo
2. Armstrong
3. ASCO
4. Cla-Val
5. Conbraco
6. Crane

7. Clow
8. Griswold
9. Hammond
10. Hays
11. Jenkins
12. Josam
13. Kennedy
14. Milwaukee
15. Mueller
16. Nibco
17. Red-White Valve
18. Smith
19. Stockham
20. Tour Anderson
21. Wade
22. Watts
23. Wilkins
24. Zurn
25. Or approved equivalent.

C. Gate Valves

1. See Valves General above.

D. Balancing Valves

1. Caleffi
2. Griswold

3. Hays
4. Armstrong CBV
5. Tour Anderson
6. Or approved equivalent.

E. Ball Valves

1. See Valves General above.

F. NSF Valves

1. Clow
2. Kennedy
3. Nibco
4. Or approved equivalent.

G. Swing Check Valves

1. See Valves General above.

H. Backflow Prevention Assemblies

1. Backflow Preventers
  - a. Apollo
  - b. Cla-Val
  - c. Conbraco
  - d. Watts
  - e. Or approved equivalent.
2. Backflow Prevention Assemblies - Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications - 2-inches and Smaller:
  - a. Febco 860-with 650A.
  - b. Conbraco 40-210-AGD.
  - c. Wilkins 375-XL-SAG.



- d. Watts 919-QT-S valve with 919AGC or 919AGF.
  - e. Or approved equivalent.
3. Backflow Prevention Assemblies - Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications - 2-1/2-inches and Larger:
- a. Febco 860 with 758A.
  - b. Conbraco Apollo 40-700 with 758A.
  - c. Watts 909-S-NFA-NRS with AGC.
  - d. Wilkins 375-FSC.
  - e. Or approved equivalent.
4. Backflow Prevention Assemblies - Double Check Valve Assembly (DCVA) for Low Hazard Applications - 2-inches and smaller:
- a. Febco 850-650A
  - b. Conbraco Apollo 40-110-T2
  - c. Watts 007-QT-FDA-S
  - d. Wilkins 350-S-XL
  - e. Or approved equivalent.
5. Backflow Prevention Assemblies - Double Check Valve Assembly (DCVA) for Low Hazard Applications - 2-1/2-inches and larger:
- a. Conbraco Apollo 45-11-1
  - b. Watts 709-DCDA with 77F-01-FDA-12
  - c. Or approved equivalent.
6. Spill Resistant Pressure Vacuum Breaker:
- a. Febco
  - b. Conbraco
  - c. Watts

- d. Wilkins
- e. Or approved equivalent.

7. Atmospheric Vacuum Breakers:

- a. Febco
- b. Conbraco
- c. Watts
- d. Wilkins
- e. Or approved equivalent.

I. Pressure Regulating Valve-Domestic Water:

- 1. Cash Acme
- 2. Cla-Val
- 3. Watts
- 4. Wilkins
- 5. Or approved equivalent.

J. Thermostatic Master Mixing Valves (ASSE 1017 Rated):

- 1. Holby Tempering Valve
- 2. Lawler Series 66
- 3. Leonard Type TM
- 4. Powers LFMM430 (Lead Free)
- 5. Symmons Temp Control Series 5
- 6. Or approved equivalent.

K. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated):

- 1. Lawler
- 2. Leonard

3. Powers Hydroguard
4. Or approved equivalent.

## 2.02 VALVES - GENERAL

### A. General

1. Sizes: Unless otherwise indicated, provide valves of the same size as the upstream pipe size.
2. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6 inches and smaller. Provide gear operators for quarter-turn valves 8 inches and larger and plug valves installed over 5 feet above the finished floor.
3. Valve Identification: The manufacturer's name (or trademark) and pressure rating clearly marked on the valve body.

### B. Valves in Insulated Piping: With 2-inch stem extension and the following features:

1. Ball Valves: With an extended operating handle of non-thermal-conductive material and protective sleeve that allows operation on the valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after the insulation is applied.

### C. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With thread according to ASME B1.20.1.

### D. Valve Bypass and Drain Connections: MSS SP-45.

### E. Building Service:

1. Shutoff and Isolation Valves:
  - a. Pipe Sizes 3-inches and Smaller: Ball Valve.
2. Drain Service: Ball Valves.
3. Strainer Blow-Off: Ball Valve.
4. Check Valves: Swing.

## 2.03 GATE VALVES

### A. Gate Valves - Class 125:

1. 2-inches and Smaller: MSS SP-80, Class 125, ASTM B62 cast bronze composition body, bonnet, and solid disc, copper-silicon non-rising stem, brass packing gland, Teflon impregnated packing, and malleable iron hand-wheel.
2. 2-1/2-inches and Larger: MSS SP-70, Class 125, ASTM A126 Grade B Ductile iron body, bolted bonnet and disc, bronze trim, copper silicon non-rising stem, bronze packing gland, Teflon impregnated packing and malleable iron hand-wheel.

### B. Gate Valves - Class 150:

1. 2-inches and Smaller: Class 150, MSS SP-80, ASTM B62 cast bronze body, bronze bonnet, bronze wedge, non-rising stem, brass packing gland, non-asbestos packing, and aluminum or malleable iron hand-wheel.
2. 2 1/2-inches and Larger: Class 150, MSS SP-70, ASTM A126 Grade B, IBBM, ductile iron body, bonnet and wedge, bronze trim, non-rising stem, brass packing gland, non-asbestos packing, and cast iron hand-wheel.

### C. Gate Valves - Class 250:

1. 2-inches and Smaller: Class 250, SWP, MSS SP-80, ASTM B61, cast bronzed body, bronze bonnet, bronze wedge, non-rising stem, bronze packing gland, non-asbestos packing, and aluminum or malleable iron hand-wheel.
2. 2 1/2-inches and Larger: Class 250, SWP, MSS, SP-70, ASTM A126, Grade B cast iron body, cast iron bonnet, cast iron wedge, bronze trim, non-rising stem, brass packing gland, non-asbestos packing, and cast iron hand-wheel.

## 2.04 BALANCING VALVES

### A. Maximum 125 PSIG System Working Water Pressure.

### B. Manual Set Balancing Valves:

1. Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:
  - a. Precise flow measurement.
  - b. Precision flow balancing.
  - c. Positive drip-tight shut-off.

2. Valve to provide multi-turn, 360-degree adjustment with micrometer-type indicators located on the valve handwheel. Valves have a minimum of five full 360-degree handwheel turns. 90-degree circuit-setter style ball valves are not acceptable. The valve handle has a hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valves are to be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi is to have two 1/4-inch threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves are to be furnished with flow-smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem, and plug is to be brass. The handwheel is to be high-strength resin.
3. 2-1/2-inch and Larger: Valves are to be of the "Y" pattern, equal percentage globe-style, and provide three functions:
  - a. Precise flow measurement.
  - b. Precision flow balancing.
  - c. Positive drip-tight shut off. Valve to provide multi-turn, 360-degree adjustment with micrometer-type indicators located on the valve handwheel. Valves are to have a minimum of five full 360-degree handwheel turns. 90-degree circuit-setter style ball valves are not acceptable. The valve handle has a hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valve body to be either cast iron with integrated cast iron flanges (2-1/2-inch to 12-inch) or ductile iron with industrial standard grooved ends (2-1/2-inch to 12-inch). The valve stems, and plug disc is to be bronze with a handwheel that permits multi-turn adjustments. Sizes 2-1/2-inch and 3-inch - five turns, sizes 4-inch to 6-inch - 6 turns, sizes 8-inch to 10-inch - 12 turns, and size 12-inch - 14 turns. Flange adapters are to be provided to prevent rotation.

C. Automatic Flow Control Valve:

1. 1/2-inches and Larger: Construction and attachment style as required by piping system. Internal working parts and removable flow cartridge stainless steel. Valves to be factory set and automatically limit flow to specified capacities with 5 percent plus or minus accuracy over entire operating pressure differential.
2. Provide shut-off valve of supply side of valve and check valve on discharge side of valve.
3. Minimum Flow Through Valve:
  - a. 1/2-inches size: 1 gpm.

- b. 3/4-inches size: 1.5 gpm.

## 2.05 BALL VALVES

- A. All ball valves on brazed piping are to be three-piece.
- B. 2-1/2 Inches and Smaller: MSS SP-110, 400-600 PSI, two-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 77CLF 100 Series two-piece.
- C. 3 Inches and Larger: MSS SP-110, 400-600 PSI, three-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 82- 100/82A 140 Series three-piece.
- D. Full Port Ball Valve: 2- to 4-inch ductile iron, ASTM A536, micro finish steel chrome-plated or stainless steel ball and stem. TFE seats, 600 PSI.

## 2.06 SWING CHECK VALVES

- A. 2 inches and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc. Nibco 413. MSS SP-80.
- B. 2-1/2-inches and Larger: Class 125, iron body, bolted bonnet, horizontal swing, Renewable seat, disc, flanged ends. Nibco F918. MMS SP-71.
- C. Rubber Flapper Check Valve: Horizontal or vertical upward flow installation. Working pressure to 175 PSI. Ductile iron or cast iron body. Steel-reinforced Buna-N rubber flapper epoxy coating on wetted parts. MSS SP-80.
- D. Gruvlok Series 7800 Check Valve: Horizontal installation. Working pressure to 300 PSI, Type 304/302 Stainless Steel conforming to ASTM 167. Ductile body, ASTM A536, stainless clapper, EPDM, nitrile or optional Viton bumper, and bonnet seals. Stainless wetted parts.

## 2.07 BACKFLOW PREVENTION ASSEMBLIES

- A. General: Assemblies model numbers listed below are for general comparison. Project-specific model numbers are to be verified contractor as approved by the jurisdiction where the project is located.
- B. Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications:
  - 1. 2-inches and Smaller: Assembly consists of shutoff ball valves in the inlet and outlet and strainer on the inlet. Assemblies include test cocks and pressure-differential relief valves located between two positive seating check valves and

comply with the requirements of ASSE Standard 1013 and AWWA C511. Bronze construction, threaded ends, stainless steel internal parts, FDA strainer, and air gap fitting. Route pipe from air gap fitting to the approved waste receptor.

2. 2-1/2-inches and Larger: Assembly consists of shutoff OS&Y gate valves in the inlet and outlet and strainer on the inlet. Assemblies include test cocks and pressure-differential relief valves located between two positive seating check valves and comply with the requirements of ASSE Standard 1015 and AWWA C511. Epoxy-coated cast iron body construction, flanged ends, stainless steel internal parts, bronze seats, and FDA strainer.

C. Double Check Valve Assembly (DCVA) for Low Hazard Applications:

1. 2-inches and Smaller: Assembly consists of shutoff ball valves in the inlet and outlet and FDS strainer on the inlet. Assemblies include test cocks and two positive seating check valves and comply with the requirements of ASSE Standard 1015 and AWWA C510. Bronze construction, threaded ends, and stainless steel internal parts.
2. 2-1/2-inches and Larger: Assembly consists of shutoff OS&Y gate valves in the inlet and outlet and strainer on the inlet. Assemblies include test cocks and two positive seating check valves and comply with the requirements of ASSE Standard 1015 and AWWA C510. Epoxy coat cast iron body construction, strainer flanged ends, and stainless steel internal parts.

D. Spill Resistant Pressure Vacuum Breaker: Watts Model 800MCQT with 777S "Y" strainer.

E. Atmospheric Vacuum Breaker: Assembly consists of a bronze vacuum breaker body with a silicone disc and full-size orifice. Device to be IAPMO listed, meet ASSE standard 1001, and ANSI standard A113.1.1 rough chrome plate finish.

2.08 PRESSURE REGULATING VALVE-DOMESTIC WATER

- A. Water: Bronze body, diaphragm or piston type, spring actuated, with separate or integral stainless steel strainer, pressure range to suit conditions, approved for potable water use, low lead. Provide shutoff valves, pressure relief valves, unions, drain valves, and bypasses.
- B. Water: Automatic control pressure regulating valve, stainless steel seat, stem and spring, diaphragm actuated with brass body, hydraulic control pilots with effluent operating temperature range 32 degrees F to 180 degrees F, FDA and AWWA approved.
- C. Water: Bronze body construction, stainless steel strainer screen, thermal expansion bypass with a renewable stainless steel seat, and high temperature resisting diaphragm.

2.09 THERMOSTATIC MASTER MIXING VALVES (ASSE 1017 RATED)

- A. Thermostatic type with bronze body construction, corrosion resistant materials, union end

stops, check inlets with strainers, 0-200 degree F dial thermometer, and discharge shut-off valve. Mixing valves to meet ASSE 1017.

- B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.
- C. Flow from the tempered water circulating pump to be split to mixing valve and building hot water heating system.

#### 2.10 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED)

- A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1070.
- B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.

END OF SECTION



**SECTION 22 13 42**  
**FACTORY-BUILT DUPLEX PUMP STATION**  
**ABOVE GROUND VALVE PACKAGE**

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The work required under this section includes, but is not limited to, furnishing all of the labor, materials, and equipment required to install, field test, and place into satisfactory operation the duplex pump station as specified herein. Pumps and mechanical accessories shall be installed within the wet well as illustrated on the project Plans. A factory built system consisting of duplex controls, valves, piping, and pressure gauges contained in a fiberglass enclosure and mounted on a factory engineered wet well cover shall be provided by the system manufacturer as shown on the project drawings and specified herein.
- B. The general provisions of the contract, including the General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this section.

1.02 REFERENCES

- A. Publications listed below form part of this specification to the extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.
  - 1. American National Standards Institute (ANSI) and American Water Works Association (AWWA)
    - a) ANSI B16.1 - Cast iron pipe flanges and flanged fittings
    - b) ANSI/AWWA C115/A21.51 - Cast/ductile iron pipe with threaded flanges
    - c) ANSI 253.1 - Safety Color Code for Marking Physical Hazards
    - d) ANSI B40.1 - Gauges, Pressure and Vacuum
    - e) AWWA C508 - Single Swing Check Valves
    - f) AWWA C504 - Plug Valves
  - 2. American Society for Testing and Materials (ASTM)
    - a) ASTM A48 - Gray Iron Castings
    - b) ASTM A126 - Valves, Flanges, and Pipe Fittings
    - c) ASTM A307 - Carbon Steel Bolts and Studs
    - d) ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs
    - e) ASTM A36 - Structural Steel
  - 3. Institute of Electrical and Electronics Engineers (IEEE)
    - a) ANSI/IEEE Std. 100 - Standard Dictionary of Electrical Terms
    - b) ANSI/IEEE Std. 112 - Test Procedure for Polyphase Induction Motors

- c) IEEE Std. 242 - Protection of Industrial and Control Power Systems
- 4. National Electric Code (NEC), National Electrical Manufacturers Association (NEMA)
  - a) NEC - National Electric Code
  - b) NEC 701 - National Electric Code article 701
  - c) NEMA Std. MG1 - Motors and Generators
- 5. Miscellaneous References
  - a) Ten-State Standards Recommended Standards for Sewage Works
  - b) Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps
  - c) NMTBA and JIC Std. National Machine Tool Builders Association & Joint Industrial Council Standards

### 1.03 SYSTEM DESCRIPTION

- A. The contractor shall furnish and install pre-engineered, factory-built, automatically controlled above ground valved packaged pumping station with submersible pumps capable of handling raw unscreened sewage, sludge, and similar domestic liquids. The pump station shall be installed in the locations shown on the Plans, and as specified herein.
- B. The pumps and guide rail accessories shall be installed in the wet well as shown on the Plans. The pump control panel, liquid level control, valves, piping, and pressure gauges shall be installed within a factory-built fiberglass enclosure and mounted on a factory-engineered polymer concrete wet well cover.
- C. The factory-built pump station design, materials of construction, pumps, valves and piping, and motor/electrical controls shall be manufactured and provided in strict accordance with the requirements as listed under PART 2 - PRODUCTS of this specification section.
- D. The basis of bid pumping station basis of bid provided for this project shall be the Model EP-1 above-ground factory-built system, as offered by Ebara Pumps Americas Corporation or equal. Alternative equipment will be considered only when submitted in strict accordance with the requirements of these Specifications. Substitution of equipment after the bid date will not be considered without prior approval and bidding the project shall establish a contractual obligation to furnish the specified or pre-approved equipment only.

### 1.04 DESCRIPTION OF WORK REQUIRED

- A. The extent of work required and requirements for the wastewater pumping station for this project are shown on the project drawings and described herein.
- B. The work required at the wastewater pump station shall include, but is not limited to, the

following:

1. Site grading, erosion control, weed control, gravel, and potable water service to the site as shown on the Plans.
  2. Installation of one factory-built prefabricated wastewater pumping station as specified herein.
  3. Piping required for each pump station, including all factory-furnished and installed piping, valves, fittings, Quick Discharge Connector, base elbow, submersible pumps, contractor-furnished piping and valves, stainless steel pump guide rails, and force main piping as specified herein, or as shown on the Plans.
  4. Electrical work required for the pump station: main electrical service with utility meter and disconnect, station lighting as may be shown on the Plans, installation of an alarm light at each station, and all necessary conduit and wiring that may be required to provide power for proper installation and operation.
  5. Wet well excavation, bypass pumping, wet well and concrete pad for placement.
  6. Finish work as required to complete the installation of the pumping station, including finish grading, erosion control, fencing, weed control, sod and/or grass seed, shrubbery, other landscaping indicated on the Plans.
- C. The Contractor shall furnish and install, as shown on the Plans and specified herein, factory-built automatic duplex submersible pump station for the specified location. The station provided for this project shall comply with the detailed descriptions that follow.
1. The principal items of equipment to be provided with the pump station shall include two submersible centrifugal solids-handling pumps, each provided with a compatible Quick Discharge Connector system, guide rails, anchor bolts, lifting hoist, concrete ballast, stainless steel lifting chain with intermediate links and all associated hardware, a steel reinforced polymer concrete station top slab with integral aluminum wet well access cover, station valves, internal piping of the sizes indicated herein or on the Plans, run-time meter for each pump, and a complete factory-built motor control center with circuit breakers, motor starters and automatic liquid level control system as specified herein to constitute a complete, working system.
  2. The basis of bid pump station for this project shall be EP-1 (Above-Ground Submersible Valve Package) manufactured by Ebara Pumps Americas Corporation or equal. Submersible solids-handling pumps shall be the Ebara Model D-Series; with the specific pump size, impeller type and motor HP as may be indicated elsewhere herein.
  3. Alternates proposed for use on this project shall be considered only if full and complete pre-submittal data for all proposed equipment is received no later than five (5) calendar days after the bid date. Submittal shall comply with the

requirements of Section 1.06 below. The decision of the Engineer regarding the equality of any/all proposed alternates is final, and re-submittal of equipment will not be allowed.

- D. Pumps and all mechanical accessories provided for each sewage pump station shall be installed in/on each wet well as indicated on the Plans and as outlined herein.
1. The duplex control panel, liquid level control system, valves, piping, and pressure gauges necessary to provide a complete working system shall be installed inside a heavy-duty factory built fiberglass enclosure.
  2. Each complete sewage pump station shall be a regular production item of the submersible pump manufacturer, not a locally assembled compilation of parts and/or components by a third party. The use of conventional station designs which utilize external concrete or fiberglass below-ground valve vaults, exposed control panels, bare concrete slab construction or concrete poured inside a fiberglass shell where it may be exposed to condensation of sewage gases (not steel reinforced polymer concrete as specified), or the use of fabricated steel construction is not to be considered equivalent to the specified factory-built system and shall not be furnished.
  3. The pump station manufacturer shall have no less than five (5) installations in full-time municipal service in the State of Alabama. Reference information for any/all reference stations shall be immediately provided upon request from the Engineer.

#### 1.05 PERFORMANCE CRITERIA

- A. Each pump shall be designed to handle raw, unscreened domestic sanitary sewage and pass up to a 3" spherical solid. Pumps shall be furnished with a minimum 4" discharge connection. Each pump shall be selected to provide the stated capacity and total dynamic head as noted elsewhere herein. Additional performance criteria can be found under the requirements of Section 2.06 B. herein.
- B. Site power furnished to pump station shall be 460/3/60VAC 3-wire electrical service, maintained within industry standards. The available fault current provided at the pump station control panel is 22kA RMS symmetrical. Voltage tolerance shall be plus or minus 10 percent. Phase-to-phase unbalance shall not exceed 1% average voltage as set forth in NEMA standard MG-1. Control voltage shall not exceed 120 volts.

#### 1.06 SUBMITTALS

##### A. Product Data

1. Prior to fabrication, the pump station manufacturer shall submit electronic files of submittal data for review and approval. The correspondence shall include contractor, supplier, and manufacturer.
2. Submittal shall include shop drawings, electrical ladder logic drawings, and support

data as follows: Catalog cuts sheets reflecting characteristics for the major items of equipment, materials of construction, dimensions, motor data, pump performance curves to illustrate the design duty point capacity (GPM), head (FT), pump hydraulic efficiency (np), and brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

3. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for the Quick Discharge Connector, base elbow, and guide rail components. Pipe penetrations and station access clearances shall be dimensioned relative to the station centerline. Electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to the extent necessary to validate function and integration of circuits to form a complete working system.

#### B. Operation & Maintenance Manuals

1. Installation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly install, operate, and maintain all equipment supplied. Content and instructions shall assume operations personnel are familiar with pumps, motors, piping and valves, but lack experience on the exact equipment supplied.
2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment and a separate section shall be so designated in the O&M Manual. Instructions shall include the following as a minimum:
  - a) Functional description of each major component, complete with operating instructions.
  - b) Instructions for operating pumps and pump controls in all modes of operation.
  - c) Calibration and adjustment of equipment for initial equipment start-up, replacement of level control components, or as may be required for routine maintenance.
  - d) Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the Specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
  - e) Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA70. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included.

Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

- f) Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, valves and piping.
- g) Operation and maintenance instructions that rely on vendor cut-sheets and literature that includes general configurations, or requires operations personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these Specifications.

## 1.07 QUALITY ASSURANCE

- A. Upon request from the Engineer (or Owner), the pump station manufacturer shall prove financial stability long-term performance and the ability to produce the specified station within the specified delivery schedules. At the request of the Engineer (or Owner) the pump station manufacturer shall provide evidence of the facilities, inventory, equipment and expertise that demonstrates the manufacturer's commitment to long-term customer service and product support.
- B. The manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law or expose the user or Engineer to unintended liabilities. "Reverse-engineered" products fabricated to substantially duplicate the design of an original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.
- C. The manufacturer must show that the basic pump station design configuration and equipment used in the pump station is a standard product and has been factory tested and shall be marketed as all components to be supplied having been assembled, operated, and tested to meet the requirements of these Specifications.
- D. The term "pump manufacturer" or "pump station manufacturer" shall be defined as the entity which designs, fabricates, machines, assembles, hydraulically tests, and warrants the final product. Any entity that does not meet this definition will not be considered a "pump manufacturer" or "pump station manufacturer" and is not an acceptable supplier. For quality control reasons and to ensure future pump and parts availability, all major components of the pumps provided shall be readily available from the manufacturer's regular inventory in the United States of America.
- E. All pump openings and passages shall be of adequate size to pass 3" diameter spheres (minimum) and any trash or stringy material that can pass through an average house collection system.
- F. The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part

3 – EXECUTION of this specification section.

1.08 MANUFACTURER'S EXPERIENCE REQUIREMENTS

- A. It is the specific intention of these Specifications that the wastewater pump station provided for this project be provided by a manufacturer with documented experience in the design, production, and successful installation of submersible sewage pumps and factory-built above-ground submersible pump stations.
  - 1. The station manufacturer shall have a minimum of twenty (20) calendar years of experience in the production of submersible sewage pumps and related equipment and shall have facilities and personnel in place to provide support of the specified factory-built above-ground submersible pumping stations.
  - 2. The pumps, station base, piping assembly, and other related equipment will be a standard production item of the station manufacturer.
  - 3. The pump station manufacturer shall maintain adequate levels of inventory to be able to provide replacement parts for the specified pumps, including major components such as impellers, casings, and motors, directly from normal stock. Proof of inventory at the pump station manufacturer's normal place of business shall be required prior to approval of any submittal data.
- B. No consideration will be given to any equipment manufacturer who cannot comply with all of the requirements stated in Sections 1.05, 1.07, and 1.08.
- C. The pump station manufacturer shall document the existence of a factory-authorized service and/or repair facility within a reasonable distance of the job site prior to bidding the specified pump station.

1.09 MANUFACTURER'S WARRANTY

- A. The pump station manufacturer shall warrant all equipment provided to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below:
  - 1. In addition to defects in material and workmanship, fiberglass reinforced polyester station enclosures are warranted for five (5) years to be resistant to rust, corrosion, corrosive soils, effects of airborne contamination or physical failures occurring in normal service for the period of the pump station warranty.
  - 2. All other equipment, apparatus, and parts furnished shall be warranted for five (5) years, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump station manufacturer shall be solely responsible for warranty of the station and all components.
- B. Components that fail to perform as specified by the Engineer, or as represented by the

manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

- C. This limited warranty shall be valid only when installation, use, and maintenance is performed in accordance with manufacturer recommendations. A start-up report completed by an authorized manufacturer's representative must be received by the purchaser within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent.

## PART 2 - PRODUCTS

### 2.01 UNITARY RESPONSIBILITY

- A. In order to unify responsibility for proper operation of the complete pump station, it is the intent of these Specifications that all system components are furnished by a single supplier (unitary source). The pumping station must be a standard catalog design, totally warranted by the pump manufacturer. Under no circumstances will a pumping system consisting of parts compiled and assembled by a manufacturer's representative, distributor, or other source be considered accepted.

### 2.02 MANUFACTURER

- A. The Specifications and project drawings depict equipment and materials that are manufactured by Ebara Pumps Americas Corporation, which has been deemed the most suitable for the service anticipated. It is not intended to eliminate other products of equal quality and performance (refer to Section 1.04.C.3). However, the contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B. After execution of the contract, the contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be in compliance with Section 1.04.C.3, superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.
- C. In event the contractor obtains Engineer's approval for equipment substitution, the contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the Engineer prior to acceptance.
- D. It will be assumed that the contractor's cost for the alternate equipment proposed is less for the proposed substitution, and if approved, the contract price shall be reduced by an amount equal to the savings identified in the substitution request.

### 2.03 STATION ENCLOSURE



- A. The station enclosure shall contain and enclose all valves and associated controls and shall be constructed to enhance serviceability by incorporating the following design characteristics:
1. Two access doors per side of station shall be provided. Doors shall be sized and placed to permit routine maintenance operations through the door openings of the enclosure. For these purposes, routine maintenance shall include frequently performed adjustments and inspections of the electrical components, controls and valves. Minimum size of the door openings on either side of the enclosure shall be 54" high X 72" wide.
  2. The access doors shall be provided with hinges and latch. Hinges shall be the continuous type. Latch shall engage the enclosure at not less than three places, and shall be protected by a keyed lock. Doors shall be rigid, without perceptible flex, when open. The use of thin, flexible single-layer fiberglass panels for the access cover doors will not be permitted.
  3. One enclosure side shall contain a screened intake vent to maximize air flow for enclosure ventilation. The opposite side shall contain the blower with intake shroud, as well as the wet well vent as described elsewhere herein. A discharge bypass quick-connection, if shown on the Plans, shall be routed to the outside of the station enclosure, with operating valves and piping to be housed inside the enclosure to prevent tampering.
  4. The station enclosure, less base, must be field removable.
- B. The station enclosure shall be manufactured of molded reinforced orthophthalic polyester resins with a minimum of 30% fiberglass, and a maximum of 70% resin. Resin fillers or extenders shall not be used.
- C. Glass fibers used will have a minimum average length of 1-1/4 inches. Major design consideration shall be given to structural stability, corrosion resistance, and water-tight properties. The polyester laminates shall provide a balance of mechanical, chemical, and electrical properties to insure long life. They must be impervious to micro-organisms, mildew, mold, fungus, corrosive liquids, and gases which can reasonably be expected to be present in the environment surrounding the wet well.
- D. The fiberglass core of the enclosure and doors shall be nominal 1 inch thickness, with a minimum core insulating value of R~7 in accordance with on ASTM C518.
- E. All interior surfaces of the housing shall be coated with a polyester resin-rich finish, which shall provide the following:
1. Maintenance-free service.
  2. Abrasion resistance.
  3. Adequate protection from sewage, greases, oils, gasoline, and other common

chemicals that can be expected to be found in a normal municipal pumping installation.

4. The outside of the enclosure shall be coated with a suitable pigmented resin, compounded to insure long maintenance-free life. Exterior finish color shall compliment the color of the polymer concrete specified elsewhere herein.
- F. An exhaust blower shall be provided for the station enclosure. Blower capacity shall be sufficient to change station air a minimum of once every minute. The blower motor shall be operated automatically and shall be turned on at approximately 70 degrees F and shall be turned off at 55 degrees F. Blower motor and control circuit shall be protected by a thermal-magnetic air circuit breaker to provide overcurrent and overload protection. Blower exhaust outlet shall be designed to prevent the entrance of rain, snow, rocks, and foreign material. A thermostat located on the pump station control panel shall provide operator-adjustable set points for the station exhaust blower.

#### 2.04 STATION BASE

- A. Station base shall be constructed of pre-cast, steel-reinforced polymer concrete that is resistant to the presence of H<sub>2</sub>S and other harmful elements. The station base shall be designed to ensure adequate strength to resist deformation of the structure during shipping, lifting, or handling. The enclosure base shall function at the wet well top and incorporate a duplex access cover, sized for the installation and removal of the specified pumps, and shall be of sufficient size to permit access to the wet well. Color used shall de-emphasize the presence of dirt, grease, etc., and shall be provided with a non-skid surface.
1. The provision of conventional concrete or fabricated steel support in direct contact with wet well gases, even if coated with epoxy paint or other means of protection is strictly prohibited and will not be allowed.
- B. A static wet well vent shall be mounted in the station base and be housed in the station enclosure. The station enclosure shall provide a transition area between the wet well and the vent outlet. The vent shall terminate through the wall of the station enclosure with a screened opening designed to prevent the entrance of rain, snow, rocks and foreign material.
- C. The station base shall incorporate a cable transition adapter for the pump cables, level controls, and associated wiring. The adapter shall provide for a vapor tight transition between the wet well and the lift station enclosure. The adapter shall incorporate cable grips for each cable and be provided with a gasket between the adapter and the station for a positive seal. Junction boxes shall not be considered for cable transition.
- D. The station base shall be furnished with elastomeric compression sealing devices for all piping penetrations to provide for a vapor tight transition between the wet well and lift station enclosure. Pipe seals shall be installed by the station manufacturer prior to shipment. Thrust clamps shall be provided on the riser piping from each pump, and on the center discharge pipe to prevent movement of the piping header during station

operation.

## 2.05 STATION APPURTENANCES AND ACCESSORIES

- A. The pump station manufacturer shall provide a 1300/1500 watt, 115 volt electric heater with cord, integral thermostat, and grounding plug for installation within the fiberglass enclosure to protect against freezing. Ungrounded heaters shall not be acceptable. The station control panel shall be provided with a separate 120VAC GFI receptacle on the panel exterior to facilitate use of the station heater.
- B. The pump station shall be provided with a 100-watt, 115 volt AC vapor-tight hand lamp with 25 feet of cord and grounding plug. Hand lamp shall be constructed of corrosion resistant materials and shall be equipped with a guard and a clear globe. Ungrounded hand lamps may be supplied if provided with an effective means of double insulation.
- C. The pump station shall be equipped with dual pressure gauges to monitor discharge pressures of each pump. Pressure gauges shall be isolated from the wastewater by the use of neoprene isolator rings to ensure accurate, repeatable readings with no possibility of compromising gauge function. Gauges shall be a minimum of four inches in diameter and shall be graduated in feet water column. Rated accuracy shall be 1 percent of full-scale reading. Pressure gauge shall be graduated 0 to 140 feet water column minimum. Gauge kit shall be board mounted and complete with all stainless-steel hoses and stainless-steel fittings as specified in Section 2.09.F.
  - 1. Under no circumstances shall the pressure gauges, connecting piping, or the internals of the isolator rings be exposed to raw sewage. Only suitable oil shall be used in the gauge and sensing piping.
- D. If the station wet well depth exceeds twenty (20) feet in depth, each pump shall be furnished with a 304 stainless steel intermediate guide rail bracket to provide the correct guide rail splicing and support.
- E. Compression couplings shall be provided for each discharge connection to join the contractor-provided plain-end ductile iron pipe to the pump station piping. Coupling size shall match the header piping provided inside the fiberglass enclosure and shall be furnished with stainless steel bolting.
- F. Thrust clamps, also sized to match the header piping diameter, shall be provided on the underside of the station base slab for each pump riser pipe to eliminate any movement of the piping inside the fiberglass enclosure as a result of hydraulic thrust during operation. A third thrust clamp shall be provided on the top side of the station base to support the piping assembly during production and shipment to the job site. Thrust clamps shall be installed by the contractor in accordance with the station manufacturer's recommendations.

2.06 PUMP DESIGN

- A. The manufacturer of the pumps must be certified to ISO 9001 by an accredited certification agency.
- B. Pump performance criteria for each pump subject station are as follows:

Primary design condition:	833 GPM @ 40.9 TDH
Hydraulic efficiency:	67.48%
Secondary design condition:	1200 GPM @ 28.4 TDH
Hydraulic efficiency:	68%
Minimum shutoff head:	74.73
Minimum motor size	15 HP
Motor Speed	1760 RPM (nominal)
Impeller type/design	Semi-open mixed flow solids handling
Minimum sphere size	3" diameter
EBARA Model:	150DLMKFU611
Station piping size	6"

- C. Station piping size noted above refers to the size of the discharge piping and valves located within the pump station enclosure, as specified elsewhere herein. Where base elbow sizing varies from the specified sizing, the pump station manufacturer shall be responsible for providing any increasing fittings as required to adapt to the station piping size shown and shall coordinate the location of the base elbows and increaser fittings in the wet well to provide proper fit.
- D. All exposed bolts and nuts shall be AISI 304 stainless steel. Mating surfaces of major components shall be machined and fitted with nitrile Buna rubber O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by the automatic compression of O-rings in two (2) planes, ensuring that O-ring contact is made on four (4) surfaces without the requirement of specific torque limits for compression.
- E. The pump casing shall be manufactured of ASTM A-48 Class 30 gray iron and shall be centerline discharge with a large radius on the cut-water to prevent clogging. The casing shall be provided with an integral 125# discharge flange. The pump casing shall be easily removable for full inspection of impeller. All pump openings and passages shall be of adequate size to pass minimum 3" diameter spherical solids and any trash or stringy material which can pass through an average house collection system.
- F. Pump impellers shall be a mixed flow multi-vane semi-open design, fabricated of ASTM A-48 Class 30 gray iron, and shall be dynamically balanced. Balancing shall not deform or weaken the impeller. Impellers shall be designed for solids handling service with a long thrulet, without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might tend to otherwise clog the pump.

1. The rear shroud of the impeller shall incorporate auxiliary pumpout vanes to hydraulically reduce pressure on the primary seal and force fibrous materials and entrained solids away from the close axial clearance on the backside of the impeller in the mechanical seal area. In addition, a lip seal shall be located behind the impeller hub and shall run against the hub to further reduce the entry of foreign materials into the seal area.
  2. Impellers shall be direct connected to the motor shaft with a slip fit, shall be positively (key) driven, and shall be secured with an impeller bolt.
  3. The pump design shall include a replaceable cast iron suction cover, which shall contain a groove(s) perpendicular to the suction opening to disrupt fibrous solids that may otherwise become lodged between the impeller and the suction cover. The suction cover shall be designed so that it can be adjusted to maintain working clearances and hydraulic efficiencies.
- G. A lifting bail shall provide for proper balance of the pump during installation and removal from the wet well. Pump lifting chain, as specified elsewhere herein, shall be attached directly to the lifting bail.
- H. All other major pump components such as motor housing, seal housing, and bearing housing shall be ASTM A-48, Class 30 gray iron. All castings shall have smooth surfaces devoid of blow holes or other casting irregularities. All mating surfaces of major components shall be machined and fitted with NBR O-rings to provide for a watertight seal. Machining and fit of the castings shall be such that the seal is accomplished by automatic compression of O-rings in two planes and O-ring contact is made on four surfaces without the requirement of specific torque limits.
1. All internal and external surfaces coming into contact with pumped media shall be prepared to SPPC-VISI-SP-3-63 then coated with a zinc-chromate primer. External surfaces shall be coated with coal tar epoxy paint; Tnemec Series 46 Hi Build Tneme-Tar. All exposed fasteners shall be of 304 series stainless steel.
- I. The pump shafts shall be sealed against leakage by means of a double mechanical seal arranged in tandem. Seal shall be positively driven and shall act independently with its own spring system. The upper seal shall operate in an oil bath, while the lower seal is lubricated by the oil from between the shaft and the seal faces, and in contact with the pumped media on the outside. Lower seal face materials shall be silicon carbide or tungsten carbide for both the rotating and stationary elements, and the upper faces shall include carbon rotating vs. ceramic stationary faces. Springs and metal parts shall be stainless steel and elastomers shall be Viton or Buna-N. The pump sealing system shall not rely on the pumped fluid for lubrication.
1. The mechanical seals shall require no special maintenance or routine unit adjustment yet shall be easily inspected or replaced. No seal damage shall result from operating the pump for short periods of time out of the liquid.

2. The rotating seal faces shall be lubricated from an oil filled reservoir between the pump and motor, with the oil serving as both lubricating and a cooling media. The reservoir shall have separate oil fill and drain plugs to ensure accuracy when measuring lubricant level and for ease of maintenance. The oil filled seal chamber shall be designed to prevent over-filling and include an anti-vortexing vane to ensure proper lubrication of both seal faces.
  3. Mechanical seal failure shall be detected by means of a mechanical float switch located in a chamber above the seal. The seal fail switch shall be comprised of a magnetic float that actuates a dry reed switch encapsulated within the stem. In the event of mechanical seal failure liquid shall be directed into the float chamber, in which the rising liquid activates the switch opening the normally closed circuit.
    - a. The float body and float shall be of a polypropylene material with a 316SS stopper.
    - b. The leakage detector shall be suitable for operation with 120VAC control voltage and shall be wired to the control panel by the installing contractor. No special purpose relays shall be required for proper operation of the seal leakage detectors provided in the pumps furnished for this project.
- J. The motor and pump must be connected to form an integral unit. Motor shall be a squirrel-cage, induction type in an air-filled water-tight enclosure. Oil-filled motors shall not be acceptable. The motor shall conform to NEMA B design standards and incorporate Class H insulation materials to withstand a continuous operating temperature of 1800 C (3560 F). The pump and motor shall be capable of handling liquids with a maximum temperature of 400 C (1040 F). Voltage and frequency tolerances shall be a maximum 10 and 5% respectively.
1. The motor shall be capable of sustaining a minimum of 20 evenly spaced starts per hour and shall be inverter duty rated in accordance with NEMA MG1 specifications. The motor shall be non-overloading throughout the specified range of operation and be suitable for intermittent operation at full load while un-submerged without damage to the unit. The motor shall not require a cooling jacket or any other means of auxiliary cooling during normal continuous operation.
  2. Bi-metallic sensors shall be embedded in each phase of the motor windings. Each switch shall open independently and terminate motor operation if temperature of the protected winding reaches the high temperature set point of 1400 C (2890 F) and shall automatically reset upon cooling of the winding. These thermal devices shall be suitable for operation on 120VAC control voltage and shall be wired to the control panel by the contractor.
- K. Motor housing shall be ASTM A48 Class 30 cast iron. The stator shall consist of copper windings dipped and baked three times in Class H varnish rated for 1800 C (3560 F). The stator shall be held securely in place by a heat-shrink fit into the motor housing. Any other means of securing the stator that require keys, pins, or other penetration of the motor

housing shall not be considered acceptable. Rotor bars and short circuit rings shall be manufactured of cast aluminum. Motor shaft shall be one-piece AISI403 or AISI420 stainless steel, rotating on two permanently lubricated ball bearings designed for a minimum B-10 life of 60,000 hours.

1. The combined pump rotor and shaft assembly shall be dynamically balanced for vibration-free operation.
- L. Power cable jacket shall be manufactured of an oil resistant chloroprene rubber material, designed for submerged applications. Cable shall be watertight to a depth of at least 65 feet. Power and control cables shall enter the motor through the top of the motor housing to an isolated junction area where internal connections are made.
1. The cable entry system shall be comprised of primary, secondary, and tertiary sealing methods. The primary seal shall be a cylindrical elastomeric grommet designed to seal the exterior of the cable and the interior of the cast component when compressed between the motor cover and a 304 S.S. washer. The secondary seal is accomplished with a compressed O-rings made of NBR material. Compression and subsequent sealing shall preclude specific torque requirements.
  2. The system shall also include a tertiary seal to prevent leakage into the motor housing due to capillary action through the insulation if the cable is damaged or cut. The cable wires shall be cut, stripped, re-connected with a copper butt end connector, and embedded in epoxy within the cable gland. This provides a dead end for leakage through the cable insulation into the motor junction area. The cable entry system shall be the same for both the power and control cables. Cable entrance design that do not prevent moisture from entering the junction area through capillary action or designs that utilize silicone or other alternative caulking materials shall be considered unacceptable.
  3. The watertight integrity of the motor housing and shaft seal shall be tested during manufacture.
- M. As referenced herein, the pump manufacturer shall provide a monitor relay for each pump, for installation in the pump control panel during station production. The relay shall continuously monitor the status of both the motor thermostats and the internal leakage sensor as noted below and shall be designed to provide alarm indication contacts for integration with the panel's indicating pilot lights and alarm indication.
1. The relay unit shall continuously apply a low voltage DC signal to the motor thermal sensor to check its status. If the unit detects that the thermal sensor contacts are closed (i.e., normal condition), the overtemperature indication remains off, and the overtemperature relay is energized, closing the contacts between the designated terminal connections.
  2. If the motor thermal sensor contacts open (i.e., overtemperature condition), the overtemperature indication is turned on, and the alarm relay is de-energized, opening the contacts between the designated connections.

3. When the high motor temperature condition has cleared, the unit will reset based on the position of alarm reset mode select switch (auto or manual). When in the auto position, the overtemperature alarm resets automatically. If the switch is in the manual position, the overtemperature reset pushbutton must be pushed for approximately 1.5 seconds to clear the alarm.
4. The unit shall also continuously apply a low voltage DC signal to the leakage sensor to check its status. If the unit detects that the leakage sensor contacts are closed (i.e., normal condition), the seal leakage indication remains off, and the leakage relay is energized, closing the contacts between the designated connections.
5. If the leakage sensor contacts open (i.e., seal leakage condition), the seal leakage indication is turned on and the leakage alarm relay is de-energized, opening/closing the contacts between the designated terminal connections.
6. Monitor relays shall be Ebara Model EPMR-4, and shall be factory-installed in the packaged pump station control panel specified herein, and wired for operation as specified.

## 2.07 AUTOMATIC QUICK DISCHARGE CONNECTION

- A. Each pump shall be furnished with a submersible discharge connection system to permit removal and installation of the pump without the necessity of an operator entering the wet well. The design must insure an automatic and firm connection of the pump to the discharge piping when lowered into place. The connection shall be metal-to-metal without the use of gaskets, O-rings, or grommets. If counterbalance weight is required to maintain contact between the pump flange and the discharge flange, list in detail all requirements in the submittal.
- B. The QDC shall be ASTM A48, Class 30 iron with integral guide rail pilots and shall be provided with all hardware and anchor bolts required for permanent installation to the wet well floor. The base plate shall be designed with an integral 90° elbow for connection to the vertical discharge piping utilizing standard ANSI 125 lbs. flanges. The base plate shall be coated with an epoxy coating for corrosion resistance. The manufacturer shall provide all necessary drawings to insure proper installation and alignment of baseplate within the wet well.
- C. Each pump shall be provided with a replaceable ASTM A48, Class 30 iron slide guide attached to pump discharge flange. The connection between the slide guide and the base shall be solely through metal-to-metal contact between the guide and the QDC elbow. Systems that require the use of gaskets, O-rings, elastomer seals, or grommets shall not be acceptable.
  1. The slide guide shall direct the pump down two vertical guide rails and onto the discharge connection in a simple lineal movement. The slide guide shall be designed to transmit full weight of the pump to the base (QDC) flange.



2. No portion of the pump shall rest directly on the bottom of the wet well or be supported by the guide rails, or lifting cable (chain). The presence of sludge and grease on guide rails shall not hinder removal of the pump during the lifting operation.
- D. The contractor shall provide two lengths of Schedule 40 304L stainless steel guide rail pipes for each pump. Guide rails shall be unspliced (unless the wet well depth exceeds twenty feet – see Section 2.05.D above), and rail size (diameter) shall be as specified by the pump manufacturer.
  - E. Upper (and intermediate, if required) guide rail brackets, and a lifting cable or chain shall be furnished for each pump. Guide rails shall be plumb, attached to the pump base (QDC) at the bottom and the guide rail brackets as described above. Upper and intermediate guide rail brackets shall be 304 S.S.
  - F. Lifting chain shall be 304 S.S. permanently attached to the lifting bail of each pump. Excess length necessary to utilize the hoist (if specified herein) shall be secured to the upper access hatch frame in the wet well. When lifting chain is used, large intermediate lifting links shall be provided every 3-5' along the length of the chain to facilitate use.
  - G. All bolts, machine screws, nuts, washers, and lock washers for complete assembly of access cover, guide rail assembly, discharge elbow (QDC), and discharge piping shall be 304 stainless steel.

## 2.08 WET WELL ACCESS

- A. The wet well access cover shall be fabricated from welded aluminum sections. A hinged aluminum door shall be provided for each pump. The hinged door shall be fabricated from 1/4" thick aluminum with non-skid diamond tread on upper surface. All hardware on access assembly shall be stainless steel with a flush upper surface without protrusions. For safety, the door shall have a 300psf rating and be fitted with a recessed staple for padlock. Door shall be furnished with a flush aluminum drop handle and automatic hold open arm.
  1. The access cover shall be provided with an aluminum frame, which shall be cast into the polymer top slab described above. Under no circumstances shall access cover leaves simply be bolted to a concrete base without a full support frame that is cast into the concrete.
- B. Metal safety grating shall be provided to prevent personnel from falling into the wet well when the aluminum access doors are open. The fall-through protection system shall be a grate consisting of two leafs made of 6061-T6 aluminum hinged on the same side of the hatch. The safety grating system shall be directly attached to the aluminum access cover frame embedded in the polymer concrete base (not bolted to the underside of the concrete base) and shall be designed to provide continuous safety assurance in both closed and open positions.
  1. When closed, the grate shall allow visibility for inspections and performance of

limited maintenance below it. When open, the grate shall act as an additional barrier to the access door opening.

2. Safety grating shall be designed to withstand a minimum pedestrian load of 300 lbs. per square foot. The grate openings shall be 4" x 6" to allow both visual inspection and limited access for maintenance purposes when the grate is closed.
3. Each leaf of the safety grating will pivot on aluminum hinge devices with 316 S.S. hardware that shall permit them to rotate upward 90 degrees and automatically lock in place. Aluminum pull rods will be attached to the each grate leaf so the operator is positioned with the grate between him and the hatch's opening whenever he raises a leaf. Each grate leaf will have a rod made from 316 S.S. that automatically engages to secure the leaf in its open position, and can be lifted upward to permit the grate leaf to close. The hatch cover will not be able to shut until the grate is closed, thereby ensuring the grate is in position when the next operator opens the hatch cover.
4. The grate shall have an OSHA safety orange finish to increase visual awareness of the safety hazard. All hardware components shall be 316 S.S. to withstand corrosive wastewater environments. Safety grating shall be affixed only to the access cover frame, and not to the concrete top slab. The use of flexible safety netting or safety chains attached to the access cover leaves is not considered a satisfactory alternative to the specified safety grating.

## 2.09 STATION VALVES AND PIPING

A. Each pump shall be equipped with a full flow type check valve capable of passing a 3" spherical solid. Valve shall be constructed with ANSI flanged ends and fitted with a weighted external lever. Valve seat shall be constructed of stainless steel, secured to the body to ensure concentricity, sealed by an O-ring, and shall be replaceable. The valve body shall be cast iron incorporating a clean-out port large enough to allow removal and/or replacement of the valve clapper without removing valve or piping from the line. Valve clapper shall have a molded neoprene seating surface incorporating low pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings. Shaft nut shall have double O-rings which shall be easily replaceable without requiring access to interior of valve body.

1. All internal hardware shall be stainless steel. Valve shall be rated at 175 PSI working pressure, 350 PSI hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3" spherical solid shall not be acceptable.
2. Check valves shall be a regular production item that are commercially available from a variety of sources. Specially-constructed check valves that are specific to a particular brand of packaged pumping station and are only available from the station manufacturer are not acceptable.

B. Each discharge line shall be equipped with a 2-way plug valve to permit isolation of the

pumps from the common discharge header. The plug valve shall be non-lubricated type. Valve body shall be cast iron with flanged end connections drilled to ANSI 125 pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel bearings and shall have a resilient facing bonded to the sealing surface. Valves shall have ports designed to pass 3" spherical solids.

- C. Flanged header pipe shall be centrifugally cast, ductile iron, complying with the requirements of ANSI/AWWA A21.51/C115 and Class 53 thickness. Flanges shall be cast iron Class 125 and shall comply with ANSI B16.1. Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe. Bolt holes shall be in angular alignment within  $\frac{1}{20}$  between flanges. Flanges shall be faced and a gasket finish applied. All pipes connected to the pump station shall be supported according to good commercial practice.

- 1. Header piping and valves provided for this project shall be as shown above.

- D. The station shall be provided with an integral discharge bypass piping arrangement to allow the operator to connect an external emergency pump in the event of a power and/or station failure. The station header pipe shall incorporate a 2-way plug valve to permit emergency access to the pump station force main after isolation of the pumps. The plug valve shall be non-lubricated, tapered type. Valve body shall be cast iron with flanged end connections drilled to 125-pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel bearings and shall have a resilient facing bonded to the sealing surface. The header pipe shall penetrate the station sidewall and terminate with a 4" ductile iron flange for connection to permanent ductile iron bypass piping.

- E. Separate pressure gauges shall be provided for each pump and shall be protected from the pumped media by means of isolator rings to assure accurate, repeatable pressure readings without compromising gauge function. Any pressure gauge design that allows raw sewage or sludge to contact the internals of the pressure gauge is not considered acceptable and will not be allowed.

- 1. The isolator ring shall incorporate a flexible rubber (Viton®) sleeve designed to measure line pressure throughout the full 360° circumference of the pipe inner diameter. The inside diameter of the isolator ring shall match that of the pipe to assure smooth, unobstructed flow, self-cleaning operation, and minimize turbulence and friction. Isolator ring body shall be fabricated of carbon steel. End plates shall be acetyl homo polymer and the elastomeric sleeve shall be Viton®.

- 2. Isolator rings shall be of the same diameter as the specified station piping and shall fit inside the bolt circle of 125# ANSI flanges. Face to face length of the isolator ring shall conform to specification MSS-SP67. The center section shall have a cavity behind the rubber sleeve filled with a high viscosity food grade silicone fluid to transfer pressure to the gauge. The isolator system shall dampen out surges or pressure spikes and eliminate gauge fluctuations without the need for a separate snubber. All pressure instruments attached to the sensor shall be rigidly supported by a post at least 0.875 inches diameter welded to the isolator. Isolator rings with more than one instrument, shall have minimum 1/2" NPT connections; 1/4" NPT

fittings are not acceptable.

3. Isolator rings shall be vacuum-filled and permanently sealed at the factory using a high viscosity food grade silicone fluid with a modular seal consisting of a rubber membrane and needle fitting to allow removal and replacement of pressure instruments without compromising the vacuum fill. The needle fitting shall have both 1/4" NPT(F) thread and 1/2 NPT(M) threads. Pressure isolator shall be capable of operating under pressure with all instruments removed with no loss of fill fluid, without isolating valves.
  4. Pressure instruments shall be attached to the isolator with a hand tightened lock ring. Maximum operating pressure without leakage shall be 1,000 psi. In addition, all gauges and/or instrumentation shall be prefilled at the factory with high viscosity food grade silicone fluid and supplied with a fitting that shall allow them to be installed and/or replaced in the field without the need for vacuum filling. The system shall be designed to allow field replacement of gauges without service interruption or process spills. No isolation valves shall be required. No tools shall be required to change pressure gauges and/or instruments. Isolator rings with a fill plug that can be removed with the resultant loss of fluid shall not be acceptable. Standard tapped single point connections or diaphragm seals vulnerable to plugging by debris or deposits shall not be acceptable.
  5. Pressure gauges shall be 4" diameter, 304 stainless steel construction or better, and shall be calibrated to read directly in feet of head. Connecting hoses shall be 304 stainless steel, with connections as outlined herein.
- F. Any pumping stations provided for this project where the wet well exceeds 25' in depth shall be provided with factory-installed air vent piping systems with check and isolation valves, to allow the automatic draining of the pump riser pipes at the end of each pump cycle. Vent piping shall prevent the buildup of vacuum within the riser piping, avoiding noise or vibration in the piping during subsequent pump starts. Provisions shall be made to allow the entrance of air into the riser pipes but prevent unimpeded discharge of the pumped media during pump run cycles.
1. Vent piping shall be Schedule 40 stainless steel, not less than 1" diameter, and shall include nipples, fittings, valves, union connectors, check valves, and other appurtenances as may be required to achieve the desired function. All vent piping, fittings, and valves provided in the station shall be 304 stainless steel, connected with NPT threads. Union connectors shall be provided before and after any/all isolation valves, check valves, or other components that may require access for repair or replacement.
  2. Isolation valves provided shall be quarter-turn plug valves for quick closure, with elastomers that are suitable for sewage and/or methane gas exposure. The use of multi-turn gate valves for isolation of components within the vent piping system will not be allowed. Isolation valves shall be of the same size as noted above. Not less than two (2) isolation valves shall be provided in each vent line, to allow the future removal of the check valve and/or union connectors as needed.

3. Check valves of no less diameter than the pipe size noted above shall be provided in the vent piping and shall be configured to allow for automatic draining of the riser piping when the pumps are off. Check valves shall be the sinking ball type, and shall be provided in 304 stainless steel construction, with Viton elastomers.
  4. Union connectors, also provided in 304 stainless steel, shall be provided both before and after the check valve and isolation valves to permit future removal as required. Union connectors shall be of the same size as the piping noted above.
  5. Piping shall be factory-installed in the station for both riser pipes and shall be connected to drilled and tapped connections in the riser piping, and to the PVC vent piping as described elsewhere herein. All piping shall be properly supported in accordance with good commercial practice.
  6. All 304 stainless steel piping, valves, fittings, etc. shall be provided with the manufacturer's standard mill finish, and do not require finish painting. Any ferrous metals and castings utilized shall be provided with a high-quality machinery enamel or epoxy finish coating prior to shipment.
- G. In addition to the vent piping described this station shall be provided with an automatic air release valve, which will be located at the top of the common tee on the discharge piping in the fiberglass enclosure. The air release valve shall provide a means of automatically venting the air contained in the riser piping and/or valve header upon starting of either pump. Discharge piping from the air release valve shall be routed to an opening in the cable transition plate, and provided with suitable couplings to prevent the entry of wet well gases into the fiberglass pump station enclosure.
1. The air release valve shall be designed to release air and gases from the header when the pumps start, and to automatically close to restrict bypass flow. When the pump stops, the valve shall automatically move to the open position, positively venting the header pump casing for the start of the next pumping cycle.
  2. Air release valve springs shall be available in different compression ratings, to allow matching of the valve to the specific application. Air release valves shall be a nominal 1" diameter, with standard NPT connections.
  3. The Air Release Valve shall be model D025 by ARI.
  4. Discharge piping from the air release valve to the cable transition plate shall be clear reinforced hose, of not less than 1" in diameter. Gas-tight seals shall be provided to prevent the leaking of wet well gas into the pump station enclosure. 1" diameter quarter-turn ball valves and union connectors shall be provided before and after the air release valve to facilitate future removal for maintenance or repair.

## 2.10 SUPPORTS AND THRUST BLOCKS

- A. All piping connected to the pump station shall be supported in accordance with good

commercial practice. The control panel, control power transformer, and discharge pressure gauge shall be mounted on a supporting framework of fabricated steel. The support frame shall be drilled to accept all equipment and shall be constructed entirely of fabricated steel angle shapes.

## 2.11 FINISH

- A. All above ground station piping, control panel, and exposed steel framework shall be cleaned with industrial grade chemical cleaner. The prime coat shall be zinc-based synthetic primer. Finish coat shall be a high-performance protective enamel coating. All coatings shall be applied at the pump station manufacturer's facility prior to assembly of the equipment, with touchup being provided as necessary to repair any damage to the coating after assembly of components.

## 2.12 ELECTRICAL CONTROLS

- A. Refer to Specification Section 26 29 00 ("Manufactured Control Panels") for additional control panel requirements.
- B. Entire installation shall be provided in compliance with NFPA 820 & NEC requirements.
- C. A complete pump control system shall be provided as a part of the factory-built pump station assembly. The pump station control panel shall be tested as an integral unit by the pump station manufacturer.
- D. The electrical control equipment shall be mounted within a NEMA 4X stainless steel dead front type control enclosure provided with a three-point latching mechanism. The enclosure door shall be hinged and sealed with a neoprene gasket. It shall include a removable plated steel back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Operator controls shall be mounted on a hinged inner door of aluminum or stainless steel. The control enclosure shall be mounted outside the fiberglass station enclosure as shown on the Plans. Panel enclosure shall be mounted to Unistrut, also in 304 stainless steel and be positioned above the 100-year flood plain. The control panel will be equipped with vapor emission type corrosion inhibitors.
  1. A NEMA 1 stainless steel junction box shall be provided inside the fiberglass pump station enclosure, to facilitate wiring between the station and the remote pump control panel. All wiring to the junction box from the pumps, transducer, float switches, vent fan, receptacles, and any/all other powered equipment in the station shall be routed to the junction box.
  2. All wiring coming to the junction box shall be made by means of appropriate terminal connections, sized to accept copper conductors of sufficient size to serve anticipated pump station loads. Terminal blocks shall be mounted to allow incoming wire bending space in accordance with Article 373 of the National Electrical Code (NEC).

3. A common ground bar shall be mounted on the junction box back plate, and the mounting surface of the ground bar shall have any paint removed before making final connections. The contractor shall make field connections to the main ground lug and each pump motor in accordance with the NEC.
  4. Control panel manufacturer shall supply externally mounted air conditioning unit to maintain an acceptable temperature within the panel enclosure. Heat calculations shall be provided by the package manufacturer to verify the sizing of air conditioning unit, but sizing shall be the responsibility of the panel manufacturer to ensure that sufficient capacity is provided for the specified equipment.
  5. Provide sunshade to shield direct sunlight from all surfaces of the pump station control panel.
- E. All control components shall be securely fastened to a removable back panel with screws and lock washers. Switches, indicators and instruments shall be mounted through the control panel door. All control devices and instruments shall be secured to the sub-plate with machine screws and lock washers. Mounting holes shall be drilled/tapped, and self-tapping screws shall not be used to mount any components. All connections from the back panel to door mounted or remote devices shall be made through terminal blocks. All control devices shall be clearly labeled to indicate function.
1. Control relays shall be the plug-in enclosed polycarbonate type, with spring return of adequate strength to compensate for the effect of any residual voltage that may exist in the control panel. All relays used for switching and latching functions within the control panel shall be identical. Relay coil windings shall be polyurethane insulated, with a minimum insulation resistance of 100 megohms minimum. Dielectric strength of the coils shall be 1500 volts RMS and all relays shall be suitable for a temperature range of from -50 to 65 degrees C. The mechanical life expectancy of control relays shall be in excess of 20 million operations. Pull-in speed shall be 14 ms typical, with 10 ms typical drop-out speed. All relays shall be suitable for continuous duty cycles and shall be U.L. recognized. Relay contacts shall be rated at 10 amps resistive at 120 VAC.
  2. Each relay will be mounted in a separate fixed polycarbonate base with integral terminal connectors suitable for the minimum wiring size specified above. Relay bases shall be attached directly to the panel subpan by means of tapped holes, or by means of DIN strip(s) mounting to the subpan. Direct mounting of relays to the subpan, or direct wiring to relay terminals is not acceptable.
  3. Relays shall be full-size ice cube design, as manufactured by IDEC, Potter-Brumfield, Schneider, or equal. The use of miniature relays is expressly prohibited. Spare relays of all sizes shall be provided as outlined herein.
- F. A main terminal block and ground bar shall be furnished for field connection of the incoming electrical supply. The connections shall be designed to accept copper conductors of sufficient size to serve anticipated pump station loads. Main terminal block

shall be mounted to allow incoming wire bending space in accordance with Article 373 of the National Electrical Code (NEC).

G. Pump station controls shall conform to third party safety certification. The finished control panel shall bear a serialized UL label listed for Enclosed Industrial Control Panels. The enclosure, and all components mounted on the sub-panel or control cover, shall conform to UL descriptions and procedures.

H. The control panel shall be equipped with a transient voltage surge suppressor to minimize damage to the pump motors and control from transient voltage surges. The suppressor shall utilize thermally protected silicon-oxide varistors encapsulated in a non-conductive housing. Mechanical indicators shall be provided on each phase to indicate protection has been lost.

I. Motor Branch Components

1. A properly-sized heavy duty air circuit breaker shall be furnished for each pump motor, and shall have a symmetrical RMS interrupting rating of 22,000 amperes at 460 volts. Circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.

a. A padlocking operating mechanism shall be installed on each motor circuit breaker. Operating handles for the breaker mechanisms shall be located on the enclosure outer door, with interlocks which permit the door to be opened only when circuit breakers are in the OFF position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

J. All motor branch and power circuit components shall be of highest industrial quality. The short circuit current rating of all power circuit devices shall be a tested combination or evaluated per the National Electrical Code Article 409. The lowest rated power circuit component shall be the overall control panel short circuit rating and shall not be less than the fault current available. The minimum control panel rating shall not be less than 10 kA, RMS symmetrical. Control assemblies operating at 120 volts nominal or less may be provided with transformers which limit the fault current and may be rated less than the minimum required short circuit rating.

K. Oil-tight pilot lights shall be provided as specified herein. Pilot lights furnished shall be in addition to any lights provided as a part of any automatic level controller that may be specified herein. All pilot lights shall be suitable for 120VAC and shall be mounted in keyed openings on the inner door of the control panel. Pilot lights shall be push-to-test, shall utilize LED lamps and shall be provided with jeweled glass or plastic lenses a minimum of 1 in diameter. A common push-to-test button for verifying the condition of pilot light lamps shall also be acceptable.

1. Individual pilot lights will be provided on the inner door of the control panel to alert station maintenance personnel to a pump run, high stator temperature or seal



leak condition for each pump.

2. Each pump run light shall be wired in parallel with the related pump motor starter to indicate that the motor is (or should be) running. Running lights shall be green in color.
3. The pump control panel shall be equipped to terminate pump operation due to high motor winding temperature or moisture in the motor housing, utilizing contacts in the pump motor housing. If either event should occur, the motor starter will drop out and a high stator temperature or seal fail pilot light on the panel door shall indicate that the pump motor has been shut down. The associated circuitry for either condition shall require manual reset. High temperature and seal leak lights shall be red in color.
4. Pump monitor relays described above shall be installed in the pump station control panel and wired in accordance with the manufacturer's instructions for protection of each pump.
5. In the event of a VFD failure, the control package shall include bypass IEC Motor starters with class 10 overload relays. The control system shall also include a 30mm bypass switch. Purpose of switch is to manually engage IEC starter circuit. This will be a manual circuit which can only be engaged onsite.

#### H. Variable Frequency Motor Controllers

1. This specification describes a complete adjustable speed AC drive (VFD) used to control the speed of NEMA design B induction motors used in areas where low harmonic content is desired or mandated.
2. The manufacturer shall supply the VFD and all necessary controls as herein specified.
3. The VFD shall be manufactured by a company with at least ten (10) years' experience in the production of this type of equipment.

#### I. QUALIFICATIONS

1. The VFD shall meet the following specifications:
  - (a) UL 508A, 508C, or UL-61800-5 – Underwriter's Laboratory.
  - (b) CAN/CSA-C22 No. 14-M91 – Canadian Standards Association. The VFD shall be C-UL or CSA Listed and carry the appropriate mark.
  - (c) Institute of Electrical and Electronic Engineers (IEEE). Std 519-2014, IEEE Guide for Harmonic Content and Control.
  - (d) The VFD shall comply with the following European Union's CE directives. The VFD shall carry the CE mark.

- EMC Low Voltage Directive 73/23 EEC
- EMC Directive 89/336 EEC
- Machinery Directive 98/37 EC

(e) Acceptable manufacturers

- Schneider Electric Altivar 630
- VFDs that are manufactured by a third party and “brand labeled” shall not be acceptable.
- VFD power structures that are manufactured by a third party and “brand labeled” shall not be acceptable.

J. Ratings

1. The VFD shall be rated to operate from 3-phase power, 380 Vac to 480 Vac +10/-10%. The overvoltage trip level shall be a minimum of 30% over nominal, and the undervoltage trip level shall be a minimum of 35% under the nominal voltage.
2. The VFD shall be rated to operate at the following environmental operating conditions. Ambient temperature: 0 to 40 °C continuous. The VFD shall have the capability to operate up to 50 °C with derating.
3. Output voltage and current ratings shall match the adjustable frequency operating requirements of standard NEMA design A or NEMA design B motors.
4. The normal duty overload current capacity shall be 110% of rated current for one (1) minute out of ten (10) minutes.
5. The heavy-duty overload current capacity shall be 150% of rated current for one (1) minute out of ten (10) minutes.

K. Operator Interface

1. A detachable UL Type 12 / IP65 rated bi-color backlit graphical user interface terminal with keypad and capacitive wheel shall be provided for monitoring, annunciation, and configuration. The graphical display shall change to a red backlit color when an alarm occurs. The mechanical mounting for the user interface on the cabinet shall be done with a 22 mm hole.
2. A “Simply Start” menu for fast and easy commissioning shall be provided. Parameter setting shall be easily accessible and user friendly with plain text messaging and actual setting range.
3. The user interface shall be capable of saving and downloading configurations of the VFDs, as well as importing them to other VFDs.
4. The user interface shall offer a mini-USB port for mass storage or PC device connection.

5. The VFD shall have self-diagnostic capabilities to display alarms, errors, and warnings as they occur and shall be able to store into memory the last 15 messages, at minimum. These shall be accessible by PC maintenance tools or by web server, with flash record for data logging.
6. The VFD shall have a separate dedicated RS232 Modbus serial port for the keypad and shall allow for simultaneous use of a remote mounted keypad with RS485 serial communications network.
7. The displayed messages shall be in plain text.

L. Protective Features

1. The VFD shall be UL 508 or UL61800-5-1 Listed for use on distribution systems.
2. The VFD shall have coordinated short-circuit rating designed to UL 508C or UL 61800-5-1
3. Voltage sag immunity per SEMI F47.
4. Upon power-up, the VFD shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, AC-to-DC power supply, control power, and the pre-charge circuit.
5. The VFD shall be protected against short circuits between output phases and ground and the logic and analog outputs.
6. The VFD shall have a selectable ride through function that will allow the logic to maintain control for a minimum of one (1) second without tripping.
7. The deceleration mode of the VFD shall be programmable for normal and trip conditions. The stop modes shall include freewheel stop and fast stop.
8. Upon loss of the analog process follower reference signal, the VFD shall trip and/or operate at a user-defined speed set by a software programmed speed setting or last speed.
9. The VFD shall have solid-state thermal protection that is UL Listed and meets UL 508C / UL 508A as a Class 10 overload protection and meets IEC 947.
10. The VFD shall have a motor thermal memory retention function per UL requirements.
11. The VFD shall be able to protect the motor when temperature probes are connected.
12. The VFD shall be able to limit the motor surge limitation to twice the DC bus

voltage. This must be accomplished by use of internal software. The VFD shall limit the motor surge limitation to value of not more than twice the DC bus voltage. Motor cable length shall be standard 50' length as specified herein.

13. The VFD shall provide VFD current protection.
  - a) Phase short circuit protection
  - b) Ground protection
  - c) Overcurrent protection
  
14. The VFD shall provide VFD voltage error protection.
  - a) Mains overvoltage protection
  - b) Mains undervoltage protection
  - c) DC Bus overvoltage protection
  - d) DC Bus pre-charge protection
  
15. The VFD shall provide VFD Thermal protection.
  - a) VFD overtemperature protection
  - b) Fan management
  - c) Switching frequency management
  
16. The VFD shall provide motor protection functions
  - a) Motor output phase detection
  - b) Motor surge voltage
  - c) Motor overload detection
  - d) Motor stall protection
  
17. The VFD shall provide application protection functions
  - a) Catch on fly function
  - b) Mains input phase lost protection
  - c) Motor overspeed input protection
  - d) Current limitation
  - e) Power limitation
  - f) Reverse inhibition
  - g) Underload protection
  - h) Overload protection
  - i) External error management
  - j) Loss of follower signal
  - k) Thermal sensor management
  - l) PID feedback
  - m) Customer defined input

#### M. Control Interface

1. A minimum of the following standard inputs/outputs shall be provided to interface with control systems and instrumentation:
  - a) Analog inputs:
    - (3) programmable 0(4)-20 mA or 0-10 Vdc

- Two (2) analog inputs shall also be programmable for temperature sensors (PTC, PT100, PT1000, KTY84)
- b) Analog outputs:
- Two (2) programmable 0(4)-20 mA or 0-10 Vdc
- c) Discrete inputs:
- (6) programmable isolated logic inputs as either sink or source
  - Two (2) discrete inputs shall also be programmable as 0-30 kHz pulse inputs
  - Two (2) discrete inputs shall be dedicated to the Safe Torque Off safety function in accordance with IEC/EN 61508-1 SIL3
- d) Discrete outputs:
- (3) programmable relay contacts
  - One (1) discrete output shall be dedicated to product watchdog logic

## 2. Safety Inputs

- a) The VFD shall provide two (2) inputs dedicated to the Safe Torque Off (STO) safety function, which prohibits unintended equipment operation, in accordance with IEC/EN 61508-1 SIL3.
- b) The VFD shall be compliant with EN13849 (PL e).
- c) The VFD shall be compliant with “Safety of Machinery,” EN 954-1.
- d) The VFD manufacturer shall provide the certified schematics and the list of devices in order to comply with IEC/EN 60204-1 stopping category 0 and 1.
- e) The VFD shall integrate the safety contacts in compliance with EN-81 13.2.2.3.

## N. Communications

1. The VFD shall provide at minimum one (1) Modbus and one (1) Ethernet Modbus TCP communication port. [In addition, the following communications options shall be provided as necessary for communications. Refer to communication requirements specified elsewhere within the Contract Documents.]

- a) [Ethernet IP or Modbus TCP, RJ45 dual port for daisy chain]
- b) [Profibus DP V2, SUB-D9 connection, compliant with Drive Profile networking]
- c) [Profinet, RJ45 dual port for daisy chain]
- d) [DeviceNet, 5 terminal points]
- e) [CANopen daisy chain, RJ45 dual port for daisy chain]
- f) [CANopen SUB-D9 connection]
- g) [CANopen open terminals, 5 terminal points]

2. VFD Ethernet ports shall be IPv6 compliant, allow for web server access, and

provide network management via Simple Network Management Protocol, and clock synchronization.

3. The VFD shall provide an embedded web server for enhanced diagnostic, configuration, parameter access, and energy management. It shall be possible to create a user-defined custom dashboard for viewing VFD and process status through tables, charts, and graphical views. It shall be possible to export data in standard table format using the web server, for information about energy consumption as well as error and warning history.
4. The VFD shall be compliant with the Cyber Security Management ISA Secure / Achilles.

O. Control Functions and Configurations

1. Application programming dedicated to pumps

- a) The VFD shall provide pump control and monitoring functions
- b) Centrifugal pump characteristics and configurations
- c) Pump monitoring function in order to define the data relevant for the pump (for example, acceleration, low speed, and high speed)
- d) Application units function in order to define the units used in applications
- e) Pump cyclic start protection in order to protect the pump against too many restarts in a dedicated time period
- f) Multi-pump functions

2. The VFD shall provide pump protection functions.

- a) Anti-jam function in order to remove automatically clogging substances from the pump impellers
- b) Pipe cleaning function in order to start the pump regularly to avoid sedimentation in pump impeller
- c) Cavitation pump protection
- d) Inlet protection in order to avoid system dry running

3. The VFD shall provide application control functions.

- a) Stop and Go function in order to reduce consumption of the VFD in case the pump does not work
- b) Pulse input for connection to flow meter feedback
- c) Process control (PID) function in order to maintain a process at a given pressure or flow reference
- d) Flow limitation function in order to allow limiting the consumption of water
- e) Friction loss compensation function in order to compensate pressure losses in pipes due to friction
- f) Pipe Fill function in order to manage a smooth control during pipe

- g) filling and to lessen the affects of water hammer
  - g) Sleep wake-up function in order to manage periods of the application when process demand is low and when it is not needed
  - h) Low demand function in order to define periods of the application when process demand is low in order to save energy
  - i) Jockey pump control function in order to start a jockey pump, during sleep period, to maintain emergency service pressure or demand, such as low water
  - j) Sensor management in order to define how VFD inputs will be used to manage the pressure sensor or flow sensor
4. The VFD shall provide application protection functions.
- a) High flow protection function in order to detect pipe burst or detect running outside normal working area
  - b) Outlet pressure protection function in order to fix minimum and maximum pressure
5. The VFD shall provide pump curve input to help optimize pump performance.
- a) Input and storage of the pump characteristics including five (5) points of the pump curve.
  - b) A best efficiency point (BEP) function in order to operate at maximum system efficiency and alarms to indicate deviation from BEP.
6. The VFD Supplier shall have Windows-based PC software for configuring and diagnosing the VFD. It shall be possible to set and modify parameters, control the VFD, read actual values, and make trend analysis using the software. The PC tools may be connected to the VFD by a wired or wireless connection.
7. The VFD shall display all faults in plain text and help screens shall be available to guide the user in troubleshooting. Codes are not acceptable.
8. The VFD shall provide a real time clock for time stamping detected errors.
9. The VFD shall display detected errors with QR codes to guide the user in the troubleshooting.
- P. The control circuit shall be protected by a normal duty thermal-magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
- Q. Pump mode selector switches shall be connected to permit manual start and manual stop for each pump individually, and to select automatic operation of each pump under control of the liquid level control system. Manual operation shall override the liquid level control system. Selector switches shall be heavy duty, oil-tight design, with contacts rated NEMA A300 minimum.





- individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Power wiring shall be 14 gauge minimum. Motor branch and power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered with suitable indelible marking tape at each end, in accordance with the electrical diagrams. All wires on the sub-plate shall be bundled and tied.
- Z. Wires connected to components mounted on the inner door shall be bundled and tied in accordance with good commercial practice. Bundles shall be flexible at the hinged side of the enclosure. Adequate length and flex shall be provided to allow the door to swing to its full open position without undue stress or abrasion on the wire or insulation. Bundles shall be held in place on each side of the hinge by mechanical fastening devices.
- AA. The pump control manufacturer shall provide a common ground bar mounted on the enclosure back plate. The mounting surface of the ground bar shall have any paint removed before making final connections. The contractor shall make the field connections to the main ground lug and each pump motor in accordance with the National Electric Code.
- BB. A permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:
1. Equipment serial number
  2. Control panel short circuit rating
  3. Supply voltage, phase and frequency
  4. Current rating of the minimum main conductor
  5. Electrical wiring diagram number
  6. Motor horsepower and full load current
  7. Motor overload heater element
  8. Motor circuit breaker trip current rating
  9. Name and location of equipment manufacturer
- CC. Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification labels shall be mounted adjacent to the device. Switches, indicators, and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.
- DD. All conduit and fittings utilized in construction of the station shall be UL listed. Liquid tight flexible metal conduit shall be constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code. Conduit shall be sized according to the National Electric Code.
- EE. Two additional 15 amp, 120VAC circuit breakers shall be provided for the standby pump engine block heater and trickle charger. Wiring from the 15-amp circuit breakers shall be routed to terminal blocks and the bottom of the control panel for field connection to the appropriate equipment by others.

## 2.13 LIQUID LEVEL CONTROL

- A. The manufacturer of the liquid level control system shall be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. The level control system shall start and stop the pump motors in response to sensed changes in wet well level, as set forth herein. The level control system shall utilize a submersible transducer for primary level control but shall also be provided with backup floats.
- C. The level control system shall incorporate automatic alternation to select first one pump, then the second pump to run as the lead pump for successive pump starts. Alternation shall occur at the end of a pumping cycle, or in the event of excessive run time.
- D. The liquid level control system shall be model PC3000XC, as manufactured by Primex Controls or equal. The PC-3000XC is a general purpose pump controller designed to sequence pumps on and off in response to changes in level. The primary sensor input to the controller shall be a 4-20 m loop as provided by the submersible level transducer as specified herein. A loop power supply shall included in the PC-3000XC controller to provide excitation voltage to the transducer.
- E. The PC-3000XC shall provide a front panel user interface for field setup and level setting adjustments. Connection to the level controller shall be made by means of a removable terminal block assembly on the back cover, facilitating replacement if necessary without the need to remove individual wires to the controller. The block assembly shall unplug directly without need of removing/disconnecting individual wires.
- F. The PC-3000XC shall incorporate the following features as a minimum:
  - 1. A 32-character alpha-numeric liquid crystal display for level, status, and setpoint information. An alternation selection switch shall be provided on the front panel to enable the operator to turn alternation on, and allow the manual designation of the lead pump if alternation is off. The controller shall provide a simple menu structure for easy display and modification of pump operating setpoints and setup configuration.
  - 2. Built in elapsed time meters shall be provided for all pumps, which shall be non-volatile and easily examined from the front panel. All external meters shall be protected from sun damage with preference being installation behind the front cover of the panel.
  - 3. A 4-20 m main sensor input with loop power supply shall be included, for easy connection to the submersible level transducer, with adjustments being provided for both scale and offset as may be required. A fully-scalable 4-20 m level output transmitter shall also be included.
  - 4. Inputs for pump seal leak sensors and pump over temperature sensors with display messages for out of specification conditions shall be included.

5. Built-in single float backup logic shall be provided.
  6. Three auxiliary inputs shall be provided, which can be used as pump-disable or pump-run confirmation inputs for a fail to start test.
  7. A built-in horn relay with internal contact closures shall be provided, as well as an input for an external mute button.
  8. Relay outputs for both high and low level alarms with adjustable setpoints shall be provided. These outputs shall be integrated into the pump control design to provide contact closures for the operating circuitry, as well as to provide the dry output contacts for future SCADA integration, as specified herein.
  9. Individually selectable on and off setpoints for up to three pumps shall be provided, for integration into the pump control panel logic for operation as specified herein.
- G. Inputs to the level controller shall be filtered and transient protected. The controller shall be provided with all required software as built in, and no programming shall be required for proper operation. Only adjustments to level control settings shall be necessary to facilitate field setup.
- H. All inputs to the level controller shall operate on low voltage/current for safety. Input power to the controller shall be 115VAC, internally fused and transient protected. As specified above, all terminal strips connecting panel wiring to/from the controller shall unplug without removing the wires for easy field replacement.
- I. An alarm silence pushbutton and relay shall be provided to permit maintenance personnel to de-energize any audible alarm device provided while corrective actions are underway. After silencing the alarm device, manual reset of the alarm condition shall clear the alarm silence relay automatically. The pushbutton shall be oil tight design with contacts rated NEMA A300 minimum.
- J. The station manufacturer will supply a 115VAC alarm light fixture with a vapor-tight red globe, guard, conduit box, and mounting base. The design must prevent rain water from collecting in the gasketed area of the fixture, between the base and globe. The alarm light will be shipped loose, for installation by the contractor in the location as designated by the Engineer or the Owner during the course of equipment installation on site.
- K. The alarm light circuit shall be equipped with a flasher causing the alarm light to flash. Flash rate shall be approximately 1 second (2 second on and off).

## 2.14 SUBMERSIBLE TRANSDUCER

- A. One analog submersible level transducer shall be supplied with the control panel. The transducer shall be designed to provide a 4-20 milliamp level signal proportional to the sensed liquid level in the wet well. The unit shall be sealed and non-fouling design, and

shall be provided flush-mounted abrasion resistant Kynar diaphragm. Level sensor shall be a KPSI Model 750 submersible level transducer, or equal by Dwyer.

- B. The submersible hydrostatic level transducer shall be provided with a 2.75" elastomeric diaphragm and protective cage specifically designed to meet the adverse environments encountered in wastewater applications. The transducer shall feature a wide sensing area comprised of a PTFE coated elastomeric diaphragm for reliable operation in highly viscous or slurry environments. The assembly shall be integrated with all required supporting electronics mounted within a durable waterproof housing constructed of welded 316 stainless steel or titanium.
- C. Polyurethane or Tefzel electrical cable shall be provided, as manufactured to MEAS specifications, and shall include Kevlar members to prevent errors due to cable elongation, as well as a unique water block feature that self-seals in the event of accidental cuts to the cable. The transducer shall be vented to atmosphere by means of tubing contained within the included cable, and shall be shipped with the manufacturer's latest-design super-dry vent filter that prevents moisture from entering the vent tube for a minimum of one year without maintenance, even in the most humid environment. Spare vent filters shall be provided as specified herein.
- D. Adequate cable shall be provided to allow installation of the transducer without need for splices in the cable between the wet well and the control panel location, and the contractor shall not cut off any additional cable that may be provided.
- E. A built-in lightning arrestor shall be included to provide protection against transient voltage spikes. Lightning-protected models shall include both internal and external panel-mounted devices for maximum protection against surges, spikes, or lightning. The transducer shall be provided with a two-year warranty against defects in materials and/or workmanship.
- F. The transducer shall be a non-fouling design and shall be provided with a wide-mouth protective cage to prevent damage to the diaphragm by debris in the wastewater. The cage shall also be constructed of 316 stainless steel or titanium and shall include spacers and a lower protective plate for protection of the sensing element and diaphragm. The transducer shall be capable of +/- 0.25% full scale static accuracy, and +/- 0.0001% full scale resolution, and shall be available in custom level ranges of up to 115 feet (35 meters). Level range provided shall be specifically selected for this project, based on the wet well depth as shown on the Plans.
- G. Analog output from the transducer shall be 4-20 mA. Excitation voltage shall be provided by the level controller specified herein, and the transducer and controller shall be matched to provide for accurate, repeatable operation for years. Operating temperature range shall be from -4 to +140 degrees Fahrenheit.
- H. An aneroid bellows constructed of flexible neoprene material shall be attached to a polycarbonate mounting bracket inside the control panel enclosure and shall be properly applied to result in a closed reference pressure system subject to zero shift errors induced by changing temperatures of up to 0.003 PSI per degree Celsius.

- I. A woven wire cable hanger shall be provided by the transducer manufacturer to allow suspension of the transducer in the wet well. The hanger shall be fabricated of 316 stainless steel and shall provide a looped connection to suspend the transducer. The wire hanger shall be a regular production item of the transducer manufacturer and shall be designed for use with the specified equipment.
- J. One spare transducer/cable assembly and one spare bellows shall be provided as spare parts.

## 2.15 BACKUP FLOAT SWITCHES

- A. A total of two (2) backup control level float switches shall be supplied with the pump control panel, for installation by the contractor as shown on the Plans or as directed in the field. Floats shall be provided for pump on/off operation and high-level alarm indication. Each float switch shall be provided with adequate cable to reach the control panel without splicing. Switches shall be the direct-acting non-intrinsically safe type, designed and constructed for long life in severe applications. Each switch shall contain a single pole mercury switch in the normally open position, which shall close when the switch body is tilted. Switches shall be epoxy encapsulated, and the level sensors shall be impact and corrosion resistant.
- B. Float switch housings shall be 316 S.S., and shall be provided with a Teflon coating to reduce the buildup of fat, oil, grease and other materials. #14/3 AWG Hypalon-jacketed Type SO cable shall be provided with each float switch, of the length as noted herein, or as necessary for installation on site. Cable shall have a minimum of 105 strands of copper in each conductor for maximum flexibility. A green ground wire shall also be included in the cable for each float switch, and shall be connected to the ground terminals in the pump control panel. Float switch contacts shall be rated for 20 amps @ 120VAC.
- C. Each float switch shall be provided with the necessary hardware to enable it to be securely mounted on a 1/8" diameter 316 S.S. mounting cable. A suitable weight kit shall be attached to the bottom of the float switch suspension cable to secure both the cable and the float in the wet well, and to prevent excessive movement. The float switch connection hardware shall be adjustable to allow repositioning in the wet well as required. The entire float assembly (weight, support cable, and all switches) shall be easily removed from the wet well for inspection, cleaning, or adjustment as required. Mounting hardware shall be included for installation of the float switches on the support cable assembly.
- D. Float switches shall be Model P40NO-SST, manufactured by Anchor Scientific, Inc. or equal. A suitable 304 S.S. support bracket shall be provided with the wet well access cover, for securing the switch support cable at the top of the wet well.

## 2.16 SPARE PARTS AND EQUIPMENT

- A. After installation and startup of the pumping stations, the pump station manufacturer shall provide the following spare parts and equipment to the Owner for use during normal operation and/or maintenance:

1. Twelve (12) oil inspection plug O-rings for the pumps, in addition to the complete set of O-rings required in (3) below.
  2. One (1) pump rebuild kit, to include spare mechanical seals, shaft bearings, and a complete set of O-rings required for the pumps, in addition to the requirements of Item 1 above.
  3. Twelve (12) spare LED lights for the control panel
  4. Three (3) spare ice cube relays for the control panel
  5. One (1) complete PC-3000XC level controller
  6. One (1) complete KPSI Model 750 submersible transducer (or equal) with 50' of cable
  7. One (1) set spare backup float switches with cable
- B. All spare parts shall be provided packed in suitable containers for extended storage by the Owner. Any spare parts consumed during the course of equipment startup shall be replaced by the manufacturer without cost to the Owner.
- C. The pump manufacturer's representative shall review the spare parts provided with the Owner, so that they are aware of what is being provided on the project.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

#### 3.02 INSTALLATION

- A. The contractor shall install, level, align, and lubricate all equipment associated with the pump station as shown indicated on the project drawings, and as outlined in the O&M manual provided with the equipment. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- B. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

- C. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that all protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

### 3.03 FIELD QUALITY CONTROL

#### A. Operational Test

1. Prior to acceptance by Owner, an operational test of all pumps, and control systems shall be conducted to verify that the installed equipment meets the purpose and intent of these Specifications. Tests shall demonstrate that all equipment provided is electrically, mechanically, structurally, and otherwise acceptable; that it is safe and in optimum working condition; and that it conforms to the specified operating characteristics.
2. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

#### B. Manufacturer's Start-up Services

1. Coordinate station start-up with the manufacturer's technical representative. The representative or factory service technician will inspect the completed installation, calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

### 3.04 CLEANING

- A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

### 3.05 PROTECTION

- A. The pump station should be placed into service immediately upon completion of field startup. If operation is delayed, the station shall be stored and maintained per the manufacturer's written instructions until it is ready for use.

END OF SECTION

**SECTION 26 05 00**  
**Basic Electrical Materials And Methods**

PART 1 - GENERAL

1.01 DESCRIPTION

A. General Conditions:

1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

B. General Requirements:

1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
4. The Owner shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.
5. Only qualified electrical sub-contractors will be allowed to submit proposals for this project. In order to be considered qualified, contractor shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Sub-contractors without qualifications will be rejected. If desired, potential electrical sub-contractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:
  - a. Power Systems.
  - b. Control Systems.
  - c. Instrumentation Systems.
6. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

1.02 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)



- A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.
- B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Engineer. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.
- C. Furnish and install complete power, telephone and other electrical services as shown on drawings and/or specified herein.
- D. Pay all electrical utility company service charges (if any) in connection therewith, including permanent meter deposit. Meter deposits will be refunded to Contractor at time of Owner's acceptance.
- E. Furnish and install complete power distribution system as shown on drawings and/or specified herein.
- F. Furnish and install a complete Power Generation and Automatic Transfer Switch System as shown on drawings and/or specified herein.
- G. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.
- H. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.
- I. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
  - 1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
  - 2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.
- J. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.
- K. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.
- L. Furnish and install complete controls, instrumentation & auxiliary systems as shown on

drawings and/or specified herein.

- M. Furnish and install a complete Surge Protection System as shown on drawings and/or specified herein.
- N. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.
- O. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.
- P. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.
- Q. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

## PART 2 - PRODUCTS

### 2.01 APPROVED MATERIALS AND DEVICES

- A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Engineer before installation. All like items and associated equipment/systems shall be of one manufacturer.
- B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.
- C. To ensure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:
  - 1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
  - 2. SECTION 26 24 17: LIGHTING PANELBOARDS
  - 3. SECTION 26 28 16: SAFETY SWITCHES AND FUSES

### 2.02 SUBMITTALS

- A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to

meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.

- B. Submit to Engineer ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.
- C. Submit to Engineer promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:
  - 1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
  - 2. SECTION 26 24 17: LIGHTING PANELBOARDS
  - 3. SECTION 26 28 16: SAFETY SWITCHES AND FUSES
  - 4. SECTION 26 29 00: MANUFACTURED CONTROL PANELS
  - 5. SECTION 26 32 13: GENERATOR SETS
  - 6. SECTION 26 36 23: AUTOMATIC TRANSFER SWITCHES
  - 7. SECTION 26 43 00: SURGE PROTECTIVE DEVICES
  - 8. SECTION 26 44 00: ELECTRICAL HEAT TRACING SYSTEMS
  - 9. SECTION 26 50 00: LIGHTING MATERIALS AND METHODS
  - 10. ALL POWER DISTRIBUTION EQUIPMENT (i.e. SWITCHBOARDS, PANELBOARDS, DRY TYPE TRANSFORMER, ETC.)
  - 11. ALL ELECTRICAL AND TELECOMMUNICATION EQUIPMENT LAYOUTS - Submittals shall include 1/4" = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical room, IT room, electrical equipment stand, generator area, or any other similar area with electrical equipment. Drawings shall indicate all panelboards, transformers, switchboards, generators, equipment racks, control panels, HVAC equipment, etc. that are located in each electrical/IT area. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. No conduits to equipment within these areas shall be installed until submittals have been provided and returned without exception by the design team.
  - 12. ALL CONTROL ITEMS & SYSTEMS
- D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Engineer. The failure of the contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Engineer will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.
- E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Engineer without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if

directed.

- F. Any required resubmittal will be reviewed by the Engineer for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.
- G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Engineer. All material proposed for substitution is subject to the approval of the Engineer and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.
- H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the Engineer on items proposed as substitutes.
- I. Submit to Engineer a certificate of final inspection from local inspection department.

### PART 3 - EXECUTION

#### 3.01 SITE VISIT

- A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

#### 3.02 CLEARANCE WITH UTILITIES

- A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.
- B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.
- C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become responsibility of the Owner.

- D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

### 3.03 WORKMANSHIP

- A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.
- B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.
- C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.
- D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.
- E. Keep site clean of accumulation of cartons, trash and debris.

### 3.04 SAFETY

- A. The contractor is solely responsible for all job safety. Engineer assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably insure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

### 3.05 CONTRACT DOCUMENTS

- A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.
- B. Contract documents consist only of the hardcopy documents issued by the Prime Engineer. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).
- C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:

1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
2. Agree to pay the electrical engineer a fee of \$50.00 per drawing, up to a maximum of \$400 per transfer, payable upon receipt of the files.
3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.

D. Take finish dimensions at job in preference to scaled dimensions.

E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Engineer.

### 3.06 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Engineer immediately if any conflict is found.

### 3.07 EQUIPMENT STORAGE

A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-stored equipment as directed by Engineer.

### 3.08 EXCAVATION, CUTTING AND PATCHING

A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Engineer's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Engineer before cutting into any structural members.

B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

### 3.09 PENETRATIONS

A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.

B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.

- C. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

### 3.10 INSTALLATION OF EQUIPMENT - GENERAL

- A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.
- B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.
- C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.
- D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.
- E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.
- F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

### 3.11 MOTORS, STARTERS AND CONTROLS

- A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.
- B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.
- C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

### 3.12 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.

- B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

### 3.13 LUG/TERMINAL RATINGS

- A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.
- B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

### 3.14 EQUIPMENT FAULT CURRENT RATINGS

- A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

### 3.15 OUTLET LOCATION

- A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to insure correct installation.

### 3.16 IDENTIFICATION

- A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.
- B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.
- C. See Specification Section 26 05 53 for additional requirements.

### 3.17 GROUNDING

- A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

### 3.18 PAINTING

- A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact



color paint as original finish.

### 3.19 ACCEPTANCE TESTING

- A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Engineer. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.
- B. The electrical sub-contractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:
  - 1. SECTION 26 32 13: GENERATOR SETS
  - 2. SECTION 26 36 23: AUTOMATIC TRANSFER SWITCHES
  - 3. SECTION 26 44 00: ELECTRICAL HEAT TRACING SYSTEMS

### 3.20 OPERATION AND MAINTENANCE DATA

- A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner's representative.

### 3.21 GUARANTY-WARRANTY

- A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
  - 1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
  - 2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 26 05 00

**SECTION 26 05 19**  
**Power Conductors And Cables 51v-600v**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Power Wires and Cables
- B. Low Voltage Wires and Cables

PART 2 - PRODUCTS

2.01 POWER WIRES AND CABLES - 600 VOLT

- A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.
- B. General Application (see below for exceptions):
  - 1. At or Below Grade (including within slab-on-grade):
    - a. #8 or larger conductors:
      - 1) XHHW or RHH/RHW/USE stranded (in conduit).
    - b. #10 or smaller conductors for circuits terminating at motors:
      - 1) THHN/THWN or XHHW stranded (in conduit).
    - c. #10 or smaller conductors (excluding circuits terminating at motors):
      - 1) THHN/THWN or XHHW solid (in conduit).
  - 2. Above Grade:
    - a. #8 or larger conductors:
      - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
    - b. #10 or smaller conductors for circuits terminating at motors:
      - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
    - c. #10 or smaller conductors (excluding circuits terminating at motors):
      - 1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).

3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Americable, Aetna or approved equal.

#### C. VFD Cabling

1. Wiring/Cabling installed between each VFD (Variable Frequency Drive) and the associated motor shall be multi-conductor shielded VFD power cable with the following characteristics:
  - a. Multi-conductor cable with three (3) power conductors and three (3) ground conductors
  - b. Soft annealed flexible stranded copper conductors.
  - c. 1kV cross-linked polyolefin insulation (to resist the potential reflected voltages experienced in 600VAC VFD applications).
  - d. Metallic shielded providing 100% shield coverage
  - e. Oil, abrasion, chemical & sunlight resistant thermosetting compound outer jacket.
  - f. Flexible TC-ER rated, UL listed for use in cable trays.
  - g. Equal to AmerCable #37-108VFD cable.

#### D. Class 1 Control Cabling (120VAC Control Circuits, Etc.)

1. Unless specified otherwise, Class 1 control cabling shall:
  - a. Be rated for exposed cable tray installation.
  - b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
  - c. Be UL-rated for the proposed application.
  - d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
  - e. Utilize copper conductors.
  - f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
  - g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
  - h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
  - i. Be rated for 600V.
  - j. Be industrial grade.
  - k. Have stranded conductors.
  - l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

E. Fixture Wiring

1. Conductor Types:
  - a. Type TFFN or XFF.
2. Minimum Sizes:
  - a. For fixtures up to 300 watts: #16.
  - b. For fixtures over 300 watts up to 1500 watts: #14.
  - c. For fixtures over 1500 watts: as required.
  - d. Conductors to concrete pour fixtures: #12.
3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.02 WIRE CONNECTIONS:

A. All connector types:

1. Shall be properly rated for the proposed application by UL and per the manufacturer.

B. At Motor Connections (within motor terminal boxes):

1. On Unshielded Wire:
  - a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
  - b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.
2. On Shielded Power Wire:
  - a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.

C. Other Dry locations:

1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
2. On Wire #10 and smaller: shall be made with one of the following:

- a. Ideal Wing Nuts or equal by 3M .
  - b. Ideal Push-In Wire Connectors (for #12 and smaller only).
- D. Other Wet/Damp locations:
- 1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by IlSCO, Burndy or T&B.
  - 2. On Wire #10 and smaller: shall be made with one of the following:
    - a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

### PART 3 - EXECUTION

#### 3.01 GENERAL INSTALLATION

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise.
- B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.
- C. No splices shall be pulled into conduit.
- D. No conductor shall be pulled until conduit is cleaned of all foreign matter.
- E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.
- F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.
- G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.
- H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

#### 3.02 POWER WIRE AND CABLE INSTALLATION:

- A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Multi-wire lighting branches shall be used as indicated.
- C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).
- D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless

specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).

- E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.
- F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

### 3.03 WIRE CONNECTIONS

- A. See Part 2 above for material types.
- B. Aluminum Wire Connections:
  - 1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).
- C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.
- D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.
- E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.
- F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

### 3.04 SHIELDED CABLE INSTALLATION

- A. Shielded VFD (power) cables:
  - 1. The braided shields and internal grounding conductors of shielded VFD (power) cables shall be grounded at BOTH ends (at VFD and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection

- ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
- 2. Contractor shall coordinate the necessary size of conduit with the outer diameter of the proposed cable type to verify that the raceway loading does not exceed NEC requirements prior to rough-in of the conduit system.

B. Shielded instrumentation (low voltage) cables:

- 1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

3.05 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:

- 1. Cabling shall be plenum-rated, multi-conductor.
- 2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
- 3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
- 4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.06 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.07 LABELING AND COLOR CODING OF WIRE AND CABLE

- A. Refer to Specification Section 26 05 53 for all labeling requirements.
- B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-	ORANGE

C	BLUE	LEG)	YELLOW
NEUTRAL	WHITE	BLUE	GRAY
GROUND	GREEN	WHITE	GREEN
		GREEN	

C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

D. Control Conductors: Shall be color coded by use of colored “tracers”. No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

### 3.08 TESTING

A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification (“ATS”) standard shall be replaced by the contractor at the contractor’s expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 26 05 19



**SECTION 26 05 26**  
**Grounding**

PART 1 - GENERAL

1.01 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:

1. Service Equipment.
2. Transformers.
3. Non-current carrying conductive surfaces of equipment.
4. Metal Buildings.
5. Structures.
6. Other Equipment.

1.02 GENERAL REQUIREMENTS

- A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to insure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.
- B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall insure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.
- B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be “jumped” by an appropriate bonding conductor.
- C. Supplemental grounding system conductors shall be bare, softdrawn, stranded, single conductor copper wire, and generally sized as follows (unless shown otherwise on plans):
1. Switchgear, motor control centers, and power transformer #4/0 minimum or as shown on plans.
  2. Power panels, #2/0.

3. Control panels and consoles, #4.
4. Process Motors, #1/0.
5. Building Columns, #4/0.
6. Light Poles, #2.
7. Telephone Backboard & Cabinet ground busses, #2.

## 2.02 GROUNDING ELECTRODES

- A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

## 2.03 CONNECTIONS

- A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.
- B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).
- C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.
- D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.
- E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

## 2.04 MANUFACTURERS

- A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.
- B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.
- C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.
- D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.
- E. Split post grounding shall be as manufactured by Burndy or T and B.

## PART 3 - EXECUTION

### 3.01 MAIN SERVICE GROUND

- A. The main service grounding electrode system shall consist of the following items bonded

together by the grounding electrode conductor:

1. The main underground cold water pipe (metal).
  2. The metal frame of the building.
  3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.
- B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

### 3.02 TRANSFORMER GROUNDS

- A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

### 3.03 EXPOSED NON-CURRENT-CARRYING METAL PARTS

- A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.
- B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8".
- C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground

potentials.

- D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible “jumpers” shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.
- E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.
- F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.
- G. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.
- H. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

### 3.04 ACCEPTANCE DOCUMENTATION AND TESTING

- A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.
- B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.
- C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 (“Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System”). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Engineer prior to the final

observation, and shall be included in final O&M documentation.

END OF SECTION 26 05 26

**SECTION 26 05 33**  
**Raceways**

PART 1 - GENERAL

1.01 DESCRIPTION

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Conduits
2. Conduit Fittings
3. Couplings & Connectors
4. Bushings
5. Raceway Hardware, Conduit Clamps & Supports
6. Watertight Entrance Seal Devices

PART 2 - PRODUCTS

2.01 CONDUITS

A. PVC-Coated Rigid Steel:

1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
4. Form 8 Condulets<sup>®</sup>, 3/4" through 2" diameters, shall have a tongue-in-groove "V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
7. Form 8 Condulets<sup>®</sup> shall be supplied with plastic encapsulated stainless steel cover screws.
8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.

9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).
10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.
11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.
12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:
  - a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. (ASTM D870)
  - b. Conduit and conduit exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513).
  - c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
  - d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
  - e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.
  - f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.
13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.
14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.

B. Rigid Galvanized Steel and I.M.C.:

1. Shall be galvanized outside and inside by hot dipping.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

C. Rigid Aluminum:

1. Shall be manufactured of 6063 Alloy, T-1 temper.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

D. Schedule 40 and 80 PVC:

1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

E. HDPE Innerduct

1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
2. Shall be corrugated unless noted otherwise.
3. Shall be manufactured by Carlon, Ipex or equal.

F. Flexible Metallic Conduit:

1. Shall be continuous spiral wound and interlocked galvanized material, code approved for grounding.

G. Liquidtight Flexible Metallic Conduit:

1. Shall be galvanized steel-core sealtite, code approved for grounding.
2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

## 2.02 FITTINGS, COUPLINGS & CONNECTORS

A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.

B. All fittings, couplings and connectors (**including, but not limited to, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) used in areas where PVC-Coated Rigid conduit is used shall also be PVC-coated.

C. All fittings, couplings and connectors (**including, but not limited to, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) installed in other wet, exterior or process areas where PVC-coated conduit systems are not required, shall be aluminum or stainless steel type. Standard steel fittings will not be acceptable.

D. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.

E. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.

F. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.

G. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit.



Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.

- H. All LB unilets sizes 1 1/4" or larger shall have rollers.
- I. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

### 2.03 BUSHINGS

- A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).
- B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.
- C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

### 2.04 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

- A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).
- B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.
- E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

### 2.05 WATERTIGHT ENTRANCE SEAL DEVICES

- A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).
- B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks

with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION

- A. Minimum Diameter: 3/4-inch.
- B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
  - 1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.
  - 2. Exterior, Used for Instrumentation Circuits: See Below.
  - 3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See “transition” items below for additional requirements. Conduits shall be left exposed until after Engineer’s observation.
  - 4. Raceways used for Instrumentation Circuits:
    - a. Typical Dry or Wet Locations: Rigid Aluminum .
    - b. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.
    - c. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): PVC-Coated Rigid Steel.
  - 5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
    - a. Exterior or Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
    - b. Dry, Interior Locations: Flexible Metallic Conduit (shall generally not exceed 24 inches in length).
  - 6. Terminations at instruments:
    - a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.
  - 7. Transition from underground or concrete-encased to exposed:
    - a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6” above floor level, and shall be installed at uniform heights.

### 3.02 RACEWAY INSTALLATION

#### A. General:

1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
3. Where any run of rigid aluminum conduit (including bends) exceeds 50' in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50' on center.
4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
7. All PVC joints shall be made as follows:
  - a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
  - b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
  - c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
8. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
9. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
10. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
11. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.
12. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .
13. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer's installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

#### B. Routing/Locating:

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.

2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.
8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
9. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be

subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.

2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.
3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
6. Raceways installed on top of flat roofing shall be supported a minimum of 3 1/2" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

#### E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. In wet, exterior or process areas, conduits shall NOT enter tops of enclosures. All conduits shall enter enclosures from bottom, left or right sides of the enclosure (utilizing rain-tight Meyers hubs as indicated above).
3. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
4. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.
7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
8. Conduit ends shall be carefully plugged during construction.
9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

#### F. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.
2. All penetrations shall be at right angles unless shown otherwise.
3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
5. All raceways entering structures, or where water is otherwise capable of entering equipment/devices through the raceway system, shall be sealed (at the first box or outlet) with foam duct sealant to prevent the entrance of gases or liquids from one area to another or into equipment/devices.
  - a. Where the elevation of the raceway penetration (into the structure) is no more than 15' below the other (higher) end of the same raceway, Polywater FST sealant (rated to hold back up to 22' of continuous water head pressure), or pre-approved equal, shall be used.
  - b. Where the elevation of the raceway penetration (into the structure) is between 15' and 75' below the other (higher) end of the same raceway, Polywater PHRD Custom Mechanical Seals (rated to hold back up to 36psi or 83' of continuous water head pressure), or pre-approved equal, shall be used.
  - c. Where the elevation of the raceway penetration (into the structure) is more than 75' below the other (higher) end of the same raceway, the contractor shall propose a custom solution designed to hold back or to drain the possible water within the associated raceway. Submittals shall be provided to the engineer for review/approval, including a summary of the anticipated elevations/PSIs, details of the proposed installation, cut-sheets of devices/materials, etc.
6. Additionally, where necessary to ensure that water does not enter equipment/devices through the raceway system (where raceways extend to equipment/devices from wet areas), junction boxes with drain assemblies in bottom shall be located at low point of raceway system near equipment/devices (to drain water out of raceway system before it enters equipment/devices). Contractors shall provide drains in raceway systems where so necessary to prevent water entry into equipment/devices. In special applications (such as to instruments, etc.), where cabling rated for exposed application is provided, contractor may propose short air gaps (approximately 6" or less) between the end of the conduit system and the equipment/device cable entry (to be made with cable gland connectors) to prevent water in conduit system from entering equipment/devices in lieu of drained junction boxes.
7. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
  - a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
  - b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.

8. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).
9. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.

G. Exterior Electrical Ductbanks:

1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in ductbanks as follows:
  - a. A minimum of 3" of concrete shall encase each side of all ductbanks.
  - b. A minimum of 1 1/2" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.
  - c. Top of ductbank shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.
  - d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
  - e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 26 05 33

**SECTION 26 05 34**  
**Outlet Boxes, Junction Boxes, Wireways**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Outlet and Junction Boxes
- B. Pull Boxes
- C. Wireways

PART 2 - PRODUCTS

2.01 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

- A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.
- B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.
- C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

2.02 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

- A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.
- B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.
- C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.
- D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.
- E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.
- F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:
  - 1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure



Integrity” for Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.

2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.
3. Cover shall be bolt-down include factory-labeling to read “Electric”, “Communications” or other as directed.
4. Hardware shall be stainless steel.
5. Shall be Quazite PG/LG Style or approved equal.

G. Above-Grade Padmounted Low Profile Pull Boxes:

1. Construction:

- a. 12Ga. stainless steel base with 12Ga aluminum top with brushed finish, and structural bracing as required.
- b. Continuous base frame with open bottom and eight (8) ½” x 1” slots for securing box to concrete pad below and a center support member.
- c. Two (2) full-size swing-open lids with full-length, stainless steel continuous hinges, lifting handles, key-locking provisions and provisions for latching lids in open position (with stainless steel chain or approved equal).
- d. Guides on lid and base frame as required to insure proper closing of box and to provide increased security.
- e. Aluminum or stainless steel barrier between power & instrumentation areas within box if box is used for both power and instrumentation wiring.
- f. Other stainless steel hardware as required.

2. Minimum Dimensions:

- a. Power: 40 inches square x 18 inches high.
- b. Instrumentation: 24 inches square x 18 inches high.

3. Manufacturer:

- a. Electrical Enclosure Mfg. (Pell City, AL).
- b. Ebox (Pelham, AL).
- c. Approved Equal.

## PART 3 - EXECUTION

### 3.01 APPLICATION

A. General

1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16”)

- a. Sheet metal boxes shall be used on concealed work in ceiling or walls.
2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed.
3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.
7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

C. Junction & Pull Boxes (larger than 4-11/16")

1. For all below grade exterior use and elsewhere as shown:
  - a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
  - b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).
3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
5. Padmounted Pull Boxes shall be installed as shown on Plans or as required by project conditions. Transclosure-style Padmounted boxes shall be installed wherever required by the quantities and sizes of conductors. Contractor shall submit all Padmounted Pull Box types prior to ordering for engineer's review and comment.
6. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
7. All others shall be oil tight JIC box not less than 16 gauge.

### 3.02 INSTALLATION

A. General

1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical

connections, etc. accessible where above gypsum board ceilings or in other similar locations.

4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 26 05 53 for identification requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
3. There shall be no more knockouts opened in any sheet metal box than actually used.
4. Any unused opening in cast boxes shall be plugged.
5. Back to back boxes to be staggered at least 3 inches.
6. Under no circumstances shall through-the-wall boxes be used.

C. Junction & Pull Boxes (larger than 4-11/16")

1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

D. Wireways and/or wall-mounted equipment

1. Mount each wireway to channels of the same metal type as the wireway.
2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 26 05 34

**SECTION 26 05 53**  
**Electrical Identification**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Wire and cable identification.
- B. Pullbox & Junction Box Identification
- C. Electrical distribution & utilization equipment identification.
- D. Emergency and Standby Power receptacle identification.
- E. Instrument and control device identification.
- F. Raceway identification.

PART 2 - PRODUCTS

2.01 WIRE AND CABLE IDENTIFICATION

- A. Intermediate Locations:
  - 1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.
- B. Circuit/Cable Termination Locations:
  - 1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

2.02 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

2.03 EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

- A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as follows:
  - 1. Emergency System source: Red engraved lettering to read "EMERGENCY".
  - 2. Legally-Required or Optional Standby Generator source:

- a. If only part of facility is fed with generator backup: Black engraved lettering to read “FED FROM GENERATOR”.
- b. If entire facility is fed with generator backup: No “...GENERATOR...” label required.

#### 2.04 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

- A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

#### 2.05 RACEWAY IDENTIFICATION

- A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of marker plate to provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.
- B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.
- C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).
- D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

#### 3.02 WIRE AND CABLE IDENTIFICATION

- A. General:
  - 1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.

B. Intermediate Locations:

1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
  - a. Wireways
  - b. Pullboxes/Junction boxes larger than 4-11/16”
  - c. Pullboxes/Junction boxes through 4-11/16” where wires and cables are not easily identifiable via the color coding and box labeling
  - d. Vaults & Manholes
  - e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
  - f. Other similar intermediate locations.
2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:
  - a. From where the circuit originates (including panel designation and circuit number):
    - 1) Ex: “FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)”
  - b. To where the circuit extends (using the common name of the equipment):
    - 1) Ex: “TO: RTU-6 (ON ROOF)”
  - c. The purpose of the circuit:
    - 1) Ex: “POWER”
  - d. The set number (If parallel power feeds are used).
    - 1) Ex: “SET NO. 3 OF 4”

C. Circuit/Cable Termination Locations:

1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

- D. Refer to Specification Section 26 05 19 for all color-coding requirements of wires and cables.

### 3.03 PULLBOX & JUNCTION BOX IDENTIFICATION

#### A. Concealed pullboxes/junction boxes:

1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: "RP-1A Cir. 1, 2 & 3"). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

#### B. Exposed pullboxes/junction boxes:

1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled "Power", "Telecommunications", "Fire Alarm" or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

#### C. Where pullboxes/junction boxes are named on contract documents (Ex:"PULLBOX #3"), an engraved nameplate shall be installed on the front surface of the box to identify the name.

### 3.04 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

#### A. General:

1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

#### B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:

1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:
  - a. Ex: First Line: "NAME: RP-A", Second Line: "120/208V-3Ø-4W", Third Line: "FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)"
2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

#### C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.)::

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
  - a. Ex: First Line: “RTU-6”, Second Line: “FED FROM: PP-A CIR. 5”
2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: “WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH”.
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: “WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER”.

#### D. Emergency Systems:

1. A sign shall be placed at the service entrance equipment (and at any remote shunt trip operators, or similar, for service equipment) indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.
2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.
3. Where an Essential Electrical System (EES) is installed, all enclosures, raceways and equipment that are components of the EES shall be readily identified as such. Raceway shall be identified at intervals not exceeding 25 ft.

#### E. Services:

1. All Service Equipment:
  - a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.
    - 1) Ex: First Line: “AVAILABLE FAULT CURRENT: 16,154 AMPS”,  
Second Line: “DATE CALCULATED: JULY 8, 2013”
  - b. All service entrance equipment shall be clearly labeled as being service entrance rated.
2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other



services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:

1. Generators shall be labeled with engraved nameplates identifying name of equipment.

3.05 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.

1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.
2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.
3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

3.06 RACEWAY IDENTIFICATION

A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.

B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.

C. Raceway nameplates shall identify:

1. The location of the other end of the raceway ("TO MCC-1" or similar). If the other end of the raceway is at an intermediate, named pullbox ("INSTRUMENTATION PULLBOX #4" or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

3.07 OTHER IDENTIFICATION

A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 26 05 53

**SECTION 26 05 73**  
**Power Distribution System Electrical Studies**

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
1. Power Distribution System Electrical Studies.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Short Circuit Studies, Protective Devices Evaluation Studies, Protective Device Coordination Studies and Arc Flash Hazard Studies shall be performed by the same entity, which shall be a Professional Engineer registered in the state where the equipment will be installed. The studies shall be per the requirements set forth in the latest edition of NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.
- B. The studies shall be submitted to the Engineer prior to shipment of any electrical distribution equipment.
- C. The studies shall include all portions of all electrical systems affected by the project (including any existing systems/equipment) from the utility service to any existing equipment at the facility (including all existing equipment fed from the same service point as any new equipment) and to all new equipment installed under this contract. All induction motors 50 HP or below and fed from the same bus may be grouped together. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. See individual study sections below for additional scope requirements.
- D. The studies shall be performed using the latest revision of the SKM Systems Analysis Power\*Tools for Windows (PTW) or EasyPower software program.
- E. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- F. The contractor shall be responsible for collecting data on any existing or proposed electrical equipment, devices, conductors, etc. as required to prepare the study, and shall supply pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the studies to be completed prior to shipment of equipment.
- G. The Power Distribution System Electrical Studies shall be performed by Square 'D' or

Cutler Hammer; or a third-party vendor if specifically approved by the engineer prior to preparation of the studies.

- H. The proposed vendor shall have completed a minimum of five (5) equivalent Arc-Flash Hazard Studies in the past three (3) years.

## 2.02 SHORT CIRCUIT STUDY

- A. The Short Circuit Study shall be performed with aid of a computer program. The study input data shall include the power company's short circuit contribution, resistance and reactive components of the branch impedances, X/R ratios, base quantities selected, and other source impedances.
- B. Short circuit momentary duty values and interrupting duty shall be calculated on each individual basis with the assumption that there is a three-phase bolted short circuit at the respective switchgear bus, switchboard, low voltage motor control center, distribution panelboard, and other significant locations throughout the system.
- C. The short circuit tabulation shall include symmetrical and asymmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contributions from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

## 2.03 PROTECTIVE DEVICE EVALUATION STUDY

- A. The Protective Device Evaluation Study shall be performed to determine the adequacy of circuit breakers, switches, transfer switches, and fuses by tabulating and comparing the short circuit rating of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.
- B. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Engineer's attention.

## 2.04 PROTECTIVE DEVICE COORDINATION STUDY

- A. The Protective Device Coordination Study shall be performed to provide the necessary calculation and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.
- B. The coordination study shall show the best coordination attainable for all breakers down through the largest breaker at each piece of distribution equipment. Coordination study shall demonstrate selective coordination where required by applicable codes or contract documents.
- C. Phase and ground overcurrent protection shall be included as well as settings of all other

adjustable protective devices. Where ground fault protection is used, coordination of the ground fault protection with the first downstream overcurrent phase protection device shall be demonstrated.

- D. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves be maintained.

## 2.05 ARC-FLASH HAZARD STUDY

- A. The Arc-Flash Hazard Study shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.
- B. The Arc-Flash Hazard Study shall be performed in conjunction with a short-circuit Study and a time-current coordination Study.
- C. The Arc-Flash Hazard Study shall be performed for the following equipment:
  - 1. All Distribution Equipment – This includes but is not limited to the following:
    - a. Switchgear
    - b. Switchboards
    - c. Motor Control Center
    - d. All Lighting and Power Panelboards
    - e. Fused Disconnect Switches rated greater than 100A
  - 2. Separately enclosed devices fed from protection device rated greater than 100A - This includes but is not limited to the following:
    - a. Control Panels
    - b. VFD's
    - c. RVSS
- D. A generic Arc-Flash label shall be applied to other electrical equipment that has not been included in the study. This includes but is not limited to the following equipment:
  - 1. Non-fused Disconnect Switches
  - 2. Fused Disconnect Switches rated 100A or less
  - 3. Transformers
  - 4. Control Panels, VFD's, RVSS, etc. rated 100A or less
- E. Where a main protective device is provided, the study shall be performed on the line side and load side of the main. The worst-case result shall be used for the study result and label.
- F. The Study shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

- G. Where incident energies are calculated to fall within the high marginal region of a given Hazard/Risk Category Level, the Hazard/Risk Category Level shall be increased one level.
- H. The Arc-Flash Hazard Study shall be performed in compliance with the latest IEEE Standard 1584, the IEEE Guide for Performing Arc-Flash Calculations. Where IEEE 1584 does not have a method for performing the required arc-flash calculations (such as for single phase equipment), calculations shall be performed and system shall be modeled using modules/methods as recommended by the arc flash software supplier (for example, using SKM Unbalanced/Single Phase Studies module for modeling single phase systems).
- I. Equipment labels to identify AFIE and appropriate Hazard/Risk Category in compliance with NFPA 70E and ANSI Z535.4 (latest version of these requirements) shall be provided to the Electrical Contractor. The Electrical Contractor shall affix the labels to the distribution equipment devices as directed by the equipment manufacturer. These labels shall, at a minimum, include the following:
  - 1. WARNING label.
  - 2. Hazard/Risk Category.
  - 3. Arc Flash Boundary Distance.
  - 4. Incident Energy (in cal/cm<sup>2</sup>) at Working Distance.
  - 5. Shock Hazard Voltage.
  - 6. Limited Approach Boundary Distance.
  - 7. Restricted Approach Boundary Distance.
  - 8. Prohibited Approach Boundary Distance.
  - 9. Equipment Name.
  - 10. Name of Firm who prepared the Study.
  - 11. Project Number of the Firm who prepared the Study.
  - 12. Date that the Study was prepared.
  - 13. Method for calculating analysis data.
  - 14. Statement to read: “Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label” (or equivalent).

## PART 3 - EXECUTION

### 3.01 SUBMITTAL REQUIREMENTS

- A. The results of the studies shall be summarized in a final report. The report shall include the following sections:
  - 1. General:
    - a. Description, purpose, basis and scope of the studies
    - b. Single line diagram of the portion of the power system which is included within the scope of the work. The single line diagram shall fit on one sheet of paper

(size as required) unless approved otherwise by engineer. The following information shall be shown on the single line diagram:

- 1) Device Name
  - 2) Branch Fault Currents with directional indicators
  - 3) General Location (for busses only)
  - 4) Other basic component information such as cable type, cable length, breaker rating, buss short circuit rating, transformer voltages, transformer size, fuse size, etc..
2. Short Circuit Study:
- a. Tabulation of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
3. Protective Device Evaluation/Coordination Study:
- a. Protective devices time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
  - b. Fault current calculations including definitions of terms and a guide for interpretation of computer printout.
  - c. Documentation from utility company on their letterhead showing their anticipated values of available short circuit currents X/R ratios and protective devices with which the power distribution system will coordinate.
  - d. Time-current characteristics of the respective protective devices shall be plotted on log-log paper. Plots shall be printed in color with a dedicated color and pattern for each curve for clear identification.
  - e. Plots shall include complete titles, respective single line diagrams and legends, and associated power company's relay or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breakers trip curves and fuses.
  - f. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents.
  - g. The coordination plots for phase and ground protective devices shall be provided on a system basis.
  - h. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
4. Arc-Flash Hazard Study:
- a. Tabulation of device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
  - b. Recommendations for reducing AFIE levels and enhancing worker safety.

- B. Furnish all labor, materials, calculations, electrical equipment, technical data and incidentals required to provide a complete short circuit study, coordination study and arc flash hazard study of protective devices, busses, etc. from the utility service to any existing equipment at the facility and all new equipment installed under this contract.
- C. The study shall comply with the following applicable provisions and recommendations of the latest revisions of the following: ANSI C37.5, IEEE Standard No. 399, and IEEE Standard No. 141.
- D. Submit calculations and results of the short circuit, protective device evaluation and coordination and arc flash hazard studies prior to submitting shop drawings for new equipment. Contractor shall verify that all proposed equipment is properly rated per the short circuit and protective device evaluation portions of the study prior to releasing equipment for manufacturing.
- E. Submit a copy of a sample typical arc flash label layout (meeting requirements outlined above) that will be used for the project.
- F. Submit final electronic copies of all SKM program files/models/input data/etc. used to perform the study to the owner with final close-out documents. These files shall be complete as required to allow future users to recreate the study.

### 3.02 INSTALLATION

- A. Contractor shall adjust all breaker settings as recommended by the coordination study prior to energizing equipment.
- B. Contractor shall affix arc flash hazard notification labels (as determined by the results of this study) to each piece of distribution equipment prior to energization of equipment. A generic arc-flash warning label shall be affixed to any electrical equipment not included in the analysis as outlined above.
- C. Where short circuit rating of equipment is dependent on setting of upstream overcurrent device, provide and install label for equipment indicating the required settings of the associated device.

END OF SECTION 26 05 73

**SECTION 26 24 17**  
**Lighting Panelboards**

PART 1 - GENERAL

1.01 GENERAL

A. The work under this section includes but is not limited to the following:

1. Lighting Panelboards
2. Circuit Breakers

PART 2 - PRODUCT

2.01 PANELBOARDS

A. Enclosure:

1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in corrosive, exterior or wet locations shall have NEMA 4 stainless steel enclosures.
3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
8. Each section of multi-section panelboards shall be of matching heights and depths.

B. Bussing/Lugs:

1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
2. All bussing and associated connectors shall be tin-plated copper.
3. All panelboards shall contain ground buss.
4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
5. Buss connectors shall be for distributed phase arrangement.



6. Main and sub-feed lugs shall be provided with AL/CU compression lugs suitable for the quantities and sizes of conductors required.
7. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.
8. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
9. Service entrance panelboards shall be provided with barrier such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations

C. Breaker arrangement and numbering:

1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
3. Breaker numbers shall be permanently attached to trim.
4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

## 2.02 CIRCUIT BREAKERS

- A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.
- B. Circuit breakers shall be of the bolt-on type.
- C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).
- D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.
- E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

- F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

### 2.03 SPECIAL REQUIREMENTS

- A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.
- B. Lighting panels larger than 400A shall conform to the requirements for power panels.

### 2.04 MANUFACTURER

- A. Panelboards shall be as manufactured by Square 'D' or Cutler Hammer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to insure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6'-7" A.F.F..
- B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.
- C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

### 3.02 PANEL IDENTIFICATION

- A. Refer to Specification Section 26 05 53.

END OF SECTION 26 24 17

**SECTION 26 27 26**  
**Wiring Devices**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Wiring Devices
- B. Plates
- C. Finishes

PART 2 - PRODUCTS

2.01 WIRING DEVICES AND PLATES

- A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- B. Receptacles shall have blade configuration and shall be heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.
- D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

2.02 FINISHES

- A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.
- B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.
- C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.
- D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

- E. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.
- F. See “Electrical Identification” specification section for coverplate labeling requirements.

### PART 3 - EXECUTION

#### 3.01 GENERAL MOUNTING

- A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.
- B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.
- C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.
- D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.
- E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.
  - 1. Receptacles and telephone outlets in offices and other finished areas: 1'-6" to the center of the box.
  - 2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0" to the center of the box.
  - 3. Receptacles over counters: As Noted
  - 4. Switches, general: 4'-0" to the top of the box.
  - 5. Push-button, etc., general: 4'-0" to the top of the box.
  - 6. Other device types: verify with engineer prior to rough-in.

END OF SECTION 26 27 26

**SECTION 26 28 16**  
**Safety Switches And Fuses**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Safety Switches
- B. Fuses
- C. Branch Feeders
- D. Feeders

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

- A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.
- B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.
- C. Fused switches shall have provisions for class R, rejection type fuses.

2.02 FUSES (600V)

- A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class "R" Fusetron.
- B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

2.03 MANUFACTURER

- A. Safety switches shall be as manufactured by Square 'D' or Cutler Hammer.
- B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

PART 3 - EXECUTION

3.01 SAFETY SWITCHES

- A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.
- B. Locations shown for safety switches on plans are diagrammatical only. Exact locations shall be field coordinated by contractor as required to provide code-required clearances.

- C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA 4X stainless steel outdoors and in wet or process areas.
- D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

### 3.02 FUSES

- A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the contractor shall provide fuses sized as directed by the associated equipment supplier at no additional cost.
- B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION 26 28 16

**SECTION 26 29 00**  
**Manufactured Control Panels**

PART 1 - GENERAL

1.01 SCOPE

- A. This section describes control stations, PLC panels, motor control panels, manufactured control panels, and other similar panels specified herein. Specifications herein are intended as an extension of requirements in other Divisions of these specifications where reference is made to Electrical Specifications.

1.02 DEFINITIONS

- A. "Control Stations": Enclosures (with all required accessories) containing only door-mounted pushbuttons, indicator lights and/or selector switches (no electronic components or starter/controller equipment).
- B. "Control Panels": Enclosures (with all required accessories) containing equipment/devices other than door-mounted pushbuttons, indicator lights and/or selector switches (such as electronic components, starter/controller equipment, etc.).

1.03 SUBMITTALS

- A. Provide the following for each control panel:
  - 1. A job-specific, custom wiring diagram
    - a. The wiring diagram shall clearly show all components (whether the components are mounted internal or external to the control panel enclosure).
    - b. All wires and terminal blocks shall be clearly labeled.
    - c. Diagram shall be in accordance with NEMA/ICS standards.
  - 2. Size, type and rating of all system components.
  - 3. Unit frontal elevation and dimension drawings.
  - 4. Internal component layout diagrams.
  - 5. Manufacturer's product data sheets for all components.
- B. A Bill of Materials shall be included with catalog information on all components.
- C. Information shall be included on any proprietary logic component sufficient to demonstrate its ability to perform the required functions.
- D. The following calculations shall be submitted:
  - 1. Thermal calculations showing amount of air conditioning or ventilation and heating required for each control panel, per ambient requirements listed below and operating temperature limitations of all equipment/devices within each control panel. Where possible, forced air ventilation shall be utilized rather than air conditioning. Panel

shall be oversized, interior equipment/devices shall be derated, and solar shielding shall be provided as required to allow the use of forced air ventilation as the cooling method. Air conditioning, ventilation, and/or heating equipment shall each have ratings/capacities at least 20% larger than required by calculations below unless noted otherwise:

- a. Thermal calculations used for sizing cooling/ventilation systems for each control panel located in exterior or non-conditioned spaces shall assume:
  - 1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
  - 2) Full solar contact where applicable (not applicable where enclosures are fully protected from solar contact using solar shields separated from panel enclosure with standoffs or similar).
  - 3) No wind.
  - 4) Heat loss from interior equipment (electronics, etc.) per equipment supplier's information.
- b. Thermal calculations used for sizing heating systems for each control panel shall assume:
  - 1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
  - 2) No heat loss by interior components of control panel.
  - 3) No solar gain on exterior of control panel.
  - 4) Doubling of heating wattage required to account for wind where control panels are located outdoors.
  - 5) Minimum temperature difference (due to heating) of 10 degrees F to prevent condensation, regardless of equipment temperature limitations.
2. Load calculations showing the sizing of all power supplies provided (with spare capacity as specified). Power supplies shall each have ratings/capacities at least 20% larger than required by load calculations unless noted otherwise.
3. Load calculations showing the sizing and anticipated runtime of all Uninterruptible Power Supply systems provided (with spare capacity as specified).

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Control panels shall be Underwriters' Laboratories labeled by the panel manufacturer. Control panel manufacturers not capable of applying the U.L. label to their products are unacceptable.
- B. All human interface equipment/devices (indicator lights, selector switches, pushbuttons, time switches, displays, keypads, and other similar items used for control, adjustments or monitoring) shall be mounted on the non-energized side of enclosure door(s) in such a way as to be accessible without exposing the user to energized parts.

### 2.02 RATINGS



- A. All Control Panels shall have short circuit current ratings at least equal to the lesser of the following, unless noted otherwise on plans:
  - 1. The short circuit current rating of the electrical distribution equipment that feeds the Control Panel.
  - 2. 150% of the available fault current at the Control Panel as determined by a Short Circuit Current study prepared by a licensed professional electrical engineer.
- B. All equipment/devices installed within control panels shall be rated to operate in ambient temperatures of 50 degrees C (122 degrees F) or higher.

## 2.03 ENCLOSURES

- A. All enclosures (with any required accessories or auxiliary items) shall fit within the space shown on the Plans. Any costs associated with furnishing equipment which exceeds the available space shall be borne by the Contractor.
- B. Enclosures (with any required accessories or auxiliary items) shall be suitable for the environment where installed.
- C. Enclosure materials shall be as follows unless noted otherwise:
  - 1. Control Stations:
    - a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
    - b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).
    - c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 of die cast zinc/aluminum construction.
  - 2. Control Panels:
    - a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
    - b. Where located in other wet, process or outdoor areas: NEMA 4X of type 316 stainless steel construction (with stainless steel hardware).
    - c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 or 12.
- D. Control Panel Enclosure Construction:
  - 1. Non-metallic control panel enclosure material, where specified, shall be reinforced polyester resin or equivalent, with a minimum thickness of 3/16 inch for all surfaces except those requiring reinforcement. Panels shall be precision molded to form a one piece unit with all corners rounded. Exterior surfaces shall be gel-coated to

- provide a corrosion-resistant maintenance-free satin finish which shall never need painting. Color pigments shall be molded into the resin. Color shall be grey.
2. Metallic control panel enclosures, where specified, shall be fabricated using a minimum of 14 gauge steel for wall or frame mounted enclosures and a minimum of 12 gauge for freestanding enclosures. Continuously weld all exterior seams and grind smooth. Reinforce sheet steel with steel angles where necessary support equipment and ensure rigidity and preclude resonant vibrations.
  3. Use pan-type construction for doors.
  4. Door widths shall not exceed 36-inches.
  5. Mount doors with full length, heavy duty piano hinge with hinge pins.
  6. Provide gasket completely around each door opening.
  7. Mount and secure all internal components to removable back plate assembly.
  8. For NEMA 1 or 12 enclosures, provide handle-operated key-lockable three point stainless steel latching system for each door.
  9. For NEMA 4X enclosures, provide provisions for padlocking all doors and provide clamps on three (3) sides of each door.

E. Control panel enclosures (and associated backpanels and other similar accessories) shall be manufactured by Hoffman Engineering Co., or Saginaw Control & Engineering.

#### 2.04 CONTROL PANEL ACCESSORIES:

- A. Cooling systems shall be provided if so required by the application to maintain temperatures within the acceptable ranges of the interior equipment. In no case (regardless of temperature ratings of internal equipment) shall maximum temperatures within control panels be allowed to exceed 50 degrees C (122 degrees F). Thermostats shall be provided to control cooling without need of manual operation. Thermostat setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Cooling units shall be as manufactured by Hoffman Engineering Co., Rittal or approved equal and shall be thermostatically controlled.
- B. Space heaters shall be provided for condensation and temperature control. Thermostats AND hygrometers (or combination hygrometers) shall be provided to control heating requirements (based on temperature and relative humidity within enclosure) without need of manual operation. Setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Space heaters and associated control devices shall be as manufactured by Hoffman Engineering Co., Rittal, Stego or approved equal.
- C. NEMA 4X control panels shall be provided with vapor-phase corrosion inhibitor(s) (chemical combinations that vaporize and condense on all surfaces in the enclosed area, to protect metal surfaces/devices within the enclosed area from corrosion). Corrosion inhibitor shall be Hoffman #AHCI series (sized as required by the enclosure volume to be protected) or equal.
- D. For outdoor panels, stainless steel solar shields for front, top and each side of panel, supported to associated panel face with standoffs as required (to allow free air flow between solar shield and panel enclosure), shall be provided where required to limit

solar loading on panel to allow use of a ventilated panel design rather than an air-conditioned panel design.

- E. Provide a sun shield over all LCD displays in exterior-mounted panels. Sun shield shall be collapsible to fully protect LCD display from UV light when not in use, shall provide side and top shielding when in use, shall be constructed of stainless steel and shall be installed such as to maintain NEMA 4X ratings of enclosures.
- F. Provide a clear polycarbonate gasketed hinged door or window to encompass all indicators, controllers, recorders, etc. mounted on NEMA 4 and 4X enclosures.
- G. Provide interior mounting panels and shelves constructed of minimum 12 gauge steel with white enamel finish. Provide metal print pocket with white enamel finish on inside of door.
- H. Provide interior LED light kit, mounted at top of interior of panel, and switched to turn “ON” when door is opened for the following control panels:
  - 1. Control panels with outer dimensions greater than 20” wide or 30” high.
  - 2. Control panels containing PLCs or other similar programmable devices.
- I. Control panels containing VFDs or Reduced Voltage Soft Starters shall include a door mounted digital keypad for adjusting the starter parameters and viewing process values and viewing the motor and starter statuses without opening the enclosure deadfront door.

## 2.05 CONTROL COMPONENTS

### A. General:

- 1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.
  - a. Devices in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.) shall be of non-metallic construction.
  - b. Devices in other areas shall be of chrome-plated construction.
- 2. All components and devices so that connection can be easily made and so there is ample room for servicing each item.
- 3. Door-mounted indicators, recorders, totalizers and controllers shall be located between 48” and 72” above finished floor level.
- 4. Door-mounted indicator lights, selector switches and pushbuttons shall be located between 36” and 80” above finished floor level.
- 5. All devices and components shall be adequately supported to prevent movement. Mounting strips shall be used to mount relays, timers and other devices suitable for this type of mounting.

### B. Pilot Lights:

1. All pilot lights to be cluster LED type & push to test.

C. Pushbuttons:

1. All STOP operators within control stations located at equipment shall be provided with lockout provisions and a minimum of two (2) sets of contact blocks.
2. Emergency shutoff pushbutton devices shall be as follows unless noted otherwise:
  - a. 2 1/4" diameter, mushroom-style, maintained contact push buttons
  - b. With a minimum of one (1) normally open dry contact and three normally closed dry contacts.
  - c. Connections made such that pushing "in" the button will shutoff the associated equipment.
  - d. Provided with a red engraved nameplate with 1/2" lettering to read "Emergency Shutoff".

D. Relays:

1. Control relays shall have the following characteristics, unless noted otherwise:
  - a. General purpose, plug-in type.
  - b. Minimum mechanical life of 10 million operations.
  - c. Coil voltage as indicated or required by application.
  - d. Single-break contacts rated 12 amperes, resistive at 240 volts.
  - e. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.
  - f. Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.
  - g. LED on/off indicator light and manual operator.
  - h. Industry standard wiring and pin terminal arrangements.
  - i. Equal to Square D 8501KP series with matching plug-in socket.
2. Interposing/isolation relays used to isolate discrete output field wiring (and where required for voltage translation for other discrete signals) to/from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:
  - a. Minimum mechanical life of 10 million operations.
  - b. Single-break contacts rated 6 amperes, resistive at 120 volts.
  - c. One (1) N.O. contact per relay.
  - d. Furnished with integral transient protection.
  - e. LED on/off indicator light.
  - f. DIN-rail mounted.
  - g. Equal to Square D type Zelio RSL.

3. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:
  - a. General purpose, plug-in type.
  - b. Minimum mechanical life of 10 million operations.
  - c. Single-break contacts rated 10 amperes, resistive at 240 volts.
  - d. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.
  - e. Rotary-thumbwheel adjustments for time value, timing range and function.
  - f. Time value adjustments from .05 seconds to 999 hours
  - g. Selectable Timing Functions, including the following:
    - 1) On Delay
    - 2) Interval
    - 3) Off Delay
    - 4) One Shot
    - 5) Repeat Cycle-Off
    - 6) Repeat Cycle-On
    - 7) On/Off Delay
    - 8) One Shot Falling Edge
    - 9) Watchdog
    - 10) Trigger On Delay
  - h. Accuracy shall be  $\pm 2\%$  and repeatability shall be  $\pm 0.1\%$ .
  - i. Furnished with integral transient protection.
  - j. LED indicator light(s) for “timing” and “on/off status”
  - k. Held in place with hold-down spring
  - l. Equal to Square D type JCK with matching plug-in socket.

## 2.06 CONFORMAL COATINGS

- A. All printed circuit boards within electronic devices (PLCs, RTUs, controllers, I/O modules, power supplies, touchscreens, Ethernet switches, radios, etc.) installed in panels located in non-conditioned or exterior/process areas shall be conformal-coated for harsh environments.

## 2.07 DC POWER SUPPLIES

- A. DC Power supplies shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, AC-to-DC switching, output voltage as required, 120vac input, size as required for the initial application plus 50% spare capacity.
- B. Redundant power supplies with diode isolation shall be provided so that the loss of one power supply does not affect system operation. The back-up supply systems shall be

designed so that either the primary or the back-up supply can be removed, repaired, and returned to service without disrupting the system operation.

- C. Power supply output shall be protected by secondary overcurrent protection device(s).
- D. The power distribution from multiloop supplies shall be selectively fused so that a fault in one instrument loop will be isolated from the other loops being fed from the same supply.
- E. Each power supply shall meet the following requirements.
  - 1. Regulation, line: 0.4% for input from 105 to 132vac.
  - 2. Regulation, load: 0.8%
  - 3. Ripple/Noise: 15mV RMS / 200 mV peak to peak
  - 4. Operating temperature range: 0 deg C - 60 deg C
  - 5. Overvoltage protection
  - 6. Overload Protection
  - 7. Output shall remain within regulation limits for a least 16ms after loss of AC power at full load.
  - 8. Output status indicator.
  - 9. UL listing
- F. Power supplies shall be manufactured by Puls, Sola, Phoenix Contact or equal.

## 2.08 UNINTERRUPTIBLE POWER SUPPLIES

- A. Uninterruptible power supplies (UPSs) shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, size as required for the initial application plus 50% spare capacity unless noted otherwise.
- B. Battery runtime shall be as specified elsewhere. If no other specification for battery runtime is specified, battery runtime shall be 12.5 minutes at full load.
- C. UPSs shall be double-conversion, on-line type.
- D. UPSs shall be rated for operation in -20 degrees C to 55 degrees C ambient temperatures.
- E. UPS batteries shall be hot-swappable and 12-year rated when installed in 25 degrees C environment and 4-year rated when installed in 50 degrees C environment.
- F. UPSs shall include dry contacts for the following alarm points:
  - 1. Loss of Input Power Alarm
  - 2. Low Battery Alarm
- G. UPSs shall be manufactured by Falcon UPS or approved equal.

## 2.09 DISCONNECTS

- A. A main disconnect switch or circuit breaker shall be supplied integral to all control panels. The main disconnect or circuit breaker shall be accessible/operable without exposing the operator to energized sections of the control panel(s), and shall be lockable in the open/off position.
- B. Individual circuit breakers shall be provided integral to the manufactured control panel for each separate power circuit originating within the control panel.
- C. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.
- D. Manufacturers:
  - 1. Square 'D' or Cutler Hammer.

## 2.10 COMBINATION STARTERS

- A. All combination starters shall utilize a unit disconnect. Magnetic starters shall be furnished in all combination starter units unless specifically shown otherwise. All starters shall utilize full NEMA/EEMAC rated contactors (size 1 minimum).
- B. Starters shall be provided with a three-pole, external (door mounted) manual reset, solid state overload relay. Solid state overload relay shall have switch-selectable trip class and shall provide protection from:
  - 1. Overload.
  - 2. Phase Unbalance.
  - 3. Phase Loss.
  - 4. Ground Fault (Class II detection).
- C. Unless specifically shown otherwise, each combination starter or each group of starters shall be furnished with a control circuit transformer including two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads (including motor space heaters and other similar loads where specified). The transformer rating shall be fully visible from the front when the unit door is opened. Unless otherwise indicated, control voltage shall be 120V AC. Control power shall be provided by individual unit control power transformers.
- D. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.
- E. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
- F. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway so

that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

G. Each starter shall be equipped with a minimum of the following control devices:

1. Door-mounted reset button.
2. Two (2) field-reversible (N.O./N.C.) auxiliary contacts
3. For reversing and two-speed starters: Four (4) field-reversible (N.O./N.C.) auxiliary contacts
4. Additional control devices as indicated on plans.

H. Control Wiring Terminal Blocks

1. Terminal blocks shall generally be:
  - a. Feed-thru, screw-in type
  - b. DIN rail mounted
  - c. Furnished with the stationary portion of the block secured to the unit bottom plate
  - d. Furnished with unit-mounted control terminal blocks for each field wire.
  - e. Rated for the voltage and current of the proposed application per UL/NEC standards.
  - f. Sized (by supplier) for the associated wire gauges/types/quantities.
  - g. Phoenix Contact UT-4 series, Weidmuller WDU-4 series (or equivalent) unless required otherwise by application.

I. Nameplates

1. Each unit shall be properly labeled with an engraved phenolic nameplate with a white background and black letters.
2. Each pilot device shall be properly labeled with a legend plate or an engraved phenolic nameplate.

J. Manufacturers:

1. Square 'D' or Cutler Hammer.

## 2.11 WIRING

- A. Refer to Section 26 05 19 for all wiring types/applications.
- B. All wiring shall be identified on each end with hot stamped, shrink tube type, or self-laminating vinyl permanent wire markers to correspond with numbering shown on wiring diagrams.
- C. All connections shall be made on terminals with no splices.



- D. All wiring runs shall be along horizontal or vertical routes to present a neat appearance. Angled runs will not be acceptable. Group or bundle parallel runs of wire in plastic wire duct where practical.
- E. All wiring runs shall be securely fastened to the panel or wire duct by means of plastic wire ties. Adequately support and restrain all wire runs to prevent sagging or movement.
- F. AC power wiring and instrumentation/analog wiring shall be run separate.
- G. Color code all internal wiring (not field wiring) as follows:
  - 1. Line and load circuits: Black (B)
  - 2. AC control wiring: Red (R)
  - 3. Externally-Powered control wiring: Yellow (Y)
  - 4. Neutral wiring: White (W)
  - 5. Low voltage DC(+)pos: Blue (BL)
  - 6. Low voltage DC(-)neg: Blue/White Tracer (BL/W)
  - 7. Grounding: Green (G)
- H. Terminal strips shall be provided for all input and output wiring. No more than two (2) wires shall be connected to one (1) terminal block.

## 2.12 ELECTRICAL SURGE AND TRANSIENT PROTECTION

### A. General

- 1. Function: Protect the system against damage due to electrical surges.

### B. Application: As a minimum, provide surge and transient protection (with proper grounding) at the following locations as described below:

- 1. Power Input High Frequency Noise Filtering:
  - a. 120VAC Control panels with integral UPSs, PLCs, or other electronic/microprocessor equipment that is susceptible to failure or improper operation due to high frequency/harmonic input transients shall be provided with series-connected high-frequency noise filters on the line input (downstream of any panel main disconnects/breakers). Filters shall be as manufactured by Edco/Emerson/Islatrol or equal (exact type(s) as required by application).
- 2. Power Input Surge Protection:
  - a. Provide surge protection device at any connection of 120VAC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:

- 1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 15kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
  - 5) Visually indicate operational status.
  - 6) Be Dehn DEHNguard series or equal by MTL Technologies, or may be combined with the High Frequency Noise Filtering device required above.
- b. Provide surge protection device at any connection of multi-pole AC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:
- 1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
  - 2) Provide protection for all phases.
  - 3) Have 40kA (per phase) peak surge current rating.
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
  - 5) Visually indicate operational status.
  - 6) Be Square D SDSA or HWA series or equal.
3. Analog I/O Panel Terminations Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel connection of each analog I/O signal. Device shall:
- 1) Be mounted internal to the associated panel.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 10kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated signal.
  - 5) Be Dehn Blitzductor XT series or equal by MTL Technologies.
4. Discrete I/O Panel Terminations Surge Protection:
- a. Provide isolation relay at the PLC (or similar) panel connection of each discrete output signal (within the associated panel). See above for isolation relay requirements.
5. Low Voltage Power Supply Load Side Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel on the load side of each low voltage power supply that has low voltage connections extending external to the panel. Device shall:

- 1) Be mounted internal to the associated panel.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 10kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated utilization voltage.
  - 5) Be as manufactured by Dehn, MTL Technologies, or Phoenix Contact.
6. Network Panel Terminations Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel connection of each network cable. Device shall:
    - 1) Be mounted internal to the associated panel.
    - 2) Be of DIN-rail mountable construction.
    - 3) Have 1kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
    - 4) Be designed specifically for the associated network connection type (Ethernet, RS485, RS232, etc.).
    - 5) Be MTL Zonebarrier series or equal.
7. Antenna Cable Terminations Surge Protection:
- a. Provide surge protection device at the connection of antenna cable to the radio panel. Device shall:
    - 1) Be mounted internal to the associated panel.
    - 2) Provide coarse protection via replaceable gas-filled surge voltage arrestor
    - 3) Be Phoenix Contact CN-LAMBDA series or equal.
- C. Installation and grounding of suppressor: As directed by manufacturer. Provide coordination and inspection of grounding.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Provide enclosure mounting supports as required for floor, frame or wall mounting. All supports in exterior, wet or process areas shall be stainless steel unless noted otherwise. All floor-mounted panels or other similar distribution equipment shall be mounted on 6" concrete housekeeping pads unless specifically shown otherwise.
- B. All enclosures used outside shall be solid bottom unless otherwise specified. All cable and piping openings shall be sealed watertight. Cable and piping shall enter the enclosure as shown on drawings or specified herein.
- C. All equipment and components shall be solidly grounded to the control panel. One grounded terminal unit shall be provided in each control panel for connection to plant ground system. Grounding digital and analog components shall be performed in

accordance with the instrument supplier's installation recommendations. Signal ground shall be solidly connected to the ground system so as to prevent ground loops

### 3.02 PAINTING

- A. For enclosures other than NEMA 4X stainless steel or fiberglass:
  - 1. Completely clean all surfaces so that they are free of corrosive residue. Then, phosphatize all surfaces for corrosion protection.
  - 2. Prime with two (2) coats and finish with one coat of factory finish textured polyurethane. Paint shall be Sherwin-Williams Polane "T" or approved equal.
  - 3. Color to be selected during shop drawing review phase.

### 3.03 IDENTIFICATION & DOCUMENTATION

- A. Refer to specification section 26 05 53 for additional requirements.
- B. Control panel power supply source, type, voltage, number or circuit ratings shall be identified inside control panels and on drawings.
- C. All interior devices and components shall be identified with thermal transfer labels with black letters on white background. Labels shall be placed on the subpanel and not the component. Marking system shall be a Brother "PTouch II" or equal. Lettering shall be 1/4" high.
- D. All front panel mounted devices such as push buttons shall be identified by the use of engraved bakelite nameplates or legend plates. Nameplates shall be 1/8" thick, white with black core.
- E. Where a panel includes a PLC or other network-connected device that is intended to be connected to another system (such as a plant SCADA system) via a network connection, the panel supplier shall provide an Interface Control Document (ICD) to the other system supplier (such as the SCADA Integrator). This document shall itemize the following for each networked parameter that is capable of being monitored or controlled by the other system:
  - 1. Parameter Name/Function (ex: Pump No. 1 On/Off Status)
  - 2. Parameter Type (discrete or analog, input or output)
  - 3. Parameter register ID/location
- F. Where a panel includes a touchscreen or other programmable HMI display and is to be monitored by another system (such as a plant SCADA system), the panel supplier shall provide copies of the HMI display code and screenshots of all proposed HMI screens to the other system supplier (such as the SCADA Integrator) for their use in duplicating the associated HMI.
- G. A job-specific, custom wiring diagram for each control panel (not including control stations without relays) shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all

control components connected to the panel (whether the components are mounted internal or external to the enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated panel, and submitted to the owner with the as-built documentation.

### 3.04 OWNER TRAINING

- A. Fully train the owner in the proper operation of all control panels/equipment, describing and demonstrating full operation, including function of each door-mounted device.

### 3.05 SPARE EQUIPMENT

- A. Provide the following spare equipment:
  1. Fuses: 10% (minimum of 3) of each size and type utilized, mounted within a pocket within the associated control panel.
  2. Where control panel contains programmable controller (or similar equipment): Flash drive containing copies of all final programs utilized within the control panel, with provisions/cable assemblies as required to connect the flash drive provided to the controller to download the programs. Flash drive shall be attached to retractable cord (long enough to reach the associated port) attached to the inside of the panel door.

END OF SECTION 26 29 00

**SECTION 26 32 13**  
**Generator Sets**

PART 1 - GENERAL

1.01 SCOPE

- A. Provide complete factory assembled generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator.
- B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.
- C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

1.02 CODES AND STANDARDS

- A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of the latest editions of the following standards/codes where applicable:
  - 1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
  - 2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
  - 3. International Building Codes.
  - 4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  - 5. NFPA99 – Essential Electrical Systems for Health Care Facilities.
  - 6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
- B. The generator set and supplied accessories shall meet the requirements of the latest editions of the following standards where applicable:
  - 1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
  - 2. UL142 – Sub-base Tanks
  - 3. UL1236 – Battery Chargers
  - 4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.

- C. The generator set and supplied accessories shall meet all applicable Environmental Protection Agency (EPA) TIER Emission Level or Emission Certification requirements and any local requirements in effect at the time the generator set is ordered (for the proposed location of the generator).
- D. The control system for the generator set shall comply with the following requirements.
  - 1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
  - 2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
  - 3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
  - 4. FCC Part 15, Subpart B.
  - 5. IEC8528 part 4. Control Systems for Generator Sets
  - 6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
  - 7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
  - 8. UL1236 –Battery Chargers.
- E. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

### 1.03 ACCEPTABLE MANUFACTURERS

- A. Caterpillar
- B. Cummins/Onan
- C. Generac
- D. Kohler

## PART 2 - PRODUCTS

### 2.01 GENERATOR SET

- A. Ratings
  - 1. The generator set assembly (including both the motor/engine assembly and the generator assembly) shall operate at 1800 rpm, and the generator shall produce a 60 Hz waveform.
  - 2. Voltage and phase ratings shall be as shown on plans.
  - 3. Minimum kW rating (and associated alternator sizing) shall be the greater of the following:
    - a. Minimum kW rating listed on plans.

- b. Ratings required to provide skVA as follows (shall be documented with reports in submittals using generator sizing software described in Part 3 below):
  - 1) If so listed on plans, the step loads fed by the generator at voltage/frequency dip criteria specified.
  - 2) If so listed on plans, the skVA rating specified.
  - 3) If neither of the above are listed on plans, generator shall be sized to accommodate a block load of 100% of the Total Demand Load listed on plans, with a maximum voltage dip of 20% and a maximum frequency dip of 10%.
- 4. kVA rating shall be 1.25 times the kW rating (based on .8 PF).
- 5. Unless shown otherwise on plans, the generator set shall be rated based on the following site conditions:
  - a. Altitude of project site.
  - b. Ambient temperatures up to 120 degrees F.
- 6. The generator set rating shall be based on emergency/standby service unless noted otherwise.

#### B. Performance

- 1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
- 2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
- 3. The engine-generator set shall be capable of accepting a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
- 4. Minimum motor starting capability shall be as shown on plans. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified skVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 20% unless shown otherwise on plans.
- 5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3<sup>rd</sup> order harmonics or their multiples. Telephone influence factor shall be less than 40.
- 6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

#### C. Construction



1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
2. The engine-generator set shall be rated for the seismic conditions for the installation location as mapped by the US Geological Survey and required by local building codes.
3. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

#### D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept compression terminations of the number and size as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required overcurrent protection located at panelboard(s) external to the generator set unless shown otherwise on plans. Where a load center or panelboard is shown within the generator enclosure on the plans, this load center/panelboard shall be furnished with the generator and shall comply with the applicable panelboard and identification sections of this specification.
3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

## 2.02 ENGINE AND ENGINE EQUIPMENT

- A. The engine shall be diesel, 4 cycle, radiator and fan cooled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:
  1. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed and operating in various isochronous or parallel states. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.
  2. Skid-mounted radiator and cooling system rated for full load operation in 120 degrees F (49 degrees C) ambient as measured at the generator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H<sub>2</sub>O restriction. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation

temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact.

3. Electric starter(s) capable of three complete cranking cycles without overheating.
4. Positive displacement, mechanical, full pressure, lubrication oil pump.
5. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
6. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.
7. Replaceable dry element air cleaner with restriction indicator.
8. Flexible supply and return fuel lines.
9. Engine mounted battery charging alternator and solid-state voltage regulator.
10. Block heater
  - a. Engine mounted, thermostatically controlled, block heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
  - b. The block heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The block heater installation shall be specifically designed to provide proper venting of the system. The block heaters shall be installed using quick disconnect couplers to isolate the heaters for replacement of the heater element without draining the coolant from the generator set. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
  - c. The block heater shall be provided with a DC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the block heater system.
  - d. The block heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104F (40C) in a 40F (4C) ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification. If the heater quantities or wattage ratings are different than shown on plans, contractor shall be responsible for providing the properly-rated circuits (with circuit breakers) as required to the heater(s).
11. Provide vibration isolators, spring & pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.
12. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15-second cranking cycles at 40F ambient temperature when fully charged.

13. Provide critical-grade exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.
14. A UL listed/CSA certified voltage regulated battery charger shall be provided for each engine-generator set. The charger shall be located at the generator unless shown otherwise on plans. Output amperage, Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Charger shall include an Analog DC voltmeter and ammeter, 12 hour equalize charge timer, and AC and DC fuses. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30VDC for remote indication of:
  - a. Loss of AC power - red light
  - b. Low battery voltage - red light
  - c. High battery voltage - red light
  - d. Power ON - green light and N.O. relay contact

## 2.03 FUEL TANK

- A. Refer to "Sub-Base Fuel Tank" Paragraph below for fuel tank requirements.

## 2.04 AC GENERATOR

- A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees Centigrade.
- B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.
- D. AC generator shall be 12-lead reconnectable type to provide the following voltage output configurations:
  1. 277/480V-3Phase-4Wire
  2. 120/208V-3Phase-4Wire
  3. 120/240V-3Phase-4Wire
  4. 120/240V-1Phase-3Wire
- E. The subtransient reactance of the alternator shall not exceed 12 percent, based on the

standby rating of the generator set.

## 2.05 GENERATOR SET CONTROL

- A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
- C. The generator set mounted control shall include the following features and functions:
  1. Control Switches
    - a. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
    - b. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
    - c. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
    - d. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
    - e. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
  2. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:
    - a. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output.

- b. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
  - c. The control system shall log total number of operating hours, total kWh, and total control on hours, as well as total values since reset.
3. Generator Set Alarm and Status Display.
- a. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright exterior day lighting conditions.
  - b. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. Conditions required to be annunciated shall include:
    - 1) low oil pressure (warning)
    - 2) low oil pressure (shutdown)
    - 3) oil pressure sender failure (warning)
    - 4) low coolant temperature (warning)
    - 5) high coolant temperature (warning)
    - 6) high coolant temperature (shutdown)
    - 7) high oil temperature (warning)
    - 8) engine temperature sender failure (warning)
    - 9) low coolant level (warning or shutdown - selectable)
    - 10) fail to crank (shutdown)
    - 11) fail to start/overcrank (shutdown)
    - 12) overspeed (shutdown)
    - 13) low DC voltage (warning)
    - 14) high DC voltage (warning)
    - 15) weak battery (warning)
    - 16) low fuel (warning)
    - 17) high AC voltage (shutdown)
    - 18) low AC voltage (shutdown)
    - 19) under frequency (shutdown)
    - 20) over current (warning)
    - 21) over current (shutdown)
    - 22) short circuit (shutdown)
    - 23) ground fault (warning) (if genset breaker is rated 1000A or greater)
    - 24) over load (warning)
    - 25) Genset circuit breaker tripped (warning)
    - 26) emergency stop (shutdown)
4. Engine Status Monitoring.
- a. The following information shall be available from an analog status panel on the generator set control :

- 1) engine oil pressure (psi or kPA)
- 2) engine coolant temperature (degrees F or C)
- 3) battery voltage (DC volts)

5. Engine Control Functions.

- a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
- b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
- c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
- d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
- e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

6. Alternator Control Functions:

- a. The generator set shall include an automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, with local indication of setting level.
- b. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

- c. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. This protection may be provided using a microprocessor-based programmable relay system designed to protect the alternator system from damage, or using programmable electronic-trip LSI breaker(s), programmed/set by the generator supplier to ensure full protection of the alternator system.
- d. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
- e. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
- f. When required by National Electrical Code or indicated on project drawings, the control System shall include a ground fault monitoring relay. The relay shall be adjustable from 3.8-1200 amps, and include adjustable time delay of 0-10.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay that will function correctly in system as installed.

7. Other Control Functions

- a. The generator set shall communicate with the Automatic Transfer Switch via hardwired control connections as required.
- b. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
- c. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is out of acceptable limits. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

8. Dry Contacts/Relays for Remote Monitoring:

- a. The control system shall provide ten (10) programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. Five (5) of these relays shall be preconfigured (and labeled accordingly) to indicate:

- 1) generator set operating at rated voltage and frequency
- 2) common warning
- 3) common shutdown
- 4) load shed command and
- 5) low fuel warning.

- b. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

## 2.06 GENERATOR REMOTE MANUAL STOP STATION

- A. Each generator set shall be furnished with a remote manual stop station of a type to prevent inadvertent or unintentional operation per NFPA 110 requirements.
- B. Stop station pushbutton shall be red, non-illuminated, push-pull, mushroom-type, maintained-contact, 1 5/8" diameter, 30mm base, heavy-duty, oil-tight, water-tight unit mounted within guarded enclosure to prevent inadvertent operation and labeled with engraved nameplate (white letters on red background) to read: "GENERATOR EMERGENCY STOP" (or similar with specific generator name where so identified on drawings).
- C. Exact stop station type shall be coordinated with generator controls supplier to ensure a fully-functional system per NFPA 110 requirements.

## 2.07 GENERATOR MAIN LINE CIRCUIT BREAKER(S)

- A. The generator set shall be provided with a mounted main line circuit breaker(s), sized as shown on plans. The circuit breaker(s) shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.
- B. The main line circuit breaker(s) shall be provided with auxiliary contacts to indicate trip/off alarm conditions to the generator set control system.

## 2.08 OUTDOOR WEATHER-PROTECTIVE ENCLOSURE

- A. The generator set shall be provided with a weatherproof, sound-attenuated, outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (if applicable) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be



cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.

- B. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 76 dBA (including exhaust noise) at any location 7 meters from the generator set in a free field environment:
- C. The enclosure shall include vertical air discharge hoods as required to redirect discharge air upwards and reduce noise accordingly.
- D. The enclosure shall be insulated with non-hygroscopic materials.
- E. The enclosure shall be rated for the wind and seismic conditions for the installation location as mapped by the US Geological Survey and required by local building codes.
- F. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:
  - 1. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
  - 2. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
  - 3. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
  - 4. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
  - 5. Salt Spray, per ASTM B117-90, 1000+ hours.
  - 6. Humidity, per ASTM D2247-92, 1000+ hours.
  - 7. Water Soak, per ASTM D2247-92, 1000+ hours.
- G. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
- H. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.
- I. A factory-mounted critical exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
- J. The enclosure shall include the following maintenance provisions:
  - 1. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves
  - 2. External radiator fill provision.

- K. If so shown on the plans, provide a factory-mounted and wired electrical distribution panel to serve the generator set and enclosure. The provisions required include:
1. 100-amp distribution panelboard installed inside enclosure and fed by a 120/208VAC power feeder installed by the contractor (unless shown otherwise on plans).
  2. Two duplex GFI receptacles, one inside the enclosure, and a weatherproof receptacle on the outside of the enclosure (all factory-wired).
  3. Two three-way switches controlling three AC lamps mounted in vapor tight and gasketed fixtures (all factory-wired).
  4. Factory-wired normal AC service from the panelboard to the engine coolant and alternator heaters, and battery charger.

## 2.09 SUB-BASE FUEL TANK

- A. Provide a sub-base fuel tank for the generator set, sized to allow for full load operation of the generator set for 24 hours. The sub-base fuel tank shall be UL142 listed and labeled. Installation shall be in compliance to NFPA37. The fuel tank shall be a double-walled, steel construction and include the following features:
1. Emergency tank and basin vents.
  2. Mechanical level gauge.
  3. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer and in compliance to UL2200 and NFPA 37 requirements.
  4. Leak detection provisions, wired to the generator set control for local and remote alarm indication.
  5. High and low level float switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level
  6. Basin drain.
  7. Integral lifting provisions.
- B. The equipment, as installed, shall meet all local and regional requirements for above ground tanks.
- C. Where the generator design/layout, sub-base fuel tank height, and/or concrete housekeeping pad for the generator set causes any circuit breaker handle, control device, metering display or other similar item to be located higher than 6'-7" above finished floor, the supplier shall provide an aluminum grating platform complete with stairs and handrails meeting all applicable code requirements for proper access to these items. The platform and stairs shall be permanently mounted to a concrete base as recommended by the system supplier. Alternatively, the supplier may relocate (at the factory) these items to be below 6'-7" above finished floor.

## 2.10 SEQUENCE OF OPERATION

- A. The maximum elapsed time allowed from loss of normal power to restoration of power to emergency circuits from generator through transfer switch shall be 10 seconds.

- B. Generator set shall start upon receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control.
  - 1. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
- C. The generator set shall complete a time delay start period as programmed into the control.
- D. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
  - 1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.
  - 2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.
  - 3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
  - 4. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand or load govern state.
- E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
- F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.
- G. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

### PART 3 - EXECUTION

#### 3.01 SUBMITTALS.

- A. Within 10 days after award of contract, provide six sets of the following information for review:
  - 1. Manufacturer’s product literature and performance data, sufficient to verify compliance to specification requirements.
  - 2. A paragraph by paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.

3. Manufacturer's certification of prototype testing.
4. Manufacturer's published warranty documents.
5. Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
6. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
7. Generator sizing software report(s) showing compliance with all specification requirements and any additional motor starting requirements indicated in contract documents.
8. Time-current-curves demonstrating that the generator alternator relaying or breaker protective device(s) provide proper protection for the alternator by a comparison of the trip characteristic of the breaker with the thermal damage characteristic of the alternator.
9. Manufacturer's installation instructions.

### 3.02 FACTORY TESTING.

- A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
- B. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. Supplier is responsible to provide two weeks notice for testing.
- C. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

### 3.03 INSTALLATION

- A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. Installation of equipment shall include furnishing and installing all interconnecting wiring, fuel lines, etc. between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C. Generator equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- D. Remote stop station type, labeling and location shall be submitted by contractor to

engineer and local fire marshal for approval prior to rough-in. Location shall be outside the room housing the prime mover (where so installed within a room) or elsewhere on the premises where the prime mover is located outside the building. Contractor shall provide all interconnections from remote stop station to generator set as required by generator set supplier for a fully-functional system.

- E. Equipment shall be initially started and operated by representatives of the manufacturer.
- F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

#### 3.04 ON-SITE ACCEPTANCE TEST:

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.
- B. Installation acceptance tests to be conducted on-site shall include the following (performed in accordance with NFPA 110):
  - 1. "Cold start" test.
  - 2. Four (4) hour full load test. Provide resistive load banks and make temporary connections as required.
  - 3. One step rated load pickup test.
  - 4. Power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.
- C. Upon completion of the manufacturer's site start-up and checkout, the contractor shall leave the diesel tank half full of fuel for use by the owner.

#### 3.05 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to not less than 5 persons. Training date shall be coordinated with the facility owner.

#### 3.06 SERVICE AND SUPPORT

- A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The generator set shall be distributed and serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an

inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

- C. The manufacturer of the generator set shall own, maintain and make available (to engineer, free of charge) generator set sizing software that calculates voltage dip, frequency dip, THDI and THDV of proposed generator/alternator set using the following inputs:
  - 1. Summary of step loads including load type (across-the-line motor, VFD, Fire Pump, Fluorescent Lighting, UPS, etc.).
  - 2. Generator Set Duty (Standby, Prime, Continuous).
  - 3. Maximum Ambient Temperature.
  - 4. Project site altitude.
  - 5. Generator Fuel type.
  - 6. Voltage/Phase/Frequency.
  
- D. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

### 3.07 WARRANTY

- A. The generator set and associated equipment shall be warranted for a period of not less than 2 years from the date of commissioning against defects in materials and workmanship.
  
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION 26 32 13

**SECTION 26 36 23**  
**Automatic Transfer Switches**

PART 1 - GENERAL

1.01 SCOPE

- A. Provide complete factory assembled power transfer equipment with field programmable digital electronic controls designed for fully automatic operation and including: voltage sensors on all phases of both sources, power switch mechanism, permanently attached manual operation provisions, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.
- B. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided. Technicians specifically trained to support the product shall service the transfer switches.

1.02 CODES AND STANDARDS

- A. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:
  - 1. CSA 282, Emergency Electrical Power Supply for Buildings
  - 2. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  - 3. NFPA99 – Essential Electrical Systems for Health Care Facilities
  - 4. NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.
  - 5. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
  - 6. NEMA ICS10-1993 – AC Automatic Transfer Switches.
- B. The transfer switch assembly shall comply with the following standards:
  - 1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
  - 2. EN55011, Class B Radiated Emissions
  - 3. EN55011, Class B Conducted Emissions
  - 4. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity.
  - 5. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
  - 6. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
  - 7. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
  - 8. IEC 1000-4-6 Conducted Field Immunity
  - 9. IEC 1000-4-11 Voltage Dip Immunity.
  - 10. IEEE 62.41, AC Voltage Surge Immunity.
  - 11. IEEE 62.45, AC Voltage Surge.
  - 12. UL1008 – Transfer Switches. Transfer switches shall be UL1008 (latest edition) listed. UL1008 transfer switches may be supplied in UL891 enclosures if necessary to meet the physical requirements of the project.

- C. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

### 1.03 ACCEPTABLE MANUFACTURERS

- A. Cummins/Onan
- B. Caterpillar
- C. Generac
- D. Kohler
- E. Zenith
- F. Russelectric
- G. ASCO
- H. Eaton

## PART 2 - PRODUCTS

### 2.01 POWER TRANSFER SWITCH

- A. Ratings
  - 1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, voltage and ampere ratings, enclosure type, and accessories.
  - 2. Main contacts shall be rated for 600 Volts AC minimum.
  - 3. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000M).
  - 4. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes equal to or greater than the required ratings shown on the drawings (at the specified voltage). The transfer switch shall be third party listed and labeled for use with the specific protective device(s) (both normal and emergency) installed in the application. All rating information including associated overcurrent devices shall be submitted with shop drawings. Where WCR is dependent on setting of upstream overcurrent device, transfer switch shall be field marked with the required settings of the associated device. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. The transfer switch and its upstream protection shall be coordinated.



## B. Construction

1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.
2. Transfer switches shall be of the Programmed (Delayed) Transition type. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.
3. The switch shall completely disconnect the load from both sources for an adjustable period of time to allow regenerative voltage to decay to a safe level prior to connecting to the new source.
4. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
5. All wiring shall be UL listed 105 degree C, 600 volt rated, and sized as required. Each wire, device or function shall be identified with a source and destination by silk-screen or similar permanent identification. Circuit boards shall be connected wiring harnesses by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
6. Bus structures shall be constructed from silver plated copper or tin plated aluminum with bolted joints for all three phases, with a full neutral, and a 1/4 x 2 inch ground bus extending through all sections.
7. The framework and all other sheet metal components of the system shall be primed with a rust-inhibiting primer, and finished with two coats of satin finish ANSI 61 gray enamel, or manufacturer's standard color.
8. All door mounted control components shall be industrial type oil-tight devices with contact ratings a minimum of twice the maximum circuit ampacity they are controlling. Toggle switches and other light duty and durability control devices are not acceptable. Indicator lamps shall be high intensity LED type devices. Indicator lamp condition (on or off) shall be easily visible in bright room lighting conditions.
9. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation or shall be indicated by mechanical flags. Barriers shall be provided to prevent inadvertent contact with any voltage of greater than 50VDC.
10. Transfer switches shall be 3-pole with a solid neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

## C. Connections

1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
2. Transfer switch shall be provided with AL/CU compression lugs suitable for the quantities and sizes of power conductors required.

## 2.02 TRANSFER SWITCH CONTROL

- A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities.
1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
  2. High intensity LED lamps to indicate that the transfer switch is “not in auto” (due to control being disabled or due to bypass switch (when used) enabled or in operation) and “Test/Exercise Active” to indicate that the control system is testing or exercising the generator set.
  3. “OVERRIDE” pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
  4. “TEST” pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
  5. “RESET/LAMP TEST” pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
  6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via an operator display panel.
  7. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:
    - a. Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.
    - b. Display source status, to indicate source is connected or not connected.
    - c. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
      - 1) Set nominal voltage and frequency for the transfer switch.
      - 2) Adjust voltage and frequency sensor operation set points.
      - 3) Set up time clock functions.
      - 4) Set up load sequence functions.
      - 5) Enable or disable control functions in the transfer switch, including program transition.

- 6) Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.
- d. Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall be incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.
- e. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.
- f. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, network communications error.

## B. Internal Controls

1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
  - a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
  - b. Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).
  - c. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for voltage imbalance.
  - d. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for loss of a single phase.
  - e. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for phase rotation.
  - f. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for over voltage conditions (adjustable for dropout over a range of 105 to 135% of normal voltage, and pickup at 95-99% of dropout voltage level).
  - g. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for over or under frequency conditions.
3. The transfer control shall incorporate a series of diagnostic LED lamps.

4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature. The program/delayed transition time setting (time in which load is not connected to either source during transfer) shall be initially set at 10 seconds to allow motors to properly decay per MG-1 standard
5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).
6. The transfer switch shall be configurable to accept a relay contact signal from an external device to prevent transfer to the generator service.
7. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage surge and RFI/EMI standards.
8. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

#### C. Control Interface

1. The transfer switch shall provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
2. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
3. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
4. The transfer switch shall provide additional relay contacts to indicate the following conditions: Utility Source Available, Load Connected to Utility, Generator Source Available, Load Connected to Generator, Pre-Transfer Warning (adjustable 0-59 second time delay).

### 2.03 ENCLOSURE

- A. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.
- B. If not specifically indicated otherwise on plans, transfer switch equipment enclosures shall meet the following minimum requirements:
  1. For dry interior locations: NEMA 1 or better (unless shown otherwise on plans).
  2. For wet interior (pump stations, etc.) or exterior locations: NEMA 3R or better (unless shown otherwise on plans).
- C. The cabinet shall provide code-required wire bend space at point of entry as shown on

the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

- D. Note size and access requirements for the transfer switch (and associated equipment) and provide equipment that will fit into the space allowed and comply with code-specified access requirements.

## 2.04 BATTERY CHARGING

- A. The transfer switch/generator set combination shall be provided with a battery charger for the generator set starting batteries. Refer to Generator Sets Specification Section 26 32 13 for specific requirements. Supply power failed indication shall be displayed on the ATS control panel.

## 2.05 SEQUENCE OF OPERATION

- A. Programmed (Delayed) Transition Sequence of Operation

- 1. Normal State:

- a. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is connected to source 1 (connected to the utility), and no start signal is supplied to the genset.

- 2. Normal Power Failure and Restoration:

- a. When the transfer switch senses a power failure on source 1, it shall complete a pre-programmed time delay start sequence, and then send a start signal to the generator set.
- b. The generator set shall immediately start and accelerate to rated voltage and frequency.
- c. The transfer system shall complete a programmable time delay sequence, and then transfer to source 2 by delayed (programmed) transition. The transfer switch shall accomplish this by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard).
- d. On return of source 1 to acceptable voltage and frequency levels, the control system shall initiate a time delay retransfer sequence. On completion of the time delay sequence, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard). The timing sequence for the contact operation shall be programmable in the controller. The control system shall transfer loads back to source 1 in the reverse sequence to that which was used to connect loads to source 2.

- e. If the generator set fails during this period and normal source is available, the transfer switch shall automatically reconnect the system loads to the normal service.
  - f. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set.
3. Generator Set Exercise (Test) With Load Mode (Delayed (programmed)Transition). The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:
- a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
  - b. The transfer switch shall issue a compatible start command to the generator set as follows:
    - 1) On generators rated 50kW and greater, the transfer switch shall cause the generator set to start and run at idle until it has reached normal operating temperature. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.
    - 2) On generators rated less than 50kW, the generator set shall immediately start and accelerate to rated voltage and frequency.
  - c. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard). The timing sequence for the contact operation shall be programmable in the controller.
  - d. The generator set shall operate connected to the load for the duration of the exercise period.
  - e. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard). The timing sequence for the contact operation shall be programmable in the controller.
  - f. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set.
  - g. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.
  - h. If the generator set fails during the exercise period and normal source is available, the transfer switch shall automatically reconnect the system loads to the normal service.
4. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:

- a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
- b. The transfer switch shall issue a compatible start command to the generator set as follows:
  - 1) On generators rated 50kW and greater, the transfer switch shall cause the generator set to start and run at idle until it has reached normal operating temperature. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.
  - 2) On generators rated less than 50kW, the generator set shall immediately start and accelerate to rated voltage and frequency.
- c. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.
- d. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

### PART 3 - EXECUTION

#### 3.01 POWER COMPANY APPROVAL

- A. The transfer switch shall be designed to meet all applicable power company requirements for connection to the power company's system, and if applicable, shall be on the power company's approved list of automatic transfer switches. Contractor shall ensure that transfer switch is specifically approved by power company for connection to their system prior to purchasing the transfer switch.

#### 3.02 FACTORY TESTING

- A. The transfer switch manufacturer shall perform a complete operational test on the transfer switch prior to shipping from the factory. A certified test report shall be submitted. Test process shall include calibration of voltage sensors.

#### 3.03 SERVICE AND SUPPORT

- A. The manufacturer of the transfer switch shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The transfer switch shall be serviced by a local service organization that is trained and factory certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

- C. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.
- D. After generator set installation, the generator set supplier shall conduct a complete operation, basic maintenance, and emergency service seminar for up to 5 persons employed by the facility owner. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures. The class duration shall be at least 4 hours in length, and include practical operation with the installed equipment.

#### 3.04 WARRANTY

- A. The automatic transfer equipment shall be warranted (by the generator supplier when a generator is supplied within the project) for a period of not less than 2 years from the date of commissioning against defects in materials and workmanship.
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION 26 36 23



**SECTION 26 43 00**  
**Surge Protective Devices**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (<1000 V) power distribution and control equipment.
- B. The specified unit(s) shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit(s) shall be connected in parallel with the facility's wiring system.
- C. The unit(s) shall be designed and manufactured in North America by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacturer of such products for minimum of ten (10) years.
- D. All products that are submitted according to these specification will be required to meet this specification in it's entirety for both service and distribution TVSS systems. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

1.03 DEFINITIONS

- A. VPR: Voltage Protection Rating.
- B. SPD: Surge Protective Device(s)
- C.  $I_{(n)}$ : Nominal Discharge Current

1.04 SUBMITTALS

- A. See specification section 26 05 00.
- B. Product Data: For each type of product indicated. Include:
  - 1. Maximum Single Impulse Surge Current Rating.
  - 2. Surge Life (Repetitive Surge) Rating.
  - 3. UL1449 (Latest Edition) Voltage Protection Ratings (VPR).
  - 4. UL1449 (Latest Edition) Nominal Discharge Current ( $I_n$ ).

5. Product dimensions and weights.
6. Furnished specialties and accessories.

C. Qualification Data:

D. Safety Agency File Number.

E. ISO 9001-2008 Certification.

F. ISO 1401-2001 Certification.

G. Operation and Maintenance Data: For SPDs to include all submittal data and any applicable operation and maintenance manuals.

H. Warranties: Sample of special warranties.

#### 1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

B. The unit shall be UL 1449 Listed and CUL Approved as a Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference Filter

C. Provide 2<sup>nd</sup> party certified data demonstrating SPD response to ANSI/IEEE C62.41.2-2002 standard waveforms when tested according to IEEE C62.45.

D. Comply with NFPA 70.

E. All SPDs provided within this project at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

#### 1.06 PROJECT CONDITIONS

A. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 150 deg F.
3. Humidity: 0 to 95 percent, non-condensing.
4. Altitude: Less than 13,000 feet above sea level.

#### 1.07 COORDINATION

A. Where field-mounted SPD's are specifically shown on plans, coordinate locations of field-mounted SPDs to allow adequate clearances for maintenance.

#### 1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

## 1.09 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replaceable Protection Modules: 1 of each size and type installed, where field-replaceable modular SPDs are provided.

2. Fuses: 1 of each size and type installed, where field-replaceable fuses are provided.

## PART 2 - PRODUCTS

### 2.01 SURGE PROTECTIVE DEVICES

A. Manufacturer:

1. Integral Devices: Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.), or by Surge Suppression Inc. if all of the performance of this specification are met and all UL listing of the equipment manufacturer are met.

2. External Devices (where specifically specified on plans): Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.) or Surge Suppression Inc.

B. Each Surge Protective Device shall:

1. Be internal to the associated distribution equipment (without violating any applicable UL listings) unless specifically shown otherwise on plans.

2. Be UL 1449 (Latest Edition) listed.

3. Have short-circuit current rating complying with UL 1449 (Latest Edition), that matches or exceeds the short-circuit rating of the associated distribution equipment.

4. Be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.

5. Have fuses, rated at 200-kA interrupting capacity.

6. Have a minimum UL 1449 Nominal Discharge Current ( $I_n$ ) Rating of 20kA.

7. Be fabricated using bolted compression lugs.

8. Provide suppression for all ten (10) modes of protection.

9. Have LED indicator lights for power and protection status of each phase.

10. Have audible alarm, with silencing switch, to indicate when protection has failed.

11. Have form-C contacts rated at 2 A and 24-V ac minimum, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with facility monitoring and control system if monitoring by that system is required by plans or other specifications.

12. Have six-digit transient-event counter, mounted to front of equipment door, set to totalize transient surges (externally mounted SPD's may have the transient –event counter monted on the visible face of the SPD).
13. Meet all UL 96A requirements (for Lightning Protection Systems) where the device is installed at a service entrance of the facility. At a minimum, these devices shall:
  - a. Be marked as Type 1 or Type 2 SPDs with product Identity consisting of “Surge Protective Device” or “SPD”, and identifying all ratings so required by UL96A and the 4 digit alpha numeric Control Number.
  - b. Have a minimum UL 1449 Nominal Discharge Current ( $I_n$ ) Rating of 20kA.
  - c. Be UL listed and labeled with holographic label.

C. Peak Single-Impulse Surge Current Rating shall be meet the following minimums unless specifically shown otherwise on plans:

<b>Application</b>	<b>Per Phase</b>	<b>Per Mode</b>
<b>Service Entrance Devices</b>	240 kA	120 kA
<b>Downstream Devices</b>	160 kA	80 kA

D. The ANSI/UL 1449 voltage protection rating (VPR) in grounded wye circuits, the SPDs shall not exceed the following:

<b>Modes</b>	<b>208Y/120V</b>	<b>480Y/277V</b>	<b>600Y/347V</b>
<b>L-N,L-G, N-G</b>	800	1200	1500
<b>L-L</b>	1200	2000	2500

E. The ANSI /UL 1449 VPR for 240/120 V, 3-wire or 4-wire circuits with high leg shall not exceed the following:

<b>Modes</b>	<b>240/120V</b>
<b>L-N,L-G, N-G</b>	1200/800

## 2.02 ENCLOSURES

- A. Where external units are specifically specified on plans, units not mounted within electrical distribution equipment (such as switchboards, MCC's, etc.) shall be provided in enclosures with NEMA enclosure ratings that match or exceed the NEMA enclosure ratings of the equipment from which the units are fed. For example, a unit fed from a NEMA 4X stainless steel panelboard shall also be mounted within a NEMA 4X stainless steel enclosure.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. All SPD's shall be integrally-mounted within the associated distribution equipment unless specifically shown otherwise on plans.
- B. Install SPDs at service entrance on load side, with ground lead bonded to service entrance ground.
- C. Install SPDs downstream of the service entrance with conductors or buses between suppressor and points of attachment as short and straight as possible. The lead lengths between the TVSS unit and the equipment being protected shall not exceed fourteen (14) inches without approval from the engineer. Do not bond neutral and ground. Leads shall be as straight as possible with no sharp bends.
- D. Where externally-mounted SPD's are specifically shown on plans, provide circuit breaker as directed by the SPD supplier as a dedicated disconnecting means for SPD unless otherwise indicated.

### 3.02 FIELD QUALITY CONTROL

- A. Ensure that interiors are free of foreign materials and dirt.
- B. Check and test switches, pushbuttons, meters for proper operation.
- C. Check and test indicating lights for proper operation and color.
- D. Perform manufacturer's on site field test procedures.

### 3.03 STARTUP SERVICE

- A. Do not perform insulation resistance (MEGGER) tests of the distribution wiring equipment with the SPDs installed. Disconnect all wires, including neutral, before conducting insulation resistance tests, and reconnect immediately after the testing is over.

### 3.04 SYSTEM WARRANTY

- A. The SPD system manufacturer shall warranty the entire SPD system against defective materials and workmanship for a period of ten (10) years from the date of substantial completion. This warranty is in effect as long as the unit is installed in compliance with the manufacturer's installation, operation, and maintenance manual, UL Listing requirements, and any applicable national or local electrical codes.
- B. Any SPD device which shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period which starts at the date of substantial completion of the system to which the surge suppressor is installed.

- C. The manufacturer is required to have a nationwide network of factory-authorized local service representatives for repair and service of this product. The manufacturer shall have a dedicated 1-800 telephone number for service problems and questions. This number shall be manned by a knowledgeable factory employee to ensure prompt response to any emergency situation that may arise.

END OF SECTION 26 43 00

**SECTION 26 44 00**  
**Electrical Heat Tracing Systems**

PART 1 - GENERAL

1.01 SCOPE

- A. This specification covers the requirements of materials and support services for heat-tracing systems. Heat tracing systems (including insulation and all accessories) shall be provided on all piping installed exposed in exterior locations or where otherwise indicated on plans unless noted otherwise.

1.02 CODES, APPROVALS, AND STANDARDS

- A. The electric heat-tracing system shall conform to this specification. It shall be designed, manufactured, and tested in accordance with the applicable requirements of the latest edition of the following codes and standards.
1. ANSI American National Standards Institute
  2. CEC Canadian Electrical Code
  3. CSA CSA International
  4. FM FM Approvals
  5. IEC International Electro-Mechanical Commission
  6. IEEE Institute Of Electrical and Electronics Engineers
  7. ITS Intertek Testing Services (Intertek ETL SEMKO)
  8. NEC U.S. National Electrical Code (NFPA 70)
  9. NEMA National Electrical Manufacturers Association
  10. NESC National Electrical Safety Code
  11. UL Underwriters' Laboratories, Inc.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Heat Tracing:

1. Raychem/Tyco Thermal Controls.
2. Thermon.
3. Nelson Heat Tracing.
4. Chromalox.

B. Insulation:

1. Armstrong World Industries, Inc.
2. Babcock & Wilcox; Insulating Products Division
3. CertainTeed Corporation
4. Knauf Fiber Glass GmbH
5. Manville Products Corp.
6. Owens-Corning Fiber Glass Corp.

7. Pittsburg Corning Corp.
8. Rubatex Corp.

## 2.02 SELF-REGULATING HEATING CABLES

- A. All heat-tracing applications with continuous exposure (maintain) temperatures from 150°F (65°C) to 250°F (121°C) or intermittent exposure temperatures from 185°F (85°C) to 420°F (215°C) shall use self-regulating cables.
  1. Self-regulating heating cable shall vary its power output relative to the temperature of the surface of the pipe or the vessel. The cable shall be designed such that it can be crossed over itself and cut to length in the field.
  2. Self-regulating heating cable shall be designed for a useful life of 20 years or more with “power on” continuously, based on the following useful life criteria:
    - a. Retention of at least 75 percent of nominal rated power after 20 years of operation at the maximum published continuous exposure (maintain) temperature.
    - b. Retention of at least 90 percent of nominal rated power after 1000 hours of operation at the maximum published intermittent exposure temperature. The testing shall conform to UL 746B, IEC 216-1 Part 1.
  3. A warranty against manufacturing defects for a period of 10 years shall be available.
  4. All cables shall be capable of passing a 2.5 kV dielectric test for one minute (ASTM 2633) after undergoing a 0.5 kg-m impact (BS 6351, Part 1, 8.1.10).

## 2.03 FREEZE-PROTECTION SYSTEMS

- A. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identification number (T-rating) of T6 (185°F or 85°C) without use of thermostats.
- B. The heating cable shall have a tinned copper braid with a resistance less than the heating cable bus wire resistance as determined in type test (ASTM, B193, Sec. 5). The braid shall be protected from chemical attack and mechanical abuse by a modified polyolefin or fluoropolymer outer jacket.
- C. In order to provide rapid heat-up, to conserve energy, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:

1. Table K.1 Minimum Self-Regulating Indices

Heating cable	S.R. index (W/°F)	S.R. Index (W/°C)
3 W/ft	0.038	0.068
5 W/ft	0.060	0.108
8 W/ft	0.074	0.133
10 W/ft	0.100	0.180



- D. The self-regulating index is the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50°F (10°C) and 100°F (38°C) and confirmed by the type test and published data sheets.
1. In order to ensure that the self-regulating heating cable does not increase power output when accidentally exposed to high temperatures, resulting in thermal runaway and self-ignition, the cable shall produce less than 0.5 watts per foot (1.64 watts per meter) when energized and heated to 350°F (177°C) for 30 minutes. After this test, if the cable is reenergized, it must not have an increasing power output leading to thermal runaway.
  2. In order to confirm 3.1B, the self-regulating heating cable shall retain at least 90 percent of its original power output after having been cycled 300 times between 50°F (10°C) and 210°F (99°C), allowing at least six minutes of dwell time at each temperature.
  3. The heating cable shall be Raychem® BTV-CT or BTV-CR self-regulating heater, with continuous exposure (maintain) capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.

#### 2.04 SYSTEMS FOR DIVISION 1 HAZARDOUS LOCATIONS

- A. The following requirements shall apply in addition to the criteria specified above:
1. The self-regulating heating cable shall be specifically FM Approved or CSA Certified for use in Division 1 locations.
  2. A ground-fault protection device set at 30 mA, with a nominal 100 ms response time, shall be used to protect each circuit.
  3. The temperature identification number (T-rating) of the cable used shall comply with FM and CSA requirements as applicable.
  4. Connection methods used with the cable shall be compatible and approved as a part of the system manufactured and supplied by the heating cable vendor for use in the Division 1 location.
  5. For plastic pipe and vessel applications, the heating cable shall be Raychem HBTV-CT or Raychem BTV-CT self-regulating heaters, with continuous exposure capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.
  6. The heating cable shall be Raychem HQTV-CT or Raychem QTVR-CT self-regulating heaters, for continuous and intermittent exposure capability up to 225°F (110°C), as manufactured by Tyco Thermal Controls.
- B. Terminations for nonhazardous And hazardous class 1, div 2 locations
1. All connection components used to terminate heating cables, including power connectors, splices, tees, and connectors shall be approved for the respective area classification and approved as a system with the particular type of heating cable in use. Under no circumstances shall terminations be used which are manufactured by a vendor other than the cable manufacturer.

2. In order to keep connections dry and corrosion resistant, components shall be constructed of nonmetallic, electrostatic, charge-resistant, glass-filled, engineered polymer enclosure rated NEMA 4X. The component stand shall allow for up to four inches (100 mm) of thermal insulation.
3. Terminals shall be spring clamp wire connection type to provide reliable connection, maintenance-free operation, and ease of reentry.
4. Heating cable terminations shall use cold-applied materials and shall not require the use of a heat gun, torch, or hot work permit for installation.
5. Components shall be rated to a minimum installation temperature of  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ), minimum usage temperature of  $-75^{\circ}\text{F}$  ( $-60^{\circ}\text{C}$ ), and maximum pipe temperature of  $500^{\circ}\text{F}$  ( $260^{\circ}\text{C}$ ).
6. The component system shall be Raychem JBM-100-L-A connection kit complete with integral LED power indicating light to serve as complete power, splice, or tee connection for up to three Raychem BTV, QTVR, or XTV industrial parallel heating cables as manufactured by Tyco Thermal Controls.

## 2.05 THERMOSTATS AND CONTACTORS

- A. Freeze protection systems shall operate using self-regulating control or with the DigiTrace AMC-1A or DigiTrace AMC-F5 thermostat and the DigiTrace E104-100A or DigiTrace E304-40A contactor in nonhazardous locations, and DigiTrace AMC-1H thermostat with DigiTrace E307-40A contactor in hazardous locations, as supplied by Tyco Thermal Controls.
- B. Where heat tracing is applied to emergency showers and/or emergency eye wash systems (or other systems where the heated piping system provides water that may be applied to persons in emergency or non-emergency situations), the sensor (that determines whether the heat tracing system is ON or OFF) shall be placed on the associated pipe or tank wall rather than in ambient air (such as to prevent the heat tracing system from overheating the associated liquid).

## 2.06 END SEAL

- A. An above-insulation, lighted end seal kit shall be provided for each heat trace circuit termination as per the manufacturer's installation details. The kit shall be E-100-LBTV2 as supplied by Tyco Thermal Controls.

## 2.07 INSULATION

- A. All components of the insulation, including covering, mastics and adhesives shall have a flame-spread rating of not over 25, and a smoke development rating of not over 50. Ratings shall be as established by tests in accordance with ASTM E 84 and Federal Specification standards. The integrated insulation assemblies shall also conform to the above specifications. Insulation shall be applied in strict accordance with the manufacturer's instructions.
- B. Description:

1. This type of insulation shall be employed for process, cold-and hot water, steam, and condensate piping and equipment with surface temperatures up to 850 degrees F. Pipe insulation and jacketing shall be applied to piping where shown, and shall include fittings, flanges, and valves. Pipe insulation shall be molded-type pipe covering, made of fibrous glass with a minimum k-factor of 0.23 at 75 degrees F mean temperature. Unless otherwise specified the insulation thickness shall be 1” minimum.
2. The insulation shall be oversized for installation over electric heating cable. Insulation shall have a factory-applied white fire-retardant vapor-barrier jacket of kraft paper and aluminum foil laminated together and reinforced with fiberglass yarn. Fittings and valves shall be covered with the same material as the pipe, cut in segments to fit snugly without open spaces, held in place with copper wire or cement, and then covered with the same jacketing material as the pipe. Insulated fittings adjacent to vapor-barrier insulation shall be sealed with an acceptable vapor-barrier cement before installation of the finish jacket. Pipe insulation and vapor-barrier shall be continuous through hangers and supports. Insulation shall be coordinated with the pipe hangers and supports and where insulation protection shields are provided the top half section of pipe insulation at support locations shall be of the same specified density, and the bottom half insulation segments provided between the pipe and the insulation protection shields shall have a density of not less than 6 lb/cu ft. All insulation shall be covered with smooth aluminum weatherproof metal or plastic preformed jacketing with a factory attached moisture barrier. The jacket for the fittings shall consist of precision-formed smooth-sided sections and shall be sized to cover and protect the insulated fitting. Each section shall be manufactured from aluminum or PVC, and all joints shall be sealed with silicon mastic or solvent welding, to provide a continuous, air and weathertight joint. Strapping shall be 1/2-inch wide, Type 3003 aluminum or stainless steel.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Heat tracing shall be provided along full length of all exposed piping or vessels located outside of buildings or in other areas designated on plans (such as by insulated piping in areas subject to cold temperature). Insulation shall be provided over all heat traced pipes.
- B. The vendor shall provide a detailed design utilizing standard heat-tracing design software, such as Tyco Thermal Controls TraceCalc® Pro design software or equal. At minimum, the design must provide the following:
  1. Circuit identification number
  2. Maintain temperature
  3. Line size and insulation
  4. Heat loss for pipe, valves, and supports
  5. Amount and type of heating cable required
  6. Spiral requirements
  7. Heating cable service voltage

8. Heating cable power output at the maintain temperature
  9. Minimum and maximum maintain temperature vs. minimum and maximum ambient temperatures
  10. Circuit breaker and transformer sizing
- C. A ground-fault protection device set at 30 mA, with a nominal 100-ms response time, shall be used to protect each circuit.
- D. Install additional heating tape at bolted flanges, valves, pipe supports, and other fittings and fixtures as recommended by supplier, but not less than the following:
1. Bolted flanges (per pair): Two times pipe diameter
  2. Valves: Four times valve length
  3. Pipe hanger or support penetrating insulation: Three times pipe diameter
- E. The entire system shall be installed in compliance with the manufacturer's recommendations for a fully-functional, code-compliant system.
- F. All insulation shall be installed by a qualified insulation contractor in strict accordance with the manufacturer's recommendations and the requirements of these specifications.
- G. All piping insulation shall be installed following required testing and approval of piping.

### 3.02 IDENTIFICATION

- A. Heat tracing systems shall be labeled at the field connection of power to the heat tracing equipment per the requirements for Utilization Equipment within Specification Section 26 05 53.
- B. Heat traced piping, vessels, etc. shall be identified with appropriate caution signs or markings at intervals not exceeding 20 feet on center per NEC requirements.

### 3.03 TESTING

- A. Factory inspections and tests for self-regulating, power limiting, series constant wattage and constant wattage (MI) heater cables shall include but are not limited to the following:
1. Testing shall be done per the latest IEEE Std. 515 test section and applicable manufacturer's standards.
  2. In the field, all heater cables shall be meggered. The following separate field megger readings shall be taken on each self-regulating and each M.I. heater cable:
    - a. Heater cable shall be meggered when received at jobsite before installation.
    - b. Heater cable shall be meggered after installation, but before insulation is applied.
    - c. Heater cable shall be meggered after insulation has been installed.

3. All three of the above field megger readings shall be greater than 20 megohms. Otherwise, the heater cable is not acceptable and shall be replaced.
4. Field megger tests shall be recorded for each heater cable, and certified reports shall be submitted to the user.

END OF SECTION 26 44 00

**SECTION 26 50 00**  
**Lighting Materials And Methods**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Lighting Fixtures
- B. Drivers

1.02 SUBMITTALS

- A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicate that the contractor/supplier intends to meet all contract requirements. Refer to specification section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.
- B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.
- C. All lighting fixtures shall be so designed and shall have drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor's expense.
- D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as required to maintain the fire rating of the assembly.

2.02 LED LUMINAIRES

- A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.
- B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.
- C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.
- D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.
- E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail “open” such as to prevent fixture operation after a surge protection failure.
- F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.
- G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

#### 2.03 STEMS/PENDANTS

- A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.
- B. Stems/Pendants shall be rigid conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.
- C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.
- D. Shall be painted the same color as the fixture trim unless noted otherwise.

#### 2.04 MANUFACTURER

- A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.
- B. Drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF LIGHTING FIXTURES

A. Support:

1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.
2. Contractor shall coordinate installation requirements for all wall-mounted fixtures (especially for wall-mounted fixtures on uneven wall surfaces, etc.) as required to assure a level/flat mounting surface and level/plumb/secure finished installation. Contractor shall provide flat mounting plates or other mounting provisions where necessary. Any proposed mounting plates, etc. shall be submitted to and approved by project architect prior to ordering materials.
3. Fixtures shall be supported independent of ceiling from structural members of building.
4. Lay-in fixtures shall be supported by four (4) taut 12 gauge hanger wires connected from each corner of the fixture to the structure above so that fixture is supported independent of the ceiling.
5. Other recessed light fixtures (including recessed downlights) shall be supported with two (2) taut 12 gauge hanger wires connected from opposing corners of the light fixture to the structure above so that fixture is supported independent of the ceiling.
6. Pendant mounted fixtures shall be directly supported from the structure above using a 9 gauge hanger wire or an approved alternate support without using the ceiling suspension system for direct support.
7. Tandem fixtures may utilize common hanger wires.
8. All lay-in fixtures shall be attached to ceiling grid by means of approved clips and in accordance with the N.E.C.
9. Contractor shall submit typical hanging detail to Engineer before installing any fixtures.

B. Connections:

1. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.
2. All flex shall contain 3 conductors (3<sup>rd</sup> wire ground). Ground wire shall be securely grounded at each end. Other conductors shall be connected by approved connectors.

C. Row-Mounted fixtures:

1. All stems on row-mounted fluorescent fixtures shall be installed as follows (except fixtures with slide grip hangers):
  - a. One stem shall be installed in the first fixture knockout from end of row (on the first and last fixture of the row).
  - b. One stem shall be installed between each two fixtures. Stem shall center joint where fixtures join and shall attach by use of "joining plates".
2. All fixtures in continuous rows other than recessed grid type shall be connected by nipples with locknuts bushings.



D. Coordination:

1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to insure proper fit and coordination with other trades.
2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 26 50 00

**SECTION 27 05 00**  
**Auxiliary System Cables, 0-50v**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless specified otherwise, all cables within the scope of this specification section shall:
1. Be rated for exposed cable tray installation.
  2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
  3. Be UL-rated for the proposed application.
  4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
  5. Utilize copper conductors.
  6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
  7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
  8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.02 INSTRUMENTATION CABLING

- A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:
1. Be #16awg minimum.
  2. Be rated for 300V.
  3. Have aluminum foil shielding.
  4. Have stranded, twisted conductors.
  5. Have PVC insulation/jacket with ripcord.
  6. Be manufactured by Belden, AlphaWire or General Cable.

2.03 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

- A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:

1. Be rated for 600V.
2. Be industrial grade.
3. Have stranded conductors.
4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

#### 2.04 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:

1. Be rated for 300V.
2. Be shielded if so recommended by the system supplier/integrator.
3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

#### 2.05 NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

### PART 3 - EXECUTION

#### 3.01 GENERAL INSTALLATION

A. Routing:

1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
  - a. Cabling is plenum-rated, multi-conductor.
  - b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
  - c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
  - d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
  - e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
2. End bushings shall be provided on both ends of all raceway terminations.

3. No splices shall be pulled into conduit.
4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.
2. For cabling not installed in conduit:
  - a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.
3. For cabling installed within conduit from endpoint to endpoint:
  - a. Fire/smoke barrier penetrations shall sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.
4. For cabling installed within cable trays:
  - a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:
    - 1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.
    - 2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

C. Excess Cabling:

1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:

1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
2. Cabling shall be neatly formed, bundled and tied at all terminations.

### 3.02 SPLICES/CONNECTIONS/TERMINATIONS:

#### A. Network Cabling:

1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

#### B. Control Cabling:

1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

#### C. Shielded cabling:

1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

### 3.03 LABELING

- A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00

**SECTION 31 22 13  
ROUGH GRADING**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Removal of topsoil and subsoil.
- B. Cutting, grading, filling, rough contouring, compacting, and preparing the site for building pads, paving, curb and gutter, sidewalks, etc.

1.02 RELATED SECTIONS

- A. Section 31 10 00 - Site Clearing.
- B. Section 31 05 13 – Soil Materials.

1.03 REFERENCES

- A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10 lb Rammer and an 18m inch Drop.
- B. ASTM C136 - Method For Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
- D. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- E. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- F. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- G. ASTM D2419 - Test Method For Sand Equivalent Value of Soils and Fine Aggregate.
- H. ASTM D2434 - Test Method For Permeability of Granular Soils (Constant Head).
- I. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- J. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

## 1.04 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

- A. Topsoil: Type S4 as specified in Section 02205.
- B. Subsoil Fill: Type S2 as specified in Section 02205.
- C. Structural Fill: Type S2 as specified in Section 02205.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verify site conditions
- B. Verify that the survey benchmark and intended elevations for the Work are as indicated.

### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain from damage.
- D. Protect above and below-grade utilities that remain.
- E. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- F. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

### 3.03 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as indicated on the finished contours plan.
- B. Do not excavate wet subsoil.

- C. When excavating through roots, perform work by hand and cut roots with a sharp axe.
- D. Stockpile in the area approved by the Owner to a depth not exceeding 8 feet and protect from erosion. Remove from the site; subsoil is not being reused.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide a firm bearing.
- F. Stability: Replace damaged or displaced subsoil to the same requirements as for specified fill.

#### 3.04 FILLING

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Maintain optimum moisture content of fill materials to attain required compaction density.
- C. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.
- D. Make grade changes gradual. Blend slope into level areas.
- E. Remove surplus fill materials from site.

#### 3.05 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 of a foot from required elevation.

END OF SECTION



**SECTION 31 23 00**  
**EARTHWORK**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Protection, modification, or installation of utilities as site work progresses with particular attention to grade changes and necessary staging or phasing of work.
- B. Cutting, filling, and grading to required lines, dimensions, contours, and elevations for proposed improvements.
- C. Scarifying, compacting, drying, dewatering, and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.02 RELATED SECTIONS

- A. Section 31 10 00 - Site Clearing
- B. Construction Drawings
- C. Erosion and Sediment Control Plans

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition
  - 1. D422 Standard Test Method For Particle – Size Analysis of Soil
  - 2. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN.m/m<sup>3</sup>))
  - 3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 Kn.m/m<sup>3</sup>))
  - 4. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
  - 5. D 2487 Classification of Soils for Engineering Purposes
  - 6. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

7. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
  8. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
1. T 88 Particle Size Analysis of Soils
  2. State Department of Transportation (DOT): Standard Specifications for Construction and Materials, Latest Edition

#### 1.04 QUALITY ASSURANCE

- A. An independent testing laboratory, selected and paid for by Owner, will be retained to perform construction testing on site.
1. The independent testing laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, Engineer, and Contractor shall be provided with copies of reports within 96 hours of the time the test was performed. In the event that the test performed fails to meet the Specifications, the independent testing laboratory shall notify Owner and Contractor immediately.
  2. Costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to the Owner. The contractor shall provide free access to the site for testing activities.
  3. Quality assurance testing shall be in accordance with Part 3, Section 3.07, "Field Quality Control."

#### 1.05 SUBMITTALS

- A. Submit a 30-pound sample of each type of fill/backfill material that is to be used in an airtight container(s) to the independent testing laboratory for classification and certification of material.
- B. Submit the name of each material supplier and the specific type and source of each material. Change in source throughout the project requires approval of the Owner.
- C. If fabrics or geogrids are to be used, the design shall be submitted for approval to the Owner.
- D. Submit Dewatering Plans upon request by Owner.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

- A. Excavated and reused material for subsoil fill as specified herein.
- B. Aggregate fill as specified in Section 02325.
- C. Imported fill material approved by Owner and specified herein.
- D. Topsoil fill as specified in Section 02230.
- E. Filter and drainage fabrics as specified in Section 02370.

### 2.02 EQUIPMENT

- A. Transport off-site materials to the project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

### 2.03 SOURCE QUALITY CONTROL

- A. In areas to receive pavement, California Bearing Ratio (CBR) test shall be performed for each type of material that is imported from off-site. The acceptable California Bearing Ratio (CBR) shall be 10.
- B. Following tests shall be performed as part of construction testing requirements on each type of on-site or imported soil material used as compacted fill:
  - 1. Moisture and Density Relationship: ASTM D 698 (or ASTM D 1557)
  - 2. Mechanical Analysis: AASHTO T 88 (or ASTM D422)
  - 3. Plasticity Index: ASTM D 4318

## PART 3 – EXECUTION

### 3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Locate and identify existing utilities that are to remain and protect from damage.

- C. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.
- D. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on construction drawings from excavating equipment and vehicular traffic.
- E. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If the marker is destroyed or needs to be removed, it shall be reset by a licensed land surveyor and replaced, as necessary, by the same.
- F. Remove from site material encountered in grading operations that, in the opinion of the Owner or Agent, is unsuitable or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in a manner satisfactory to Owner. Backfill areas with layers of suitable material and compact as specified herein.
- G. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform the following procedures:
  - 1. Drain the water out by gravity with a ditch having a flow line lower than the lowest elevation in a low area. If drainage cannot be performed by gravity ditch, use an adequate pump to obtain the same results.
  - 2. After drainage of the low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying the low area dry and undisturbed.
  - 3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation by the Owner or Agent. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into the lowest elevation of site filling operation, but not under building subgrade or within 10'-0" of the perimeter of building subgrade or paving subgrade. If, after observation by the Owner or Agent, the material is found to be unsuitable, unsuitable material shall be removed from the site.
- H. Dewatering shall be performed in accordance with Section 02140, unless otherwise specified on the construction drawings.
- I. Undercut and recompact loose sands in the upper 2 to 3 feet of existing grade prior to placement of any fill.
- J. Prior to constructing any slopes, begin by undercutting the toe to key in the fill mass to be constructed. Provide benches into existing slopes in accordance with the construction drawings.

### 3.02 EXCAVATION FOR FILLING AND GRADING

- A. Classification of Excavation: The contractor acknowledges that the site has been investigated to determine the type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.
- B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage, and groundwater management to control the moisture of soils.
- C. Shore, brace, and dewater excavations as necessary to maintain excavation in accordance with OSHA regulations.
- D. Excavated material containing rock or stone greater than 4 inches in largest dimension shall not be used within the upper 24 inches of the proposed subgrade in parking and drive areas and within 48" of the subgrade of building areas to 10 feet outside of the building area.
- E. Rock or stone less than 12 inches in largest dimension is acceptable as fill to within the upper 24 inches of proposed subgrade in parking and drive areas and 48" of the subgrade of building areas to 10 feet outside of the building area.
- F. Rock or stone less than 4 inches in the largest dimension and mixed with suitable material is acceptable as fill within the upper 24 inches of proposed subgrade in parking and drive areas and 48" of the subgrade of building areas to 10 feet outside of the building area.

### 3.03 FILLING AND SUBGRADE PREPARATION

- A. Fill areas to contours and elevations shown on Construction Drawings with unfrozen materials.
- B. Place fills in continuous lifts specified herein.
- C. Refer to Section 02321 for filling requirements for structures.
- D. Refer to Section 02322 for filling requirements for utilities.
- E. Refer to Section 02323 for filling requirements for pavements.
- F. Refer to Section 02324 for filling requirements for out parcels.
- G. Refer to Section 02318 for rock excavation.
- H. Subgrade areas exposed by excavation or stripping subgrade shall be scarified to a minimum depth of 8 inches and compacted to a minimum of 98 percent of maximum density, in accordance with ASTM D 698. Moisture content shall be within 2 percent of

optimum moisture content. These areas shall then be proof rolled to detect areas of insufficient compaction. Proof rolling shall be accomplished by making a minimum of 2 complete passes with a fully-loaded tandem-axle dump truck with a maximum weight of 20 tons, or approved equal, in each of 2 perpendicular directions while under the supervision and direction of the independent testing laboratory. Areas of failure shall be excavated and recompacted as specified herein. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to the Owner.

- I. Fill materials used in the preparation of subgrade in all areas other than structures, utilities, or pavements(see related sections for backfilling within these areas) shall be placed in lifts or layers not to exceed 8-inches loose measure and compacted to 98 percent of maximum density, in accordance with ASTM D 698. Moisture content shall be within 2 percent of optimum moisture content.
- J. Material imported from off-site shall have a CBR value equal to or above pavement design of 10

### 3.04 MAINTENANCE OF SUBGRADE

- A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.
- B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.
- C. Remove areas of finished subgrade found to have insufficient compaction density to the depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than the best subgrade material on site. The surface of the subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

### 3.05 BORROW AND SPOIL SITES

- A. Contractor shall be responsible for compliance with NPDES and local erosion control permitting requirements for any and all, on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil and/or borrow operations, the Contractor shall clean up spoil and/or borrow areas in a neat and reasonable manner to the satisfaction of the off-site property owner, if applicable, Owner, and Engineer.

### 3.06 RIPRAP

- A. Place rip-rap in areas where indicated on Construction Drawings. Stone for rip-rap shall consist of field stone or rough unhewn quarry stone as nearly uniform in section as is practical. Stones shall be dense, resistant to the action of air and water, and suitable for

- the purpose intended. Unless otherwise specified, stones used as rip-rap shall weigh between 50 pounds and 150 pounds each, and at least 60 percent of stones shall weigh more than 100 pounds each.
- B. Dress slopes and other areas to be protected to line and grade shown on Construction Drawings prior to the placing of rip-rap. Undercut areas to receive rip-rap to an elevation equal to the final elevation less average diameter of stones before placing rip-rap.
  - C. Install filter fabric and bedding stone prior to placement of stones if so, indicated on Construction Drawings. Bedding stone shall be quarried and crushed angular limestone, 6 inches in depth.
  - D. Place stones so that a greater portion of the weight is carried by the earth and not by adjacent stones. Place stones in a single layer with close joints. Upright areas of stone shall make an angle of approximately 90 degrees with an embankment slope. Place courses from the bottom of the embankment upward, with larger stones being placed in lower courses. Fill open joints and embed stones in embankment as necessary to present a uniform top surface such that variation between tops of adjacent stones shall not exceed 3 inches.

### 3.07 FINISH GRADING

- A. Grade areas where finish grade elevations or contours are indicated on Construction Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. The finished subgrade surface shall not be more than 0.10 feet above or below the established finished subgrade elevation. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in a manner that will minimize erosion potential. For topsoil, sodding, and seeding requirements, refer to Section 02900.
- B. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to the proper elevation. Replant or replace grass, shrubs, bushes, or other vegetation that appears dead, dying, or disturbed by construction activities.

### 3.08 FIELD QUALITY CONTROL

- A. Field density tests for in-place materials shall be performed as part of construction testing requirements according to one of following standards:
  - 1. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission)
- B. Perform density test as follows:

1. Building Subgrade Areas, Including 10'-0" Outside of Exterior Building Lines: In cut areas, not less than 1 compaction test for every 2,500 sq. ft. Infill areas, the same rate of testing for each 8-inch lift measured loose.
  2. Areas of Construction Exclusive of Building Subgrade Areas: In cut areas, not less than 1 compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.
- C. Corrective measures for non-complying compaction:
1. Remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

END OF SECTION



**SECTION 31 23 33  
TRENCHING AND BACKFILLING**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Excavating trenches for utilities.
- B. Compacted fill from the top of utility bedding to subgrade elevations.
- C. Backfilling and compaction.

1.02 RELATED SECTIONS

- A. Section 31 05 13 - Soil Materials.
- B. Section 33 30 00 – Sanitary Sewerage

1.03 REFERENCES

- A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.
- B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
- D. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- E. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- F. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

#### 1.05 FIELD MEASUREMENTS

A. Verify that the survey bench-mark, control point, and intended elevations for the Work are as shown on drawings.

#### 1.06 COORDINATION

A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

### PART 2 – PRODUCTS

#### 2.01 MATERIALS

A. Fill Type S2: As specified in Section 31 05 13.

B. Structural Fill Type A1: As specified in Section 31 05 13.

C. Concrete: Concrete thrust blocks are to be cast in place with a compressive strength of 3,000 psi.

### PART 3 – EXECUTION

#### 3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

C. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below-grade utilities, which are to remain.

E. Cut out soft areas of sub-grade not capable of compaction in place. Backfill with Fill Type S2 or A1 and compact to a density equal to or greater than requirements for subsequent backfill material.

#### 3.02 EXCAVATING

A. Excavate subsoil required for utilities.

B. Cut trenches sufficiently wide to enable installation and allow inspection. Minimum width

of trenches shall be as indicated in the plans. Remove water or materials that interfere with Work.

- C. Do not interfere with 45 degrees bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- E. Remove lumped subsoil, boulders, rock, organic materials, and debris.
- F. Correct areas over-excavated by backfilling with appropriate material.
- G. Stockpile excavated material in area designated on site and removed excess material not being used from the site.

### 3.03 BACKFILLING

- A. Backfill trenches to contours and required cover with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy sub-grade surfaces.
- C. Granular Fill A1: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- D. Soil Fill Type S2: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.
- E. Employ a placement method that does not disturb or damage utilities in the trench.
- F. Maintain optimum moisture content of fill materials to attain required compaction density.
- G. Remove surplus fill materials from the site.

### 3.04 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

### 3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

### 3.06 SCHEDULE

- A. Sewer Main – Type 3 Laying Condition (Normal Soil):
  - 1. Pipe bedded in loose consolidated soil type S-2; 4-inch minimum.
  - 2. Backfill to a minimum cover of 36” above pipe with lightly consolidated Fill Type S2.
  - 3. A minimum of 4 inches of topsoil type S4 at the surface
  
- B. Sewer Main – Type 4 Laying Condition (Normal Soil):
  - 1. Pipe bedded in aggregate type A-1; 4 inch minimum.
  - 2. Backfill to a minimum cover of 36” above pipe with Fill Type S2, in 12 inch lifts, compacted to 80 percent Standard Proctor, AASHTO T-99.
  - 3. A minimum of 4 inches of topsoil type S4 at the surface
  
- C. Sewer Main – Type 5 Laying Condition (Laying in Rock):
  - 1. Pipe bedded in aggregate type A-1; 4 inch minimum.
  - 2. Backfill to top of the pipe with aggregate type A-1; compacted in 8” lifts to 90 percent Standard Proctor, AASHTO T-99.
  - 3. Backfill remainder to a minimum cover of 36” above pipe with Fill Type S2, in 12 inch lifts, compacted to 80 percent Standard Proctor, AASHTO T-99.
  - 4. A minimum of 4 inches of topsoil type S4 at the surface
  
- D. Sewer – Beneath roadways and drives:
  - 1. Pipe bedded in aggregate type A-1; 4 inch minimum.
  - 2. Backfill remainder to a minimum cover of 36” above pipe with Fill Type A-1, in 8 inch lifts, compacted to 90 percent Standard Proctor, AASHTO T-99.

END OF SECTION

**SECTION 31 37 16**  
**RIP RAP**

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. RIP RAP

1.02 RELATED SECTIONS

A. Section 31 22 13 - Rough Grading.

B. Section 31 23 33 - Trenching and Backfilling

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Rip rap: By the ton.

B. Geotextile Fabric: Subsidiary to the riprap tonnage price.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ALDOT standard

PART 2 – PRODUCTS

2.01 MATERIALS

A. Rip rap: ALDOT Class I Rip rap material consisting of graded stones ranging from 10 to 100 pounds with not more than 10% having a weight over 100 pounds and at least 50% having a weight over 50 pounds and not over 10% having a weight under 10 pounds.

B. Rip rap: ALDOT Class IV Rip rap material consisting of graded stones ranging from 50 to 1,000 pounds with not more than 25% having a weight over 1000 pounds and at least 50% having a weight over 500 pounds and not more than 25% having a weight under 50 pounds.

C. Geotextile Fabric: Non-biodegradable, woven.

PART 3 – EXECUTION

3.01 PLACEMENT

- A. Place geotextile fabric over the substrate, lap edges, and ends.
- B. Place rip rap at embankment slopes as indicated.
- C. Installed Thickness: 18-inch average.

END OF SECTION

**SECTION 32 13 13  
CONCRETE PAVING**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas, and Roads.

1.02 RELATED SECTIONS

- A. Alabama Standard Specifications for Roads and Bridges; State of Alabama Department of Transportation and Development; Latest Edition.
- B. ACI 301 -Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
- C. ACI 305R -Hot Weather Concreting; American Concrete Institute International; 1999.
- D. ACI 306R -Cold Weather Concreting; American Concrete Institute International; 1988.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

- A. Wood or Steel form material, profiled to suit conditions.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751), sponge rubber or cork (ASTM D 1752), or Treated Redwood with cap or bonded and pressed fiber board with cap or Engineer approved equal.
  - 1. Thickness: 1/2" inch unless specified otherwise.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280); deformed billet steel bars; unfinished finish.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A 185/A 185M; in flat sheets; unfinished.
- C. Dowels: ASTM A 615/A 615M Grade 40 (280); deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: Provide in accordance with State of Alabama Highways standards.

## 2.04 ACCESSORIES

A. Joint Sealer Requirements:

1. Type: S – Single Component.
2. Grade: P -Pourable or Self-Leveling used for horizontal traffic joints.
3. Use: T -Traffic.
4. Immersion rated sealant applications require primer.
5. Color: gray or stone

B. Joint Cleaner:

1. Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Primer:

1. Non-staining type, recommended by sealant manufacturer to suit the application.

D. Joint Backing:

1. Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit the application.

E. Bond Breaker:

1. Pressure sensitive tape recommended by sealant manufacturer to suit application.

F. Masking tape:

1. Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

## 2.05 CONCRETE MIX DESIGN

A. Concrete mix shall conform to Section 109 of the Alabama Standard Specifications for Highway Construction, 2018 Edition.

B. Concrete Properties:

1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days. As indicated on drawings.

## 2.06 MIXING



A. On Project Site:

1. Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers:

1. Comply with ASTM C 94/C 94M.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of the base are correct.

3.02 SUB BASE

- A. Prepare subbase in accordance with State of Alabama Department of Transportation standards.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole frames with oil to prevent bonding with concrete pavement.
- C. Notify the Engineer minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertically in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement as indicated.
- B. Interrupt reinforcement at contraction joints.
- C. Place dowels to achieve pavement and curb alignment as detailed.

3.06 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow the recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when the base surface temperature is less than 40 degrees F, or the surface is wet or frozen.

### 3.07 PLACING CONCRETE

- A. Place concrete in accordance with State of Alabama Department of Transportation standards.
- B. Do not place concrete when the base surface is wet.
- C. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

### 3.08 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 1/4 inch wide expansion joints at Locations as detailed on the drawing's foot intervals and to separate paving from vertical surfaces and other components and in the pattern indicated.
  - 1. Form joints with joint filler extending from the bottom of the pavement to within 1/4 inch of the finished surface.
  - 2. Secure to resist movement by wet concrete.
- C. Provide keyed joints as indicated.
- D. Saw cut contraction joints 1/8 -7/16 inch wide at an optimum time after finishing. Cut shall be at 1/4 of the depth of the slab.

### 3.09 JOINT SEALING

- A. Examination
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint surfaces are clean and dry.
- D. Ensure concrete surfaces are fully cured.

- E. Report unsatisfactory conditions in writing to the Engineer.
- F. Do not proceed until unsatisfactory conditions are corrected.

### 3.10 PREPARATION

- A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.
- B. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bonds.
- C. Clean concrete joint surfaces to remove curing agents and form release agents.
- D. Protect elements surrounding the Work of this section from damage or disfiguration.
- E. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

### 3.11 SEALANT INSTALLATION

- A. Install primer and sealants in accordance with ASTM C 1193 and the manufacturer's instructions.
- B. Install joint backing to maintain the following joint ratios:
  - 1. Joints up to 1/2 inch (13 mm) Wide: 1:1 width-to-depth ratio.
  - 2. Joints Greater than 1/2 inch (13 mm) Wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.
  - 3. Install a bond breaker where joint backing is not used.
  - 4. Apply primer where required for sealant adhesion.
  - 5. Install sealants immediately after joint preparation.
  - 6. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- C. Joining Silicone and Polyurethane Sealants:
  - 1. Install polyurethane sealants first.
  - 2. Join silicone sealant to polyurethane in accordance with the manufacturer's instructions.
  - 3. Tool exposed joint surface concave.

### 3.12 CLEANING

- A. Remove masking tape.
- B. Clean adjacent surfaces soiled by sealant installation.

### 3.13 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.
- C. Maximum Variation From Design Thickness: 1/4 inch.

#### 3.14 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 32 12 16.
  - 1. Provide free access to concrete operations at the project site and cooperate with the appointed firm.
  - 2. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

#### 3.15 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

**SECTION 32 92 19**  
**SEEDING**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Seeding, mulching, and fertilizer.
- B. Maintenance.

1.02 RELATED SECTIONS

- A. Section 31 05 13 - Soil Materials: Topsoil material.
- B. Section 31 23 33 - Trenching: Rough grading over cut.
- C. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this Section.

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Included in site work.

1.04 REFERENCES

- A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.05 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.06 MAINTENANCE DATA

- A. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height and types, application frequency, and recommended coverage of fertilizer.

1.07 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing the percentage of seed mix, year of production, net weight, date of packaging, and packaging location.

1.08 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.
- B. Provide a certificate of compliance from an authority having jurisdiction indicating approval of seed mixture.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of the manufacturer.

1.10 MAINTENANCE SERVICE

- A. Maintain seeded areas immediately after placement until the grass is well established and exhibits a vigorous growing condition.

PART 2 – PRODUCTS

2.01 SEED MIXTURE

- A. Seed Mixture:
  - 1. Pensacola Bahia Grass: 20 lbs/acre.
  - 2. Kentucky 31 Fescut: 20 lbs/acre.
  - 3. Bermuda Grass (Hulled): 20 lbs/acre.
  - 4. Reseeding Crimson Clover: 20 lbs/acre.
- B. Recommended seed mixture may vary depending on the time of year.

2.02 SOIL MATERIALS

- A. Topsoil: As specified in Section 02205 Type S-4.

2.03 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources, of proportion necessary to eliminate any deficiencies of topsoil.

- C. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.
- E. Stakes: Softwood lumber, chisel pointed.
- F. String: Inorganic fiber.

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Verify that the prepared soil base is ready to receive the work of this Section.

#### 3.02 FERTILIZING

- A. Apply fertilizer in accordance with the manufacturer's instructions.
- B. Apply after smooth raking of topsoil.
- C. Do not apply fertilizer at the same time or with the same machine as will be used to apply seed.
- D. Mix thoroughly into the upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

#### 3.03 SEEDING

- A. Apply seed at a rate of 2 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on the same day.
- C. Do not sow immediately following rain, when the ground is too dry, or during windy periods.
- D. Roll seeded area with roller not exceeding 112 lbs.
- E. Immediately following seeding and compacting, apply mulch.
- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

#### 3.04 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery.
- B. Cover seeded slopes where the grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- C. Lay fabric smoothly on the surface and bury the top end of each section in a 6 inch deep excavated topsoil trench. Provide a 12 inch overlap of adjacent rolls. Backfill the trench and rake smooth, level with adjacent soil.
- D. Secure outside edges and overlaps at 36-inch intervals with stakes.
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- F. At the sides of ditches, lay fabric laps in the direction of water flow. Lap ends and edges minimum 6 inches.

### 3.05 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll the surface to remove minor depressions or irregularities.
- F. Control the growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas, which show bare spots.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION



**SECTION 33 01 30**  
**CLEANING OF DRAINS, SEWERS, AND MANHOLES**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes cleaning of sewer pipe and fittings installed and/or rehabilitated, complete as shown on the Drawings and as specified herein.
- B. Cleaning includes proper high-pressure water jetting, rodding, bucketing, brushing, and flushing of drains, sewers, and manholes prior to inspection by closed circuit television, pipeline rehabilitation or replacement, point repairs, manhole preparation, and testing operations.
- C. Clean all sewers to remove debris, roots, intruding services, deposits, and other blockages to a minimum of 95 percent open. Perform sewer cleaning work to an acceptable level as necessary to perform a thorough television inspection of the sewer. If the pipe condition is such that cleaning may cause a potential collapse, then the pipe shall be televised without attempting to clean it to 95 percent condition, pending approval by ENGINEER.
- D. Related Requirements

1. SECTION 33 01 31 – CCTV Inspection of Sewer Pipelines

1.02 DEFINITIONS

- A. Light Cleaning: Small amounts of debris existing within the sewer line and where sewer reaches do not require heavy cleaning, as defined below, and that produce little or no debris.
- B. Heavy Cleaning: Large deposits of debris or heavy root growth existing within the sewer line and where sewer reaches require debris removal of depths up to 25 percent of pipe height.
- C. Excessive Heavy Cleaning: Large deposits of debris or heavy root growth existing within the sewer line and where sewer reaches require debris removal exceeding the definition of Heavy Cleaning, and the time required to clean and inspect the line must be at least twice the average time required to clean and inspect other sewers of comparable length and diameter.

1.03 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Light Cleaning

- 1. Clean sewer using standard industry procedures of high-pressure water jetting equipment or other approved equipment. Costs related to cleaning of such sewers shall be included in CONTRACTOR's unit prices for CCTV and Heavy Cleaning.

2. Basis of Measurement: By linear foot.
3. Basis of Payment: TV inspection, data compiling according to NASSCO PACP standards, and audio-video recording of the pipeline.

#### B. Heavy cleaning

1. Heavy cleaning must be approved by ENGINEER. Include costs related to cleaning of such sewers in Unit Prices for Heavy Cleaning. Costs related to televising of such sewers following heavy cleaning shall be included in Unit Prices for CCTV and Heavy Cleaning. Compensation for heavy cleaning of a particular line will only be paid if:
  - a. Heavy cleaning was authorized by the ENGINEER prior to the performance of the work.
  - b. CONTRACTOR proves that both significant time and effort were necessary to clean the line (i.e. time required to clean and inspect the line must be at least twice the average time required to clean and inspect other sewers of comparable length and diameter.
  - c. Adequate video proof of 'before' blockage, debris, grit or grease build-up, or other condition is provided.
  - d. A submerged camera does not justify a need for heavy cleaning; proof that submergence was due to a blockage or heavy debris and not sag in the line will be required.
2. Heavy Cleaning will be paid for on a lineal foot basis only for the length required to be cleaned, i.e., from the downstream manhole to the approximate location of heavy cleaning. This may or may not include the entire pipe section unless otherwise approved by the ENGINEER or OWNER.
3. Basis of Measurement: By linear foot, measured.
4. Basis of Payment: TV inspection, data compiling according to NASSCO PACP standards, and audio-video recording of the pipeline.

#### C. Excessive Heavy Cleaning

1. Pipes that contain excessive blockages will be paid on a time and material basis upon approval by ENGINEER. A full-time resident observer is required to oversee time and material work. Provide direct water source as required. ENGINEER or OWNER may determine any individual pipe is to be cleaned on a time and material basis.

### 1.04 INFORMATIONAL SUBMITTALS

- A. Refer to SECTION 01 33 00 - Submittal Procedures.
- B. Submit a safety plan prior to performing any on-site work that includes the following as a minimum:
  - 1. Confined Space Entry.
  - 2. Personal Protective Equipment.
- C. Qualifications Statements:
  - 1. CONTRACTOR shall have a minimum of five years experience in the sewer line and underground structure cleaning and must submit a list of at least three customers who have had similar work completed by CONTRACTOR. Furnish trained and qualified technicians with proper experience operating equipment that is being used on this project.

#### 1.05 CLOSEOUT SUBMITTALS

- A. Refer to SECTION 01 78 00 - Closeout Submittals.
- B. Submit one complete set of documentation regarding inspections and work performed. Based on work scope, submit written reports, photographs, and External Hard Drives that incorporate color video and data.

### PART 2 – PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Remove debris, roots, intruding services, deposits, and other blockages to a minimum of 95 percent open as necessary to perform a thorough television inspection of the sewer. If pipe condition is such that cleaning may cause a potential collapse, televise pipe without attempting to clean it to 95 percent condition, pending approval by ENGINEER.
- B. Refer to SECTION 01 73 00 – Execution.
- C. Select, based on pre-construction CCTV inspection, cleaning equipment to address conditions of manhole and sewer lines at the time the work commences to adequately remove dirt, grease, rocks, sand, and other materials and obstructions from sewer lines and manholes to allow performance of other work.
- D. Take satisfactory precautions to protect sewer lines from damage that might be caused by improper use of cleaning equipment. Whenever using hydraulically propelled cleaning tools that depend upon water pressure to provide their cleaning force, or any tools that retard flow of water in sewer lines, take precautions to ensure that water does not cause

damage or flooding to public or private property.

- E. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.
- F. Remove water meters, piping, and related equipment from fire hydrants at the end of each work day.

### 3.02 EQUIPMENT

#### A. Hydraulic Sewer Cleaning Equipment

1. Equipment: movable dam type constructed so that a portion of the dam may be collapsed at any time during cleaning operation to protect against flooding of the sewer.
2. Movable dam shall be the same diameter as the pipe being cleaned and shall provide a flexible scraper around the outer periphery to ensure total removal of grease. If sewer cleaning balls or other such equipment which cannot be collapsed instantly are used, take special precautions against flooding sewers and public or private property.

#### B. High-Velocity Jet (Hydrocleaning) Equipment:

1. Have a minimum of 500 feet of high-pressure hose.
2. Have a selection of two or more velocity nozzles that are capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned. Also include a high-velocity gun for washing and scouring manhole walls and floor.
3. Be capable of producing a minimum of 80 gallons per minute flows from a fine spray to a long-distance solid stream and delivering up to 1000 psi. Be able to carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel. Locate controls so equipment can be operated above ground. Select flow rates and pressures as required for each size of sewer, type of debris, and amount of debris, and as recommended by nozzle manufacturers.
4. Have a water tank, auxiliary engines and pumps, and a hydraulically driven hose reel.
5. Have root-cutting blades that are hydraulically spun.

#### C. Mechanical Cleaning Equipment

1. Bucket machines shall be in pairs and with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with a direct drive that could cause damage to the pipe shall not be acceptable.

2. Power rodding machines shall be either sectional or continuous type capable of holding a minimum of 750 feet of the rod. Rod shall be specifically treated steel. To ensure safe operation, the machine shall have a fully enclosed body and an automatic safety release clutch or relief valve.

### 3.03 APPLICATION

- A. Provide appropriate screening to stop the passing of materials into downstream sewers. Sludge, dirt, sand, rocks, grease, and other solid or semisolid residue, debris, and material resulting from cleaning operations shall be removed at downstream manhole of the section of the sewer being cleaned. Passing material from the manhole section to the manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment, shall not be permitted.
- B. Remove debris, residue, and other materials resulting from cleaning operations from the site at the end of each workday and shall be disposed of in an approved and lawful manner. Under no circumstances will the accumulation of debris, residue, and other matter be permitted on site beyond the stated time unless prior written authorization is given for storage in totally enclosed containers.
- C. Flushing of sanitary sewers to facilitate cleaning activities without the capture of solids and debris is expressly prohibited without the written permission of the ENGINEER.
- D. Retrieval of equipment lodged in pipes or a wet well is CONTRACTOR's responsibility and shall be performed at CONTRACTOR's expense.
- E. Cleaning Precautions: During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools that retard flow in sewer lines are used, precautions shall be taken to ensure that the water pressure created does not damage or cause flooding of public or private property being served by sewer. When possible, flow of sewage in the sewer shall be utilized to provide the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, water shall be conserved and not used unnecessarily.
- F. No sewer cleaning shall take place in a particular sewer segment until upstream pipe segments have been cleaned. If cleaning is done in a downstream pipe segment in order to facilitate overall cleaning operations, the segment shall be re-cleaned at no additional cost to OWNER after pipes upstream of that segment have been cleaned.
- G. Sewer line walls shall be cleaned adequately to provide for proper operation of joint testing and sealing equipment or internal inspection to discern structural defects, misalignment and infiltration/inflow sources. Cleaning shall be performed immediately prior to joint testing and sealing and internal inspection to preclude the build-up of debris from infiltration/inflow sources and discharges from upstream pipeline sections.
- H. Designated sewer manhole sections shall be cleaned using hydraulically propelled, high-

velocity jet or mechanically powered equipment. If cleaning of an entire section cannot be successfully performed from one manhole, equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or equipment fails to traverse the entire manhole section, it will be assumed that a major blockage exists, and cleaning effort shall be repeated with other types of equipment. Immediately report any blockages to the ENGINEER.

- I. Water for sewer cleaning shall be provided by the OWNER and obtained at locations in accordance with the OWNER. If water is obtained from a potable supply, provide appropriate backflow prevention devices as required by the authority having jurisdiction to protect the potable system from cross connections and contamination. Prevent cross-contamination of any public or private water systems used for this purpose.

#### 3.04 FIELD QUALITY CONTROL

- A. Refer to SECTION 01 40 00 - Quality Requirements.
- B. Acceptance of sewer line cleaning is contingent on satisfactory completion of television inspection. If television inspection shows cleaning to be unsatisfactory, re-clean the sewer line and re-inspect until cleaning is shown to be satisfactory.
- C. If internal joint testing and sealing is to follow cleaning, give particular attention to the adequacy of cleaning to ensure that proper seating of the sealing packer can be achieved.
- D. Inspection of cleaning operations will be made on a daily basis by the ENGINEER.

#### 3.05 FINAL CLEANING

- A. Refer to SECTION 01 77 00 - Closeout Procedures.
- B. Upon cleaning of underground sewer lines or structures, removal debris from finish grade and clean work areas so conditions at conclusion of the work are equal to or better than areas prior to work of this Section.

END OF SECTION

**SECTION 33 05 05  
BURIED PIPE INSTALLATION**

PART 1 – GENERAL

1.01 SUMMARY

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to install and test all buried piping, fittings, and specials. The Work includes the following:
  - a. All types and sizes of buried piping, except where buried piping installations are specified under other Sections or other contracts.
  - b. Unless otherwise shown or specified, this Section includes all buried piping Work required, beginning at the outside face of structures or structure foundations, including piping beneath structures, and extending away from structures.
  - c. Work on or affecting existing buried piping.
  - d. Installation of all jointing and gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, cathodic protection, and other Work required for a complete, buried piping installation.
  - e. Supports, restraints, and thrust blocks.
  - f. Pipe encasements, with the exception of piping embedded in concrete within a structure or foundation.
  - g. Field quality control, including testing.
  - h. Cleaning and disinfecting.
  - i. Incorporation of valves, meters, and special items shown or specified into piping systems in accordance with the Contract Documents and as required.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before buried piping Work.
2. Coordinate with appropriate piping Sections of Division 40, Process Integration.

C. Related Sections

1. SECTION 40 05 19 – Ductile Iron pipe.

2. SECTION 40 05 31 – Thermoplastic Process Pipe.
3. SECTION 40 05 39 – Concrete Pipe. (NOT USED)

#### D. Related Standards

1. ASTM C924, Practice for Testing Concrete Pipe Sewer Lines by Low- Pressure Test Method.
2. ASTM D2321, Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
3. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.
4. ASTM F1417, Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air.
5. ANSI/AWWA C105, Polyethylene Encasement for Ductile-Iron Pipe Systems.
6. ANSI/AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
7. ANSI/AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
8. ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
9. ANSI/AWWA C606, Grooved and Shouldered Joints.
10. ANSI/AWWA C651, Disinfecting Water Mains.
11. AWWA M23, PVC Pipe - Design and Installation.
12. AWWA M41, Ductile-Iron Pipe and Fittings.
13. ASCE 37, Design and Construction of Sanitary and Storm Sewers.
14. American Concrete Pipe Association, Concrete Pipe Handbook.
15. Chlorine Institute, Inc., Piping Systems for Dry Chlorine, Pamphlet No. 6.
16. NFPA 24, Standard for the Installation of Private Fire Service Mains and their Appurtenances.

#### 1.02 QUALITY ASSURANCE



A. Regulatory Requirements:

1. Comply with requirements and recommendations of authorities having jurisdiction over the Work, including:
  - a. OWNER's Water Department
2. Obtain required permits for Work in roads, rights-of-way, railroads, and other areas of the Work.

1.03 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
  - a. Laying schedules for concrete pipe and piping with restrained joints.
  - b. Details of piping, specials, joints, harnessing and thrust blocks, and connections to piping, structures, equipment, and appurtenances.
2. Product Data:
  - a. Manufacturer's literature and specifications, as applicable, for products specified in this Section.
3. Testing Procedures:
  - a. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER's approval prior to commencing testing.

B. Informational Submittals: Submit the following:

1. Certificates:
  - a. Certificate signed by the manufacturer of each product certifying that product conforms to applicable referenced standards.
2. Field Quality Control Submittals:
  - a. Results of each specified field quality control test.

C. Closeout Submittals: Submit the following:

1. Record Documentation:
  - a. Maintain accurate and up-to-date record documents showing modifications

made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work. Submittal shall show the actual location of all piping Work and appurtenances at the same scale as the Drawings.

- b. Show piping with elevations referenced to the Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping, provide offset dimensions as required to document piping location.
- c. Include profile drawings with buried piping record documents when the Contract Documents include piping profile drawings.
- d. Conform to SECTION 01 78 39 – Project Record Documents.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

##### A. Delivery:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Upon delivery, inspect pipe and appurtenances for cracking, gouging, chipping, denting, and other damage and immediately remove from Site and replace with acceptable material.

##### B. Storage:

1. Store materials to allow convenient access for inspection and identification. Store material off-ground using pallets, platforms, or other supports. Protect packaged materials from corrosion and deterioration.
2. Pipe and fittings other than PVC and CPVC may be stored outdoors without cover. Cover PVC and CPVC pipe and fittings stored outdoors.

##### C. Handling:

1. Handle pipe, fittings, specials, and accessories carefully in accordance with the pipe manufacturer's recommendations. Do not drop or roll material off trucks. Do not drop, roll, or skid piping.
2. Avoid unnecessary handling of pipe.
3. Keep pipe interiors free from dirt and foreign matter.
4. Protect interior linings and exterior coatings of pipe and fittings from damage. Replace pipe and fittings with damaged lining regardless of the cause of damage.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

A. Pipe Piping materials are specified in the Contract Drawings.

B. General:

1. Manufacturer shall cast or paint on each length of pipe and each fitting pipe material, diameter, and pressure or thickness class.

### 2.02 BURIED PIPING IDENTIFICATION

A. Polyethylene Underground Warning Tape for Metallic Pipelines:

1. Tracer tape shall be of inert, acid- and alkali-resistant, polyethylene, four mils thick, six inches wide, suitable for direct burial. The tape shall be capable of stretching to twice its original length.
2. Message shall read, “CAUTION “POTABLE WATER,” “SANITARY SEWER,” “CHLORINE GAS,” or other appropriate services, as indicated in the Contract Drawings and “PIPE BURIED BELOW” with bold letters approximately two inches high. Messages shall be printed at maximum intervals of two feet.
3. Manufacturer: Provide products of one of the following:
  - a. Brady Corporation
  - b. Seton Identification Products
  - c. Marking Services, Inc.
  - d. Or equal.

B. Detectable Underground Warning Tape for Non-Metallic Pipelines:

1. Tape shall be of inert, acid- and alkali-resistant, polyethylene, five mils thick, six inches wide, with aluminum backing, and have 15,000 psi tensile strength and 80 percent elongation capability. Tape shall be suitable for direct burial.
2. Message shall read, “CAUTION “POTABLE WATER,” “SANITARY SEWER,” “CHLORINE GAS,” or other appropriate services, as indicated in the Contract Drawings “PIPE BURIED BELOW” with bold letters approximately two inches high. Messages shall be printed at maximum intervals of two feet.
3. Manufacturer: Provide products of one of the following:

- a. Brady Corporation
- b. Seton Identification Products
- c. Marking Services, Inc.
- d. Or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General:

- 1. Install piping as shown, specified, and recommended by the pipe and fittings manufacturer.
- 2. In the event of a conflict between the manufacturer’s recommendations and the Contract Documents, request an interpretation from the ENGINEER before proceeding.
- 3. ENGINEER will observe excavations and bedding prior to laying pipe by CONTRACTOR. Notify ENGINEER in advance of excavating, bedding, pipe laying, and backfilling operations.
- 4. Minimum cover over buried piping shall be 5 feet unless otherwise shown or approved by ENGINEER.
- 5. Earthwork is specified in SECTION 31 23 00 – Earthwork.
- 6. Excavation in excess of that required or shown and that is not authorized by ENGINEER shall be filled at CONTRACTOR’s expense with drainage fill furnished, placed, and compacted in accordance with SECTION 31 23 00 – Earthwork.
- 7. Comply with NFPA 24 for “Outside Protection,” where applicable to water piping systems used for fire protection.

B. Separation of Sewers and Potable Water Piping:

- 1. Horizontal Separation:
  - a. Where possible, existing and proposed potable water mains and service lines and sanitary, combined, and storm sewers shall be separated horizontally by a clear distance of at least ten feet.
  - b. If local conditions preclude the specified clear horizontal separation,

installation will be allowed if potable water main is in separate trench or on undisturbed earth shelf on one side of sewer and with bottom of potable water main at least 18 inches above top of sewer.

c. Exception:

- 1) Where it is not possible to provide minimum horizontal separation described above, construct potable water main of cement-lined ductile iron pipe with restrained push-on joint or restrained mechanical joint pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test water main and sewer as specified in this Section prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.

2. Vertical Separation:

- a. Provide minimum vertical distance of 18 inches between outside of potable water main and outside of sewer when sewer crosses over potable water main.
- b. Center a section of potable water main pipe at least 17.5 feet long over sewer so that sewer joints are equidistant from potable water main joints.
- c. Provide adequate structural support where potable water main crosses under sewer. At minimum, provide compacted select backfill for ten feet on each side of crossing.

d. Exceptions:

- 1) Where it is not possible to provide minimum vertical separation described above, construct potable water main of cement-lined ductile iron pipe with restrained push-on joint or restrained mechanical joint pipe. Hydrostatically test water main and sewer as specified in this Section, prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.
- 2) Encase either potable water main or sewer in watertight carrier pipe extending ten feet on each side of crossing, measured perpendicular to potable water main.

C. Plugs:

1. Temporarily plug installed pipe at end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe.
2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.

3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.
4. Where plugging is required for phasing of the Work or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to ENGINEER.

D. Bedding Pipe: Bed pipe as specified and in accordance with details on the Drawings.

1. Trench excavation and backfill and bedding materials shall conform to SECTION 31 23 23 – Trenching and Backfilling, as applicable.
2. Where ENGINEER deems existing bedding material unsuitable, remove and replace existing bedding with approved granular material furnished, placed, and compacted in accordance with SECTION 31 23 23 – Trenching and Backfilling. Payment for additional excavation and providing granular material will be made under the unit price payment items in the Contract.
3. Where pipe is installed in rock excavation, provide a minimum of three inches of granular bedding material underneath pipes smaller than four-inch nominal diameter, and a minimum of six inches of granular bedding material underneath pipes four-inch nominal diameter and larger.
4. Excavate trenches below bottom of pipe by amount shown and indicated in the Contract Documents. Remove loose and unsuitable material from bottom of trench.
5. Carefully and thoroughly compact pipe bedding with handheld pneumatic compactors.
6. Do not lay pipe until ENGINEER approves bedding condition.
7. Do not bring pipe into position until preceding length of pipe has been bedded and secured in its final position.

E. Laying Pipe:

1. Conform to manufacturer's instructions and requirements of standards and manuals listed below, as applicable:
  - a. Ductile Iron Pipe: ANSI/AWWA C600, ANSI/AWWA C105, AWWA M41.
  - b. Concrete Pipe: AWWA M9.
  - c. Steel Pipe: ANSI/AWWA C206, AWWA M11.
  - d. Thermoplastic Pipe: ASTM D2321, ASTM D2774, ANSI/AWWA C605, AWWA M23, AWWA M45, AWWA, M55.

- e. Sanitary and Storm Sewers: ASCE 37.
2. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by ENGINEER. Remove and reinstall pipes that are not installed correctly.
  3. Slope piping uniformly between elevations shown.
  4. Keep groundwater level in trench at least 24 inches below bottom of pipe before laying pipe. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.
  5. Start laying pipe at lowest point and proceed towards higher elevations, unless otherwise approved by ENGINEER.
  6. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by ENGINEER.
  7. Place concrete pipe containing elliptical reinforcement with minor axis of reinforcement in vertical position.
  8. Excavate around joints in bedding and lay pipe so that pipe barrel bears uniformly on trench bottom.
  9. Deflections at joints shall not exceed 75 percent of amount allowed by pipe manufacturer, unless otherwise approved by ENGINEER.
  10. For PVC and CPVC piping with solvent welded joints, 2.5-inch diameter and smaller, and copper tubing, snake piping in trench to compensate for thermal expansion and contraction.
  11. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the Site and replace with acceptable products.
  12. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is laid.
  13. Field cut pipe, where required, with machine specially designed for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.

14. Do not place blocking under pipe, unless specifically approved by ENGINEER for special conditions.
15. Touch up protective coatings in manner satisfactory to ENGINEER prior to backfilling.
16. Notify ENGINEER in advance of backfilling operations.
17. On steep slopes, take measures acceptable to ENGINEER to prevent movement of pipe during installation.
18. Thrust Restraint: Where required, provide thrust restraint conforming to Article 3.3 of this Section.
19. Exercise care to avoid flotation when installing pipe in cast-in-place concrete, and in locations with high groundwater.

F. Jointing Pipe:

1. Ductile Iron Mechanical Joint Pipe:
  - a. Immediately before making joint, wipe clean the socket, plain end, and adjacent areas. Taper cut ends and file off sharp edges to provide smooth surface.
  - b. Lubricate plain ends and gasket with soapy water or manufacturer's recommended pipe lubricant, in accordance with ANSI/AWWA C111, just prior to slipping gasket onto plain end of the joint assembly.
  - c. Place gland on plain end with lip extension toward the plain end, followed by gasket with narrow edge of gasket toward plain end.
  - d. Insert plain end of pipe into socket and press gasket firmly and evenly into gasket recess. Keep joint straight during assembly.
  - e. Push gland toward socket and center gland around pipe with gland lip against gasket.
  - f. Insert bolts and hand-tighten nuts.
  - g. If deflection is required, make deflection after joint assembly and prior to tightening bolts. Alternately tighten bolts approximately 180 degrees apart to seat gasket evenly. Bolt torque shall be as follows:

Pipe Diameter (inches)	Bolt Diameter (inches)	Range of Torque (ft-lbs)
3	5/8	45 to 60
4 to 24	3/4	75 to 90



30 to 36	1	100 to 120
42 to 48	1.25	120 to 150

- h. Bolts and nuts, except those of stainless steel, shall be coated with two coats, minimum dry film thickness of eight mils each, of high build solids epoxy or bituminous coating manufactured by Tnemec, or equal.
- i. Restrained mechanical joints shall be in accordance with Section 40 05 19, Ductile Iron Pipe.

2. Ductile Iron Push-On Joint Pipe:

- a. Prior to assembling joints, thoroughly clean with wire brush the last eight inches of exterior surface of spigot and interior surface of bell, except where joints are lined or coated with a protective lining or coating.
- b. Wipe clean rubber gaskets and flex gaskets until resilient. Conform to manufacturer's instructions for procedures to ensure gasket resiliency when assembling joints in cold weather.
- c. Insert gasket into joint recess and smooth out entire circumference of gasket to remove bulges and to prevent interference with proper entry of spigot of entering pipe.
- d. Immediately prior to joint assembly, apply thin film of pipe manufacturer's recommended lubricant to surface of gasket that will come in contact with entering spigot end of pipe or apply a thin film of lubricant to outside of spigot of entering pipe.
- e. For assembly, center spigot in pipe bell and push pipe forward until spigot just makes contact with rubber gasket. After gasket is compressed and before pipe is pushed or pulled in the rest of the way, carefully check gasket for proper position around the full circumference of joint. Final assembly shall be made by forcing spigot end of entering pipe past gasket until spigot makes contact with base of the bell. When more than a reasonable amount of force is required to assemble the joint, remove spigot end of pipe to verify proper positioning of gasket. Do not use gaskets that have been scored or otherwise damaged.
- f. Maintain an adequate supply of gaskets and joint lubricant at the Site when pipe jointing operations are in progress.

3. Ductile Iron Proprietary Joints:

- a. Install pipe that utilizes proprietary joints for restraint specified in SECTION 40 05 19 – Ductile Iron Pipe, or other such joints, in accordance with manufacturer's instructions.

4. Thermoplastic Pipe Joints:

a. Solvent Cement Welded Joints:

- 1) Bevel pipe ends and remove all burrs before making joints. Clean pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F. Do not make solvent cement welded joints in wet conditions.
- 2) Use solvent cement supplied or recommended by pipe manufacturer.
- 3) Apply joint primer and solvent cement and assemble joints in accordance with recommendations and instructions of manufacturer of joint materials and pipe manufacturer.
- 4) Take appropriate safety precautions when using joint primers and solvent cements. Allow air to circulate freely through pipelines to allow solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.

b. Bell and Spigot Joints:

- 1) Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joints.
- 2) Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer's recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.

5. Mechanical Coupling Joints:

- a. Mechanical couplings include: sleeve-type flexible couplings, split flexible couplings, ANSI/AWWA C606 grooved or shouldered end couplings, plasticized PVC couplings, and other mechanical couplings specified in SECTION 40 05 06 – Couplers, Adapters, and Specials for Process Piping.
- b. Prior to installing and assembling mechanical couplings, thoroughly clean joint ends with wire brush to remove foreign matter.
- c. For mechanical couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends. After lubrication, install gasket around joint end of previously installed piece and mate joint end of subsequent piece to installed piece. Position gasket and place coupling housing around gasket and over grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand. Tighten bolts uniformly to produce an equal pressure on all parts of housing. When housing clamps meet

metal to metal, joint is complete and further tightening is not required.

- d. For plasticized PVC couplings, loosen the stainless steel clamping bands and remove clamps from coupling. Slide coupling over plain ends of pipes to be joined without using lubricants. Place clamps over each end of coupling at grooved section and tighten with torque wrench to torque recommended by manufacturer.

G. Backfilling:

1. Conform to applicable requirements of SECTION 31 23 00 – Earthwork.
2. Place backfill as Work progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of backfill.

H. Connections to Valves and Hydrants:

1. Install valves and hydrants as shown and indicated in the Contract Documents.
2. Provide suitable adapters when valves or hydrants and piping have different joint types.
3. Provide thrust restraint at all hydrants and at valves located at pipeline terminations.

I. Transitions from One Type of Pipe to Another:

1. Provide necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

J. Closures:

1. Provide closure pieces shown or required to complete the Work.

### 3.02 TRACER TAPE INSTALLATION

A. Pipe Polyethylene Underground Warning Tape for Metallic Pipelines:

1. Provide polyethylene tracer tape for buried metallic piping, which includes pipe that is steel, ductile iron, cast iron, concrete, copper, and corrugated metal.
2. Provide tracer tape 12 to 18 inches below finished grade, above and parallel to buried pipe.
3. For pipelines buried eight feet or greater below finished grade, provide second line of magnetic tracer tape 2.5 feet above crown of buried pipe, aligned along pipe centerline.

4. Tape shall be spread flat with message side up before backfilling.
- B. Detectable Underground Warning Tape for Non-Metallic Pipelines:
1. Provide polyethylene tracer tape with aluminum backing for buried, non-metallic piping, which includes pipe that is PVC, CPVC, polyethylene, HDPE, FRP, ABS, and vitrified clay.
  2. Provide magnetic tracer tape 12 to 18 inches below finished grade, above and parallel to buried pipe.
  3. For pipelines buried eight feet or greater below finished grade, provide second line of magnetic tracer tape 2.5 feet above crown of buried pipe, aligned along the pipe centerline.
  4. Tape shall be spread flat with message side up before backfilling.

### 3.03 THRUST RESTRAINT

- A. Provide thrust restraint on pressure piping systems where shown or indicated in the Contract Documents.
- B. Thrust restraint may be accomplished by using restrained pipe joints or concrete thrust blocks. Thrust restraints shall be designed for axial thrust exerted by test pressure as required by the OWNER.
- C. Place concrete thrust blocks against undisturbed soil. Where undisturbed soil does not exist, or for projects where the Site consists of backfill material, thrust restraint shall be provided by restrained pipe joints.
- D. Restrained Pipe Joints:
  1. Pipe joints shall be restrained by means suitable for the type of pipe being installed.
    - a. Ductile Iron, Push-on Joints and Mechanical Joints: Restrain with proprietary restrained joint system as specified in Section 40 05 19, Ductile Iron Pipe; lugs and tie rods; or other joint restraint systems approved by ENGINEER.
    - b. Thermoplastic Joints: Where bell and spigot-type or other non-restrained joints are utilized, provide tie rods across joint or other suitable joint restraint system, subject to the approval of ENGINEER.
    - c. Prestressed Concrete Cylinder Pipe Joints: Restrain utilizing clamp type restrained joint, snap ring-type restrained joint, or by welding. Concrete pipe requiring restraint shall have sufficient longitudinal steel reinforcement provided to handle thrust forces at maximum design stress of 12,500 psi. Thrust forces in longitudinales must be transmitted directly to steel joint bands using welded connections sufficient to carry stresses involved. No allowance

for the concrete to handle tensile forces is allowed. Thrust restraint shall be in accordance with ANSI/AWWA Manual M9.

- d. Joints for Concrete Pipe Other than Prestressed Concrete Cylinder Pipe: Restrain joints utilizing clamp type restrained joint or snap ring-type restrained joint.

E. Concrete Thrust Blocks:

1. Provide concrete thrust blocks on pressure piping at changes in alignment of 15 degrees or more, at tees, plugs and caps, and where shown or indicated in the Contract Documents. Construct thrust blocks of Class B concrete, conforming to SECTION 03 30 00 – Cast in Place Concrete.
2. Install thrust blocks against undisturbed soil. Place concrete so that pipe and fitting joints are accessible for repair.
3. Concrete thrust block size shall be as shown on the Drawings or as approved by ENGINEER.

### 3.04 WORK AFFECTING EXISTING PIPING

A. Location of Existing Underground Facilities:

1. Locations of existing Underground Facilities shown on the Drawings should be considered approximate.
2. Determine the true location of existing Underground Facilities to which connections are to be made, crossed, and that could be disturbed, and determine location of Underground Facilities that could be disturbed during excavation and backfilling operations, or that may be affected by the Work.

### 3.05 FIELD QUALITY CONTROL

A. General:

1. Test all piping in this Section.
2. When authorities having jurisdiction are to witness tests, notify ENGINEER and authorities having jurisdiction in writing at least 48 hours in advance of testing.
3. Conduct all tests in presence of ENGINEER.
4. Remove or protect pipeline-mounted devices that could be damaged by testing.
5. Provide all apparatus and services required for testing, including:

- a. Test pumps, compressors, hoses, calibrated gages, meters, test containers, valves, fittings, and temporary pumping systems required to maintain OWNER's operations.
  - b. Temporary bulkheads, bracing, blocking, and thrust restraints.
6. Provide air if an air test is required, power if pumping is required, and gases if gases are required.
  7. Unless otherwise specified, OWNER will provide fluid required for hydrostatic testing. CONTRACTOR shall provide means to convey fluid for hydrostatic testing into piping being tested. CONTRACTOR shall provide fluid for other types of testing required.
  8. Repair observed leaks and repair pipe that fails to meet acceptance criteria. Retest after repair.
  9. Unless otherwise specified, testing shall include existing piping systems that connect with new piping system. Test existing pipe to nearest valve. Piping not installed by CONTRACTOR and that fails the test shall be repaired upon authorization of OWNER. Unless otherwise included in the Work, repair of existing piping or Underground Facilities will be paid as extra Work.

B. Testing:

1. Unless otherwise specified, required test pressures are at lowest elevation of pipeline segment being tested.
2. Test Pressure:
  - a. Test pressure as required by the OWNER based on maximum anticipated sustained operating pressure and methods described in applicable ANSI/AWWA manual or standard that applies to the piping system.

C. Hydrostatic Testing:

1. Preparation for Testing:
  - a. For thermoplastic pipe, follow procedures described in Section 7 of ANSI/AWWA Standard C605.
  - b. For other piping follow procedures described in ANSI/AWWA Manual M9, except that minimum wetting period required immediately prior to testing for asbestos cement pipe shall be 24 hours rather than the 48 hours prescribed for concrete pipe. Wetting period is not required for pipe that is not cement mortar-lined.
2. Test Procedure:

- a. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in pipe being tested.
  - b. Expel air from pipe as required. Obtain approval of ENGINEER prior to tapping pipe for expelling air.
  - c. Examine exposed joints and valves and make repairs to eliminate visible leakage.
  - d. After specified wetting period, add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.
  - e. Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
  - f. Timed Test Period: After stabilization period, maintain test pressure for at least two hours. During timed testing period, add fluid as required to maintain pressure within five psig of required test pressure. Test pressure shall then remain steady for one hour, indicating no leakage.
  - g. Pump from test container to maintain test pressure. Measure volume of fluid pumped from test container and record on test report. Record pressure at test pump at 15 minute intervals for duration of test.
3. Allowable Leakage Rates: Leakage is defined as the quantity of fluid supplied to pipe segment being tested to maintain pressure within five psi of test pressure during timed test period. Allowable leakage rates for piping are:
- a. Rates based on formula or table in ANSI/AWWA Manual M41:
    - 1) Metal pipe joined with rubber gaskets as sealing members, including the following joint types:
      - a) Bell and spigot and push-on joints.
      - b) Mechanical joints.
      - c) Bolted sleeve type couplings.
      - d) Grooved and shouldered couplings.
  - b. Rates based on make-up allowance in ANSI/AWWA Manual M9:
    - 1) Prestressed concrete cylinder pipe and other types of concrete pipe joined with O-ring rubber gasket sealing members.

c. Rates based on formula or table in ANSI/AWWA C605:

1) Plastic pipe joined with O-ring gasket sealing members.

D. Sewer Testing with Low Pressure Air:

1. Plug and bulkhead ends and lateral connections of pipe segment to be tested.
2. Required test pressure shall be increased by an amount equal to the elevation of groundwater above invert of lowest point of pipe segment being tested.
3. Test in accordance with requirements of authority having jurisdiction.
4. If there are no Laws and Regulations covering the test, use test procedures described in the following standards:
  - a. Thermoplastic and HDPE Pipe: ASTM F1417.
  - b. Concrete Pipe: ASTM C924.

E. Vertical Deflection Test for Thermoplastic, FRP, and HDPE Pipe:

1. Conduct vertical deflection test at least thirty days after backfill has been placed.
2. Manually pull pin-type vertical gauge mounted on sled through pipe. Gauge shall be manufactured by Quality Test Products, or equal. Set gauge so that sled will stop if vertical deflection of pipe exceeds five percent. Excavate and re-install piping that fails deflection test, and retest.
3. Use rigid ball or mandrel for deflection test, which shall have diameter of at least 95 percent of base inside diameter or average inside diameter of piping, depending on which is specified in applicable ASTM standard, including appendix, to which pipe is manufactured. Perform test without mechanical pulling devices. Re-install and retest pipe segments that exceed deflection of five percent.

### 3.06 CLEANING AND DISINFECTION

A. Cleaning, General: Clean pipe systems as follows:

1. Thoroughly clean all piping, including flushing with water, dry air, or inert gas as required, in manner approved by ENGINEER, prior to placing in service. Flush chlorine solution and sodium hypochlorite piping with water.
2. Piping 24-inch diameter and larger shall be inspected from inside and debris, dirt and foreign matter removed.
3. For piping that requires disinfection and has not been kept clean during storage or installation, swab each section individually before installation with five percent sodium hypochlorite solution.



B. Disinfection:

1. Disinfect all potable and finished water piping.
2. Suggested procedure for accomplishing complete and satisfactory disinfection is specified below.
  - a. Prior to disinfection, clean piping as specified and flush thoroughly.
  - b. Conform to procedures described in ANSI/AWWA C651. Use continuous feed method of disinfecting unless alternative method is acceptable to ENGINEER.
3. Water for initial flushing, testing, and disinfection will be furnished by OWNER. CONTRACTOR shall provide all temporary piping, hose, valves, appurtenances, and services required. Cost of water required for redisinfection will be paid by CONTRACTOR to OWNER at water utility's standard rates.
4. Chlorine shall be provided by CONTRACTOR.
5. Bacteriologic tests will be performed by OWNER. Certified test laboratory report will be provided to CONTRACTOR, if requested.
6. Chlorine concentration in water entering the piping shall be between 50 and 100 ppm, such that minimum residual concentration of 25 mg/L remains after 24-hour retention period. Disinfect piping and all related components. Repeat as necessary to provide complete disinfection.
7. After required retention period, flush chlorinated water to closed drain line, unless otherwise acceptable to ENGINEER. Properly dispose of chlorinated water in accordance with Laws and Regulations. Do not discharge chlorinated water to storm sewers, ditches, or overland.

END OF SECTION

**SECTION 33 30 00  
SANITARY SEWERAGE**

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.
- B. The extent of the sanitary sewerage system is indicated on the Drawings and as otherwise required by authorities having jurisdiction.
- C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the Contractor from his/her contract amount.

1.02 RELATED SECTIONS

- A. Section Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - 1. Section 31 23 00 – Earthwork
  - 2. Section 31 37 16 – Rip-Rap and Crushed Stone
  - 3. Section 03 30 00 – Cast-in-Place Concrete
  - 4. Section 01 57 13 – Temporary Erosion Control
  - 5. Section 32 12 16 – Asphalt Paving
- C. Related Specifications
  - 1. ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
  - 2. ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
  - 3. ASTM C 497: Test Methods for Concrete Pipe, Manhole Sections, or Tile
  - 4. ASTM C 877: Specification for External Sealing Bands for Concrete Pipe, Manholes and Precast Box Sections
  - 5. ASTM C 923: Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

6. ASTM C 990: Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
7. ASTM C 1244: Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
8. AASHTO M 199M/M 199-05: Precast Reinforced Concrete Manhole Sections
9. AASHTO T 280: Concrete Pipe, Manhole Sections, or Tile
10. State of Alabama Department of Transportation Standard Specifications for Highway Construction.
11. U. S. Department of Labor, Occupational Safety and Health Administration.

### 1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  1. Product data for piping, valves, fittings, and specialties.
  2. Shop drawings for precast concrete sanitary manholes, including frames and covers.
    - a. Shop drawings for cast-in-place concrete or field-erected masonry sanitary manholes, if any, including frames and covers.

### 1.04 QUALITY ASSURANCE

- A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.
- B. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.
- C. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.
- D. Pumping Stations must have a final inspection at the end of a one-year warranty period.
- E. If during construction of the project, the site or project conditions reveal conflicts or harm to existing utilities either by vicinity or by destruction during construction, the contractor must repair or relocate the existing utility at the contractor or developer's expense. Failure to do this in a timely manner will result in suspension of the project or rejection of final acceptance of the project until the item is corrected. If a major break occurs and the contractor does not correct immediately a repair will be made and billed to the Contractor.

- F. All improvements will have a 1-year warranty beginning from the date of substantial completion.

#### 1.05 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.
- B. The Contractor shall maintain all drainage ways, gutters, etc. at all times. The Contractor shall remove any eroded or washed material that enters pipes, ditches, or streams.
- C. The Contract shall provide erosion control as required to protect from damage surrounding areas. Erosion control measures shall meet all requirements of Section 01 57 13 - Temporary Erosion Control

#### 1.06 SEQUENCING AND SCHEDULING

- A. Coordinate connection to public sewer with utility company.
- B. Coordinate with interior building sanitary drainage piping.
- C. Coordinate with other utility work.

### PART 2 – PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cleanouts:
    - a. Ancon, Inc
    - b. Josam Co
    - c. Smith (Jay R.) Mfg. Co.
    - d. Wade Div.; Tyler Pipe.
    - e. Zurn Industries, Inc.; Hydromechanics Div.
  - 2. Underground Warning Tapes:
    - a. Allen Systems, Inc.; Reef Industries, Inc.

- b. Brady (W.H.) Co.; Signmark Div.
- c. Calpico, Inc.
- d. Carlton Industries, Inc.
- e. EMED Co., Inc.
- f. Seton Name Plate Co.

## 2.02 PIPE & FITTINGS

General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated below, refer to drawings for locations of each one, or if not indicated, selection is Installer's option.

### A. Gravity Sewer

1. Ductile Iron Pipe shall meet the requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, latest revision. Pressure classes and wall thicknesses shall be in accordance with bury depths and laying conditions as specified in the above mentioned standards. Minimum pressure class for buried pipe shall be 350 psi for pipes less than or equal to 12 inches, 250 psi for pipes less than or equal to 24 inches, and 150 psi for pipes greater than or equal to 30 inches. For depths of cuts greater than 8 feet, pipe wall thickness may be required to be greater than the minimum specified. The design parameters specified in ANSI/AWWA C151/A21.51, latest revision, shall be followed to determine the minimum pipe wall thickness under these conditions. Thickness of gravity sewers shall be based on an internal pressure of 0 psi gage or atmospheric pressure.
2. 4-inch green stripe must be painted along the top of all sanitary sewer gravity mains. Ductile Iron Pipe shall be installed under storm drains, under a depth of 3 feet to the top of the pipe, and over a depth of 12 feet to the top of the pipe.
3. All ductile iron pipe for underground installation shall be provided with an exterior bituminous coating of 1 mil minimum thickness. All ductile iron pipe shall have an interior cement mortar lining with a 40-mil thickness coating of Protecto 401 ceramic epoxy or approved equal.
4. PVC pipe shall be SDR 26 heavy wall sewer pipe meeting the requirements of ASTM D3034 for 4" to 15" gravity pipe and ASTM F679 for 18" and 21" gravity pipe. All PVC pipe shall be green in color and shall have green sanitary sewer marker tape buried with all mains and lateral.
5. Sewer laterals shall be Ductile Iron Pipe meeting the requirements of AWWA C151, pressure class 350 minimum, from the main to the property line if the depth of the sewer is over 12 feet or under 3 feet to the top of the pipe. Laterals between 3 and 12

feet to the top of the pipe may be SDR 26 meeting ASTM D3034. Laterals from the property line to the structure may be Ductile Iron Pipe, class 350 minimum, Schedule 40 solid PVC pipe, or SDR 26 as approved by the Building Official or Engineer.

#### B. Force Main Sewers

1. Ductile Iron Pipe shall meet the requirements of AWWA9 C151, pressure class 350 minimum, for force main installations. A 4-inch green stripe must be painted along the top of all sanitary sewer gravity mains. PVC pipe shall not be used for force mains unless otherwise directed.
2. HDPE shall be a minimum of DR-11, 200 PSI. (IPS 3" and Smaller and DIPS 4" and Larger) Specification applies for both Laterals and Force Mains.
3. Gaskets for ductile iron pipe shall meet the requirements of AWWA C111 for rubber gaskets. Gaskets for PVC pipe shall be ASTM F477 elastomeric seals.
4. D.I. Pipe shall be manufactured by U.S. Pipe and Foundry or American Cast Iron Pipe Company only. Pipe from other manufacturers will not be accepted.

#### C. Couplings

1. Rubber or elastomeric sleeve and stainless-steel band assembly fabricated to match outside diameters of pipes to be joined.

#### D. Sleeves

1. ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

#### E. Bands

1. Stainless steel, one at each pipe insert.

#### F. Fittings

1. Fittings on PVC or Ductile Iron force main piping shall be restrained joints as follows:
  - a. Compact Ductile Iron in accordance with ANSI/AWWA C153/A21.53 with Mega-Lug type retainer glands with twist off nuts.
  - b. Joint restraint may be provided using Lok-Ring or equivalent pipe joints.
  - c. Transition gaskets shall be used with pressure class PVC pipe to Ductile Transitions.
  - d. Fittings shall not be used on gravity sewer piping. All changes in direction on gravity piping shall occur at a manhole.

e. Connections of gravity sewers to old mains or repairs shall be performed with Imax style adapters. No Fernco style or metal banding strap adapters allowed.

f. Ductile iron sleeve style adapters allowed.

#### G. Encasement

1. Polyethylene encasement for ductile iron pipe shall meet the requirements of ANSI/AWWA C105/A21.5 and shall only be used around gas mains.
2. Casing pipe shall be ASTM A252, Grade 2, with casing spacers, minimum 4 per joint, and end seals.

#### H. Valves

1. All valves installed in force mains shall be AWWA C515 resilient seated gate valves with ductile iron body and bonnet, bronze or 304SS stems, non-rising stems, and 2" square operating nut.
2. Valve boxes shall comply with AWWA M44 for cast-iron valve boxes with adjustable extension and 5' diameter barrel. The use of PVC valve boxes and/or extensions is prohibited.
3. Stainless Steel / Brass check valve and cut off valves shall be installed on all low-pressure force main laterals at the right of way / easement line.

### 2.03 MANHOLES

A. Precast Concrete Manholes: Normal traffic precast reinforced concrete in accordance with ASTM C 478, 48" minimum diameter, placed on a minimum of 4" of  $\frac{3}{4}$ " crushed stone, of depth indicated with provision for ASTM C 443 rubber gasket joints. All manhole covers shall be round.

1. Base Section: 6-inch minimum thickness monolithic base section for floor slab and 4-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor of precast concrete inverts.
2. Riser Sections: 4-inch minimum thickness; 48-inch diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.
5. Gaskets: ASTM C 443, rubber.

6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch equally spaced intervals.
  7. Pipe Connectors: ASTM C 923, resilient, Kor-N-Seal of size required, for each pipe connecting to base section.
  8. Channel and Bench: Concrete.
  9. Manhole Frames: All manhole frames and covers shall be East Jordan Iron Works Model V-1480-1 or John Bouchard & Sons Model 1190 lettered "Sanitary Sewer" or approved equivalent. SEWER or STORM SEWER will not be accepted for lettering on sanitary sewer manholes.
  10. External Manhole Sealing Sleeve to prevent inflow and infiltration shall be as manufactured by Sealing Systems, Inc. or approved equivalent.
  11. Rings and covers must have plastic or rubber non-flood inserts installed on every manhole.
  12. All manhole penetrations shall have Kor-N-Seal pipe connectors.
  13. All precast manholes shall be new, unused manholes delivered directly from the manufacturer to the job site. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the outside of the barrel.
  14. Manhole base, riser, transition, and cone sections shall have offset tongue and grove joints and shall be made watertight with pre-lubricated rubber gaskets conforming to ASTM C443 and butyl sealant water stops.
  15. Manholes shall be assembled with the fewest number of sections to makeup the required height, thereby reducing the number of joints. The use of more than one riser section of 16" or less shall be prohibited.
- B. Cast-in-Place Manholes (if any):
1. When the inside diameter of the largest pipe is 33" or greater, the manhole base may be cast-in-place.
  2. The base must not be cast less than 4" or more 12" above the outside top of the main incoming or outgoing pipe.
  3. Concrete used must be Class "A" Portland Cement Concrete. Slump must not exceed 2" as determined by the slump cone method of ASTM C143. All manhole covers shall be round. Minimum and maximum wall thicknesses for the cast-in-place sections must conform to the following table and strictly adhered to.



**MINIMUM/MAXIMUM WALL THICKNESSES  
FOR CAST-IN-PLACE SECTIONS**

<b>Manhole Diameter (inches)</b>	<b>Minimum Wall Thickness (inches)</b>	<b>Maximum Wall Thickness (inches)</b>
48	5	7
60	6	8
72	7	9
84	8	10
96	9	11

4. Inside diameters of the cast-in-place portions must equal the diameter of the manhole specified. Standard precast manhole riser sections and other components as specified in this Section must be used above the cast-in-place base to bring the manhole rim to grade.
5. Manholes with cast-in-place bases and all of the associated connections and joints must be capable of passing the leakage test as specified in these Specifications.
6. Cast-In-Place manholes must maintain the specified internal diameter throughout the manhole base and riser sections. The internal diameter must not be decreased until the cone section or flat slab top is placed. Cast-In-Place manhole base bottoms must be placed on a minimum of 4 inches of 3/4-inch crushed rock.
7. Cast-In-Place manhole bases must be 8 inches thick with #4 steel reinforcing bars placed at 12 inches on center each way. The reinforcing must be centered between the manhole invert and bedding.
8. Concrete on the cast portion may be placed against undisturbed earth provided wall if thickness requirements can be met; otherwise, outside forms are required. Forms must be removed, and the structure visually inspected prior to backfill. All rock pockets, cracks, or other defects must be patched in conformance with these specifications.
9. Standard concentric cones conforming to ASTM C478 must be used on all manholes shown on the Plans unless otherwise specified. Where depth is insufficient for cones, concentric flat slab tops must be used.
10. Joints in precast manhole shafts must be sealed by buttering the joint space of the previously laid barrel section or base with mortar or must be sealed with preformed plastic sealing compound and installed as recommended by the manufacturer. All joint surfaces must be thoroughly cleaned prior to placing the sealing compound or buttering with mortar. The inside and outside of mortared joints must be plastered with mortar and the inside brushed to a smooth finish with a wet brush. Special precautions must be taken to see that the entire joint space is filled with mortar and is watertight.

11. The joint between the manhole frame and the cone or grade ring must be sealed by buttering the joint space with mortar or using an epoxy adhesive.
12. The in-place depth of the 24-inch manhole opening must not exceed 18 inches from the top of the frame to the top of the cone. If the manhole is a flat slab top, or if the depth of the opening must exceed 18 inches, a 36-inch frame and cover with corresponding 36-inch manhole components must be used. The depth of a 36-inch opening as described above must not exceed 24 inches.
13. Components for construction of manholes must be selected to provide the least achievable vertical dimension between the finished frame surface and the top of the cone or soffit of the flat slab top. The depth of precast grade rings or cast-in-place grade rings must not exceed 8 inches on new or reconstructed manholes.
14. At the Contractor's option, the manhole frame and cover size may be increased from 24 to 36 inches if necessary to facilitate testing of the storm drain system. No additional compensation will be paid to the contractor if the contractor elects to increase the size, and the manhole frame and cover will be paid for at the unit price bid for the 24-inch frame and cover. If the Contractor elects to install a 36-inch frame and cover, it must remain as a permanent part of the improvements (i.e. it must not be replaced with a 24-inch frame and cover after testing).
15. All castings must be manufactured true to pattern and with satisfactory fit of all component parts. Round frames and covers must have machined bearing surfaces. Manhole covers that do not fit neatly and bear firmly in the ring will be rejected.
16. Unless otherwise specified, exposed surfaces of the castings with the parts assembled and disassembled must be painted with commercial quality asphalt paint after testing and assembly.
17. Bottom, Walls, and Top: Reinforced concrete.
18. Channel and Bench: Concrete.
19. Steps: Cast into sidewall at 12- to 16-inch intervals.

#### 2.04 MANHOLE STEPS

- A. General: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.
  1. Material: Copolymer Polypropylene Plastic Coating over 1/2 inch minimum Grade 60 steel reinforcing, 12-inches wide, with slip resistant surface.
  2. Manhole steps shall conform to ASTM C478 as manufactured by M.A. Industries, Model PSI-PF, or Equal.

## 2.05 MANHOLE FRAME AND COVERS

- A. Manhole frames and covers shall be close-grained, cast-iron, smooth, clean, free of blisters, blowholes and other defects and conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure a flat, fine surface. Castings judged to be defective by the Owner or Engineer will be rejected and shall be replaced by the Contractor.
- B. Covers and frames shall be “heavy-duty” type, rated for a minimum of H-20 loading. Covers and frames shall be made in the United States. All castings shall be clearly marked with the manufacturer's name, product catalog No. and made in the U.S.A. in cast letters.
- C. Manhole covers shall be cast with two non-penetrating type pick holes. Covers shall not have vent holes.
- D. Manhole frames and covers shall be of either Standard Type (non-bolted) or Watertight Type (bolt-down), as indicated on the drawings. If not indicated, manhole covers shall be standard type. In locations where the manhole rim elevation is below the 100-year flood elevation, manhole frame and covers shall be Watertight Type.

## 2.06 CLEANOUTS

- A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

## 2.07 IDENTIFICATION

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters “CAUTION - SEWER LINE BURIED BELOW.”

## PART 3 – EXECUTION

### 3.01 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWAGE SYSTEMS

- A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.
- C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.
- D. Perform excavation to lines and grades established by the Drawings. Construct excavation a minimum of two (2) feet in diameter larger than the outside dimensions of the manhole

base and sections.

- E. If material in bottom of excavation is unsuitable for supporting manhole, excavate unsuitable material to a depth specified by the Engineer and backfill resulting void with ALDOT No. 57 crushed limestone.
- F. Backfill around manholes constructed in paved areas or areas to be paved with ALDOT 825, Type "A". Compact backfill in 8-inch loose lifts to minimum density of 95% Standard Proctor Density with vibratory compaction equipment.
- G. Backfill around manholes in unimproved areas and lawns with native materials, compacted in 8-inch loose lifts to minimum density of 95% Standard Proctor Density.

### 3.02 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS

- A. Refer to Paragraph 2.02 above.

### 3.03 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use manholes for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.
- F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.
- G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

- H. Ductile iron force main and gravity sewer pipe shall be installed in accordance with AWWA C600.
- I. PCV gravity sewer pipe shall be installed in accordance with ASTM D2321.
- J. Sewer lines shall be installed with a minimum 18” vertical and 60” horizontal separation.
- K. Manholes shall be installed at all changes in direction on gravity sewer piping.
- L. All gravity sewer pipe shall be bedded in a minimum of 6” of ALDOT #8910 stone.
- M. All gravity sewer pipe shall be backfilled to 12” minimum above the pipe with ALDOT #8910 or #57 stone.
- N. All trenches under paving shall be backfilled completely with ALDOT #8910 stone.
- O. The maximum allowable slope on gravity sewer piping is 12% without the Engineer’s approval. All pipes on slopes over 10% will have concrete restraint collars on 50-foot centers with the first collar located at the face of the downstream manhole.
- P. If a geotechnical engineer/tester is present, after reaching 12” of stone above the top of the sanitary sewer main, a geotextile fabric may be laid over the stone and compacted backfill installed in a maximum of 6” lifts reaching 98% compaction may be utilized if separate compaction test reports will be submitted otherwise all sanitary sewers within roads, parking lots, or paved areas will have to be backfilled with 100% stone.
- Q. Cleanout are required on all force mains at locations directed by the Engineer and as shown on the plans at 750’ increments or as directed.
- R. All Low-Pressure force mains shall be installed at 36” minimum cover to 60” maximum cover unless otherwise directed by the Engineer.
- S. Low-Pressure Force Main / Force Mains shall be bedded in a minimum of 6” Stone (#8910) and stone shall extend above the pipe a minimum of 12”.
- T. Bedding:
  - 1. Class “1” Bedding shall be ALDOT Standard Specifications for Highway Construction, Section 801, as follows:
    - (a) ***Gravity Pipe (ALL materials) – No. 57 crushed limestone.***
    - (b) ***Pressure Pipe (material NOT PLASTIC) – No. 57 crushed limestone.***
    - (c) ***Pressure Pipe (PLASTIC material) – No. 8910 crushed limestone.***
  - 2. Class “2” Bedding shall be reinforced concrete 3000 psi design mix.
  - 3. Class “3” Bedding shall be native soil.

U. Select Backfill:

1. Select backfill where specified or required shall be crushed limestone. Crushed stone shall meet or exceed the requirements of the ALDOT Standard Specifications for Highway Construction, Section 825, Type "A".

V. Standard Backfill:

1. Standard backfill shall consist of native soils of good earth, sand, gravel, and shall be free of large rocks, boulders and other deleterious substances.

W. Pipe Joint Construction and Installation

1. Join and install PVC pipe as follows:
  - (a) Solvent cement joint pipe and fittings, joining with solvent cement in accordance with ASTM D 2855 and ASTM F 402.
  - (b) Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212, and for truss pipe ASTM D 2680, Appendix XI.
  - (c) Installation in accordance with ASTM D 2321.
  - (d) Maximum deflection at any joint shall be one-half the manufacturer's recommended maximum deflection allowed.

X. Manholes

1. General: Install manholes complete with accessories as indicated, or if not indicated, in compliance with project requirements and authorities having jurisdiction. Form continuous concrete or split pipe section channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.
  - (a) Place precast concrete manhole sections as indicated and install in accordance with ASTM C 891.
  - (b) Construct brick manholes as indicated.
  - (c) Construct cast-in-place manholes as indicated.
  - (d) Provide rubber joint gasket complying with ASTM C 443 at joints of sections.
  - (e) Install manhole steps as indicated.

Y. Placing Manhole Base and Sections:

1. Manholes shall be constructed to the sizes, shapes, dimensions and at the locations shown on the plans.
2. Precast manhole bases shall be set plumb and true to the lines and grades specified by the plans. Manholes out of plumb in excess of 1/4 inch in eight (8) feet shall be reset.

3. Clean ends of manhole sections of foreign materials and inspect ends for damage.
4. Place pre-lubricated gasket into recess. Follow gasket and water stop manufacturers' installation instructions. Set manhole section.
5. When new openings are required in existing manholes, openings shall be core drilled.

Z. Granular Base

1. Remove standing water from excavation. Place 12-inches minimum of ALDOT #57 stone and compact with vibratory compaction equipment.
2. Excavations deeper than 12-inches below required grade of manhole base, not approved by the Engineer, shall be filled with ALDOT No. 57 crushed limestone and compacted by vibratory compaction equipment at no additional cost to the Owner.

AA. Cleanouts

1. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

BB. Tap Connections

1. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.
2. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.
3. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.
  - i. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
  - ii. Use epoxy bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

CC. Installation Of Identification

1. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.04 FIELD QUALITY CONTROL

- A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.
- B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
  1. In large, accessible piping, brushes and brooms may be used for cleaning.
  2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
  3. Flush piping between manholes, if required by local authority, to remove collected debris.
- C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
  1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
  2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.
  3. **ALL SEWER MAINS AND MANHOLES MUST BE VISUALLY INSPECTED BY THE OWNER'S REPRESENTATIVE AND ENGINEER, OR ENGINEER'S REPRESENTATIVE PRIOR TO BACKFILLING. ANY MAINS OR MANHOLES NOT INSPECTED PRIOR TO BACKFILL WILL NOT BE ACCEPTED.**
  4. A representative of the sewer department must be present when the cap on all service stub-outs is removed. At submerged stub-outs, the water level in the excavation must be lowered and kept below the elevation of the cap until the cap is removed and the pipe is extended above the water level. Any caps removed without a representative of the sewer department present will result in rejection of the connection.

3.05 MANHOLE TESTING

- A. All new manholes must be tested for leakage after assembly but prior to back-filling around the manhole.



- B. The Contractor is responsible for conducting all leakage tests.
- C. The Contractor is responsible for providing all equipment, materials, and labor for performing and making measurements of the leakage tests.
- D. The Engineer or Engineer's Representative must witness all leakage tests and verify the accuracy and acceptability of the equipment utilized.
- E. The Engineer or Engineer's Representative may require a manhole to be tested after backfilling if there is reason to suspect that the manhole has been disturbed during the backfilling operation or at other times during construction.
- F. When leakage exceeds the amount allowed by these Specifications, the Contractor, at its own expense, must determine the source, or sources, of leakage and repair or replace all defective materials and workmanship to the satisfaction of the Engineer and Owner.
- G. The extent and type of repair that may be allowed, as well as results, are subject to the approval of the Engineer and Owner.
- H. The completed manhole installation must then be retested and required to meet the requirements of this Section. Any individually detectable leaks must be repaired, regardless of the results of the tests.
- I. Manholes must be tested for leakage by the following method:
  - 1. Manhole Vacuum Test
    - (a) All lift holes, connections, and inside and outside joints must be sealed as described in this Section. All pipes entering the manhole must be plugged, taking care to securely brace the plug from being drawn into the manhole. Plugs and the ends of pipes connected by flexible boots must be blocked to prevent their movement during the vacuum test. When plugs are being placed, the pipe adjacent to the manhole must be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole.
    - (b) A probable point of leakage is at the junction of the manhole and the pipe; therefore the plug must be placed in the connected pipes outside of the manhole base. The test head must be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations. In the case of flat slab top manholes, the test head must be placed at the top surface of the flat slab top. A vacuum of 10 inches of mercury (approximately 5 psi) must be drawn and the vacuum pump shut off. With the valves closed, the time must be measured for the vacuum to drop to 9 inches. The manhole passes the test if the measured time is greater than the times listed in the following Table for the particular manhole size.

### MINIMUM VACUUM PASS TIMES

Manhole Size (inches)	Minimum time (seconds) to drop to 9" Hg
48	60
54	67
60	75
72	90
84	105
96	120

- (c) If the manhole fails the initial test, repairs must be made while the vacuum is still being drawn. Re-testing must continue until a satisfactory test is obtained.

#### 2. Test by the Exfiltration Method

- (a) At the discretion of the Engineer, the Contractor can substitute the Exfiltration Method of testing for the Vacuum Test described in Section 3.05.I.1. This method can only be used when ground water is not present. If ground water is present, a Vacuum Test must be used unless otherwise directed by the Engineer. All backfilling and compaction must be completed prior to the commencement of testing.

- (b) The procedures for the test include the following:

- (i) Manhole section interiors must be carefully inspected; units found to have through wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating must be applied after the testing unless coating is applied before field assembly, or at the factory. All lift holes and exterior joints must be plugged with an acceptable non-shrink grout. Grout must not be placed in horizontal joints. Tests must be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.
- (ii) After cleaning the interior surface of the manhole, the Contractor must place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs must be as recommended by the plug manufacturer.

#### J. Failure to Pass the Test

1. If the manhole fails to pass the initial test method as described in Section 3.05.I.1, "Test by the Vacuum Method", of these Specifications, and, if allowed, the Exfiltration Test Method, per Section 3.10.B, of these Specifications, or if visible groundwater leakage

into the manhole is observed, the Contractor must locate the leak, if necessary, by disassembling the manhole.

2. The Contractor must check the gaskets and replace them if necessary.
3. The Contractor may re-lubricate the joints and re-assemble the manhole, or the Contractor may install an acceptable exterior joint sealing product on all joints and then retest the manhole. If the Contractor chooses to attempt to repair the manhole rather than replace it, the manhole must be retested until it passes. Cold applied preformed plastic gaskets cannot be used for repair.
4. Records of all manhole testing must be made available to the Engineer at the close of each working day, or as otherwise directed by the Engineer.
5. Any damaged or visually defective products or any products out of acceptable tolerance must be removed from the site.

### 3.06 MEASUREMENT AND PAYMENT

- A. The quantity of each type of manhole will be measured by the unit. The unit price paid for each manhole includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing manholes, complete in place, including excavation and backfill, manhole bases, mortar, concrete, reinforcement, and acceptance testing, as shown or specified in the Contract, specified in these Specifications, and directed by these the Engineer.
- B. Payment for adjusting manholes will conform to these Specifications, with the following exceptions:
  1. The unit price paid includes all necessary excavation, backfill, sealing, and concrete; and
  2. The unit price paid will be the average of all depths and limits of adjustment required.
- C. The unit price paid for manhole reconstruction includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in reconstructing manholes, complete in place, including excavation and backfill, demolition, disposal, mortar, concrete, and reinforcement as shown on the plans or specified in the Contract, in these Specifications, and as directed by the Engineer.

END OF SECTION

**SECTION 33 32 11**  
**FIELD-ERECTED WASTEWATER PUMPING STATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Provide submersible sewage pumps suitable for continuous duty operation underwater without loss of watertight integrity to a depth of 65 feet. Pump system design shall include a guide rail system be such that the pump will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pump shall be easily removable for inspection or service, requiring no bolts, nuts, or other fasteners to be disconnected, or the need for personnel to enter the wet well. The motor and pump shall be designed, manufactured, and assembled by the same manufacturer.

**1.02 MANUFACTURER**

- A. EBARA International Corporation – Offered by The Eshelman Company, Inc.  
(P) 205-424-7570;
- B. Or ENGINEER Approved Equal

**1.03 PUMP CHARACTERISTICS**

- A. Pumps shall conform to the following requirements:
  - 1. Model: Ebara 100DLKFU67.5
  - 2. Number of units: Two (2)
  - 3. Design flow (gpm): 700 GPM
  - 4. Design TDH (ft): 27.8'
  - 5. Minimum shut off head (ft): 48.7'
  - 6. RPM (nominal): 1800
  - 7. Maximum HP: 10 HP
  - 8. Minimum efficiency at design (%): 61%
  - 9. Voltage/HZ: 460 V/60 Hz
  - 10. Phase: 3 Ph

**1.04 PUMP CONSTRUCTION**

- A. All major parts of the pumping unit(s) including casing, impeller, suction cover, wear rings, motor frame and discharge elbow shall be manufactured from gray cast iron, ASTM A-48 Class 30. Castings shall have smooth surfaces devoid of blow holes or other casting irregularities. Casing design shall be centerline discharge with a large radius on the cut water to prevent clogging. Units shall be furnished with a discharge elbow and 125 lb. flat face ANSI flange. All exposed bolts and nuts shall be 304 stainless steel. All mating surfaces of major components shall be machined and fitted with NBR o-rings where watertight sealing is required. Machining and fitting shall be such that sealing is

accomplished by automatic compression of o-rings in two planes and o-ring contact is made on four surfaces without the requirement of specific torque limits. Internal and external surfaces are prepared to SSPC-VIS1-3-63 then coated with a zinc-rich epoxy primer. The external surfaces are then coated with an H.B. Teneme-Tar 46-413 coal tar epoxy.

## B. Impellers

1. For units 2 to 5 HP, the impeller shall be radial single or multi-vane, semi-open design. It shall be dynamically balanced and shall be designed for solids handling with a long throulet without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump. The 2 to 5 HP impeller design shall also include back pump out vanes to reduce the pressure and entry of foreign materials into the mechanical seal area. In addition, a lip seal shall be located behind the impeller hub to further reduce the entry of foreign materials into the seal area. Impellers shall be direct connected to the motor shaft with a slip fit, key driven, and secured with an impeller bolt. The design shall include a replaceable cast iron suction cover. The suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies.
2. For units 7 1/2 to 30 HP, the impeller shall be a mixed flow multi-vane semi-open design. It shall be dynamically balanced and shall be designed for solids handling with a long throulet without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump. The 7 1/2 to 30 HP impeller design shall also include back pump out vanes to reduce the pressure and entry of foreign materials into the mechanical seal area. In addition, a lip seal shall be located behind the impeller hub to further reduce the entry of foreign materials into the seal area. Impellers shall be direct connected to the motor shaft with a slip fit, key driven, and secured with an impeller bolt. The design shall include a replaceable cast iron suction cover. The suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies.
3. For high head units with 4" discharge, 40 to 60 HP shall have a radial multi-vane, enclosed impeller design. It shall be dynamically balanced and shall be designed for solids handling with a long throulet without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump. A lip seal shall be located behind the impeller hub to reduce the entry of foreign materials into the mechanical seal area. Impellers shall be direct connected to the motor shaft with a slip fit, key driven, and secured with an impeller bolt. The design shall include a replaceable casing wear ring at the pump suction to maintain working clearances and hydraulic efficiencies.
4. For units 6" to 12" discharge sizes, 40 to 60 HP, the impeller shall be a mixed flow multi-vane enclosed design. It shall be dynamically balanced and shall be designed for solids handling with a long throulet without acute turns. The inlet edge of the

impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump. A lip seal shall be located behind the impeller hub to reduce the entry of foreign materials into the seal area. Impellers shall be direct connected to the motor shaft with a slip fit, key driven, and secured with an impeller bolt. The design shall include a replaceable casing wear ring at the pump suction to maintain working clearances and hydraulic efficiencies. optional K-series design:

### C. Mechanical Seals

1. For units 2 to 5 HP, double mechanical seals operating in an oil bath shall be provided on all units. The oil filled seal chamber shall be designed to prevent over-filling and include an anti-vortexing vane to insure proper lubrication of both seal faces. Lower face materials shall be silicon carbide, upper faces carbon vs. ceramic, NBR elastomers, and 304SS hardware. Seal system shall not rely on pumping medium for lubrication.
2. Units 7 1/2 to 60 HP shall be designed to include a double mechanical seal in a tandem arrangement. Each seal shall be positively driven and act independently with its own spring system. The upper seal operates in an oil bath, while the lower seal is lubricated by the oil from between the shaft and the seal faces, and in contact with the pumpage. The oil filled seal chamber shall be designed to prevent over-filling and include an anti-vortexing vane to insure proper lubrication of both seal faces. Lower face materials shall be silicon carbide (tungsten carbide for 150-300 DLF 50 & 60 HP only), upper faces carbon vs. ceramic, NBR elastomers, and 304SS hardware. Seal system shall not rely on pumping medium for lubrication.

## 1.05 MOTOR CONSTRUCTION

- A. The pump motor shall be an air-filled induction type with a squirrel cage rotor, shell type design, built to NEMA MG-1, Design B specifications. Stator windings shall be copper, insulated with moisture resistant Class H insulation (Class F for 2-5HP). The stator shall be dipped and baked three times in Class H varnish (Class F for 2-5HP) and heat shrunk fitted into the stator housing. Rotor bars and short circuit rings shall be manufactured of cast aluminum. Motor shaft shall be one-piece AISI403 for 2 to 5 HP, AISI420 for 7 1/2 to 60 HP, rotating on two permanently lubricated ball bearings designed for a minimum B-10 life of 60,000 hours. Motor service factor shall be 1.15 and capable of up to 20 starts per hour. The motor shall be designed for continuous duty pumping at a maximum sump temperature of 104°F. Voltage and frequency tolerances shall be a maximum 10 / 5% respectively. Motor over temperature protection shall be provided by miniature thermal protectors embedded in the windings. Mechanical seal failure protection shall be provided by a mechanical float switch located in a chamber above the seal. This switch shall be comprised of a magnetic float that actuates a dry reed switch encapsulated within the stem. Should the mechanical seal fail, liquid shall be directed into the float chamber, in which the rising liquid activates the switch opening the normally closed circuit. For units 2 to 30 HP the float body and float shall be a polypropylene material with a 316SS stopper. Units 40 HP and greater, the float switch components shall be 304SS. The motor shall be

non-overloading over the entire specified range of operation and be able to operate at full load intermittently while unsubmerged without damage to the unit.

- B. Power cable jacket shall be manufactured of an oil resistant chloroprene rubber material, designed for submerged applications. Cable shall be watertight to a depth of a least 65'. The cable entry system shall comprise of primary, secondary, and tertiary sealing methods. The primary seal shall be achieved by a cylindrical elastomeric grommet compressed between the motor cover and a 304SS washer. Secondary sealing is accomplished with a compressed o-ring made of NBR material. Compression and subsequent sealing shall preclude specific torque requirements. The system shall also include tertiary sealing to prevent leakage into the motor housing due to capillary action through the insulation if the cable is damaged or cut. The cable wires shall be cut, stripped, re-connected with a copper butt end connector, and embedded in epoxy within the cable gland. This provides a dead end for leakage through the cable insulation into the motor junction area. The cable entry system shall be the same for both the power and control cables.

#### 1.06 GUIDE RAIL SYSTEM

- A. Design shall include two (2) 304SS schedule 40 guide rails sized to mount directly to the quick discharge connector, QDC, at the floor of the wet well and to a guide rail bracket at the top of the wet well below the hatch opening, (refer to project drawings). Intermediate guide brackets are recommended for rail lengths over 15 feet.
- B. Guide rails are not part of the pump package and shall be supplied by others.
- C. The QDC shall be manufactured of cast iron, ASTM A48 Class 30. It shall be designed to adequately support the guide rails, discharge piping, and pumping unit under both static and dynamic loading conditions with support legs that are suitable for anchoring it to the wet well floor. The face of the inlet QDC flange shall be perpendicular to the floor of the wet well. The discharge flange of the QDC shall conform to ANSI B16.1 Class 125. The pump design shall include an integral self-aligning sliding bracket. Sealing of the pumping unit to the QDC shall be accomplished by a single, linear, downward motion of the pump. The entire weight of the pump unit shall be guided to and wedged tightly against the inlet flange of the QDC, making metal to metal contact with the pump discharge forming a seal without the use of bolts, gaskets or o-rings. A stainless-steel lifting chain of adequate length for removing and installing the pump unit is recommended. The chain shall have a round link with a 2-1/4" inside diameter every two feet. This link will allow for a sliding pinch bar through the link to pick the chain, more than once, if necessary, at multiple intervals during pump removal and installation.

#### 1.07 Variable Frequency Motor Controllers

- A. Refer to Specification Section 26 29 00 ("Manufactured Control Panels") for additional requirements.

#### B. DESCRIPTION

1. This specification describes a complete adjustable speed AC drive (VFD) used to control the speed of NEMA design B induction motors used in areas where low harmonic content is desired or mandated.
2. The manufacturer shall supply the VFD and all necessary controls as herein specified.
3. The VFD shall be manufactured by a company with at least ten (10) years' experience in the production of this type of equipment.

#### C. QUALIFICATIONS

1. The VFD shall meet the following specifications
  - a) UL 508A, 508C, or UL-61800-5 – Underwriter's Laboratory.
  - b) CAN/CSA-C22 No. 14-M91 – Canadian Standards Association. The VFD shall be C-UL or CSA Listed and carry the appropriate mark.
  - c) Institute of Electrical and Electronic Engineers (IEEE). Std 519-2014, IEEE Guide for Harmonic Content and Control.
  - d) The VFD shall comply with the following European Union's CE directives. The VFD shall carry the CE mark.
    - 1) EMC Low Voltage Directive 73/23 EEC
    - 2) EMC Directive 89/336 EEC
    - 3) Machinery Directive 98/37 EC
  - e) Acceptable manufacturers
    - 1) Schneider Electric Altivar 630
    - 2) Approved Equal
    - 3) VFDs that are manufactured by a third party and "brand labeled" shall not be acceptable.
    - 4) VFD power structures that are manufactured by a third party and "brand labeled" shall not be acceptable.

#### D. Ratings

1. The VFD shall be rated to operate from 3-phase power, 380 Vac to 480 Vac +10/-10%. The overvoltage trip level shall be a minimum of 30% over nominal, and the undervoltage trip level shall be a minimum of 35% under the nominal voltage.
2. The VFD shall be rated to operate at the following environmental operating conditions.
3. Ambient temperature: 0 to 40 °C continuous. The VFD shall have the capability to operate up to 50 °C with derating.



4. Output voltage and current ratings shall match the adjustable frequency operating requirements of standard NEMA design A or NEMA design B motors.
5. The normal duty overload current capacity shall be 110% of rated current for one (1) minute out of ten (10) minutes.
6. The heavy-duty overload current capacity shall be 150% of rated current for one (1) minute out of ten (10) minutes.

#### E. Operator Interface

1. A detachable UL Type 12 / IP65 rated bi-color backlit graphical user interface terminal with keypad and capacitive wheel shall be provided for monitoring, annunciation, and configuration. The graphical display shall change to a red backlit color when an alarm occurs. The mechanical mounting for the user interface on the cabinet shall be done with a 22 mm hole.
2. A “Simply Start” menu for fast and easy commissioning shall be provided. Parameter setting shall be easily accessible and user friendly with plain text messaging and actual setting range.
3. The user interface shall be capable of saving and downloading configurations of the VFDs, as well as importing them to other VFDs.
4. The user interface shall offer a mini USB port for mass storage or PC device connection.
5. The VFD shall have self-diagnostic capabilities to display alarms, errors, and warnings as they occur and shall be able to store into memory the last 15 messages, at minimum. These shall be accessible by PC maintenance tools or by web server, with flash record for data logging.
6. The VFD shall have a separate dedicated RS232 Modbus serial port for the keypad and shall allow for simultaneous use of a remote mounted keypad with RS485 serial communications network.
7. The displayed messages shall be in plain text.

#### F. Protective Features

1. The VFD shall be UL 508 or UL61800-5-1 Listed for use on distribution systems.
2. The VFD shall have coordinated short-circuit rating designed to UL 508C or UL 61800-5-1
3. Voltage sag immunity per SEMI F47.

4. Upon power-up, the VFD shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, AC-to-DC power supply, control power, and the pre-charge circuit.
5. The VFD shall be protected against short circuits between output phases and ground and the logic and analog outputs.
6. The VFD shall have a selectable ride through function that will allow the logic to maintain control for a minimum of one (1) second without tripping.
7. The deceleration mode of the VFD shall be programmable for normal and trip conditions. The stop modes shall include freewheel stop and fast stop.
8. Upon loss of the analog process follower reference signal, the VFD shall trip and/or operate at a user-defined speed set by a software programmed speed setting or last speed.
9. The VFD shall have solid-state thermal protection that is UL Listed and meets UL 508C / UL 508A as a Class 10 overload protection and meets IEC 947.
10. The VFD shall have a motor thermal memory retention function per UL requirements.
11. The VFD shall be able to protect the motor when temperature probes are connected.
12. The VFD shall be able to limit the motor surge limitation to twice the DC bus voltage. This must be accomplished by use of internal software. The VFD shall limit the motor surge limitation to value of not more than twice the DC bus voltage. Motor cable length shall be standard 50' length as specified herein.
13. The VFD shall provide VFD current protection.
  - a) Phase short circuit protection
  - b) Ground protection
  - c) Overcurrent protection
14. The VFD shall provide VFD voltage error protection.
  - a) Mains overvoltage protection
  - b) Mains undervoltage protection
  - c) DC Bus overvoltage protection
  - d) DC Bus pre-charge protection
15. The VFD shall provide VFD Thermal protection.
  - a) VFD overtemperature protection
  - b) Fan management
  - c) Switching frequency management

16. The VFD shall provide motor protection functions
  - a) Motor output phase detection
  - b) Motor surge voltage
  - c) Motor overload detection
  - d) Motor stall protection
  
17. The VFD shall provide application protection functions
  - a) Catch on fly function
  - b) Mains input phase lost protection
  - c) Motor overspeed input protection
  - d) Current limitation
  - e) Power limitation
  - f) Reverse inhibition
  - g) Underload protection
  - h) Overload protection
  - i) External error management
  - j) Loss of follower signal
  - k) Thermal sensor management
  - l) PID feedback
  - m) Customer defined input

#### G. Control Interface

1. A minimum of the following standard inputs/outputs shall be provided to interface with control systems and instrumentation:
  - a) Analog inputs: (3) programmable 0(4)-20 mA or 0-10 Vdc
    - 1) Two (2) analog inputs shall also be programmable for temperature sensors (PTC, PT100, PT1000, KTY84)
  - b) Analog outputs: Two (2) programmable 0(4)-20 mA or 0-10 Vdc
  - c) Discrete inputs: (6) programmable isolated logic inputs as either sink or source
    - 1) Two (2) discrete inputs shall also be programmable as 0-30 kHz pulse inputs
    - 2) Two (2) discrete inputs shall be dedicated to the Safe Torque Off safety function in accordance with IEC/EN 61508-1 SIL3
  - d) Discrete outputs: (3) programmable relay contacts
    - 1) One (1) discrete output shall be dedicated to product watchdog logic
  
2. Safety Inputs

- a) The VFD shall provide two (2) inputs dedicated to the Safe Torque Off (STO) safety function, which prohibits unintended equipment operation, in accordance with IEC/EN 61508-1 SIL3.
- b) The VFD shall be compliant with EN13849 (PL e).
- c) The VFD shall be compliant with “Safety of Machinery,” EN 954-1.
- d) The VFD manufacturer shall provide the certified schematics and the list of devices in order to comply with IEC/EN 60204-1 stopping category 0 and 1.
- e) The VFD shall integrate the safety contacts in compliance with EN-81 13.2.2.3.

## H. Communications

1. The VFD shall provide at minimum one (1) Modbus and one (1) Ethernet Modbus TCP communication port. [In addition, the following communications options shall be provided as necessary for communications. Refer to communication requirements specified elsewhere within the Contract Documents.]
  - a) [Ethernet IP or Modbus TCP, RJ45 dual port for daisy chain]
  - b) [Profibus DP V2, SUB-D9 connection, compliant with Drive Profile networking]
  - c) [Profinet, RJ45 dual port for daisy chain]
  - d) [DeviceNet, 5 terminal points]
  - e) [CANopen daisy chain, RJ45 dual port for daisy chain]
  - f) [CANopen SUB-D9 connection]
  - g) [CANopen open terminals, 5 terminal points]
2. VFD Ethernet ports shall be IPv6 compliant, allow for web server access, and provide network management via Simple Network Management Protocol, and clock synchronization.
3. The VFD shall provide an embedded web server for enhanced diagnostic, configuration, parameter access, and energy management. It shall be possible to create a user-defined custom dashboard for viewing VFD and process status through tables, charts, and graphical views. It shall be possible to export data in standard table format using the web server, for information about energy consumption as well as error and warning history.
4. The VFD shall be compliant with the Cyber Security Management ISA Secure / Achilles.

## I. Control Functions and Configurations

1. Application programming dedicated to pumps
  - a) The VFD shall provide pump control and monitoring functions
    - 1) Centrifugal pump characteristics and configurations

- 2) Pump monitoring function in order to define the data relevant for the pump (for example, acceleration, low speed, and high speed)
  - 3) Application units function in order to define the units used in applications
  - 4) Pump cyclic start protection in order to protect the pump against too many restarts in a dedicated time period
  - 5) Multi-pump functions
- b) The VFD shall provide pump protection functions.
- 1) Anti-jam function in order to remove automatically clogging substances from the pump impellers
  - 2) Pipe cleaning function in order to start the pump regularly to avoid sedimentation in pump impeller
  - 3) Cavitation pump protection
  - 4) Inlet protection in order to avoid system dry running
- c) The VFD shall provide application control functions.
- 1) Stop and Go function in order to reduce consumption of the VFD in case the pump does not work
  - 2) Pulse input for connection to flow meter feedback
  - 3) Process control (PID) function in order to maintain a process at a given pressure or flow reference
  - 4) Flow limitation function in order to allow limiting the consumption of water
  - 5) Friction loss compensation function in order to compensate pressure losses in pipes due to friction
  - 6) Pipe Fill function in order to manage a smooth control during pipe filling and to lessen the affects of water hammer
  - 7) Sleep wake-up function in order to manage periods of the application when process demand is low and when it is not needed
  - 8) Low demand function in order to define periods of the application when process demand is low in order to save energy
  - 9) Jockey pump control function in order to start a jockey pump, during sleep period, to maintain emergency service pressure or demand, such as low water
  - 10) Sensor management in order to define how VFD inputs will be used to manage the pressure sensor or flow sensor
- d) The VFD shall provide application protection functions.
- i. High flow protection function in order to detect pipe burst or detect running outside normal working area
  - ii. Outlet pressure protection function in order to fix minimum and maximum pressure

- e) The VFD shall provide pump curve input to help optimize pump performance.
  - 1) Input and storage of the pump characteristics including five (5) points of the pump curve.
  - 2) A best efficiency point (BEP) function in order to operate at maximum system efficiency and alarms to indicate deviation from BEP.
  
- f) The VFD Supplier shall have Windows-based PC software for configuring and diagnosing the VFD. It shall be possible to set and modify parameters, control the VFD, read actual values, and make trend analysis using the software. The PC tools may be connected to the VFD by a wired or wireless connection.
  
- g) The VFD shall display all faults in plain text and help screens shall be available to guide the user in troubleshooting. Codes are not acceptable.
  
- h) The VFD shall provide a real time clock for time stamping detected errors.
  
- i) The VFD shall display detected errors with QR codes to guide the user in the troubleshooting.
  
- j) The control circuit shall be protected by a normal duty thermal-magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
  
- k) Pump mode selector switches shall be connected to permit manual start and manual stop for each pump individually, and to select automatic operation of each pump under control of the liquid level control system. Manual operation shall override the liquid level control system. Selector switches shall be heavy duty, oil-tight design, with contacts rated NEMA A300 minimum.
  
- l) Six digit elapsed time indicators (non-reset type) shall be connected to each motor starter to indicate the total running time of each pump in hours and tenth of hours.
  
- m) Dry (non-powered) contacts shall be provided to the terminal strip for connection to existing or future SCADA equipment that may not be required under this contract. Contacts provided shall be provided for each pump to indicate Apump on@, Apump off@, Apump high temperature@, and Apump leakage alarm@. Dry contacts for Ahigh wet well level@ shall also be provided.
  - 1) Monitoring contacts shall be provided for each pump located in the wet well. All contacts shall be Form B design, capable of carrying a minimum of 10 amps at 120VAC. Contact closures shall be

separately wired with two separate leads in the panel, and with no common wiring between functions.

- n) Two (2) duplex ground fault indicating utility receptacle providing 115VAC power shall be mounted on the side of the control enclosure. Receptacle circuits shall be protected by 15 ampere thermal-magnetic circuit breakers.
- o) If required, the lift station shall be equipped with NEMA 3R enclosed 5KVA auxiliary control transformer to supply 115VAC for control and auxiliary equipment. The primary and secondary side of the transformer is to be protected by a thermal magnetic circuit breaker sized to meet the power requirements of the transformer.
- p) The control panel shall be equipped to monitor the incoming power and shut down the pump when required to protect the motor(s) from damage caused by voltage less than 83% of nominal. The motor(s) shall automatically restart when power conditions return to normal.
- q) The control panel shall be equipped with a panel heater to minimize the effects of humidity and condensation. The heater shall include an adjustable thermostat.
- r) The control panel, as furnished by the manufacturer, shall be completely wired. The contractor shall field connect the power feeder lines to the main terminal block, final connections to the remote alarm devices, and the connections between the pump and the pump motor control. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC). All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:
  - 1) Line and load circuits, AC or DC power                      Black
  - 2) AC control circuit less than line voltage                      Red
  - 3) DC control circuit                      Blue
  - 4) Interlock control circuit, from external source                      Yellow
  - 5) Equipment grounding conductor                      Green
  - 6) Current carrying ground                      White
  - 7) Hot with circuit breaker open                      Orange
- s) Control circuit wiring inside the control panel, with the exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Power wiring shall be 14 gauge minimum. Motor branch and power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered with suitable indelible marking tape at each end, in accordance with the electrical diagrams. All wires on the sub-plate shall be bundled and tied.

- t) Wires connected to components mounted on the inner door shall be bundled and tied in accordance with good commercial practice. Bundles shall be flexible at the hinged side of the enclosure. Adequate length and flex shall be provided to allow the door to swing to its full open position without undue stress or abrasion on the wire or insulation. Bundles shall be held in place on each side of the hinge by mechanical fastening devices.
- u) The pump control manufacturer shall provide a common ground bar mounted on the enclosure back plate. The mounting surface of the ground bar shall have any paint removed before making final connections. The contractor shall make the field connections to the main ground lug and each pump motor in accordance with the National Electric Code.
- v) A permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:
  - 1) Equipment serial number
  - 2) Control panel short circuit rating
  - 3) Supply voltage, phase and frequency
  - 4) Current rating of the minimum main conductor
  - 5) Electrical wiring diagram number
  - 6) Motor horsepower and full load current
  - 7) Motor overload heater element
  - 8) Motor circuit breaker trip current rating
  - 9) Name and location of equipment manufacturer
- w) Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification labels shall be mounted adjacent to the device. Switches, indicators, and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.
- x) All conduit and fittings utilized in construction of the station shall be UL listed. Liquid tight flexible metal conduit shall be constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code. Conduit shall be sized according to the National Electric Code.
- y) One additional 20 amp, 120VAC circuit breaker shall be provided to power the remote Effluent Pump Station Flow Transmitter.
- z) Two additional 20 amp, 120VAC circuit breakers shall be provided for the standby pump engine block heater and trickle charger. Wiring from the 15 amp circuit breakers shall be routed to terminal blocks and the bottom of



the control panel for field connection to the appropriate equipment by others.

## 1.08 LIQUID LEVEL CONTROL

- A. The manufacturer of the liquid level control system shall be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- B. The level control system shall start and stop the pump motors in response to sensed changes in wet well level, as set forth herein. The level control system shall utilize a submersible transducer for primary level control, but shall also be provided with backup floats.
- C. The level control system shall incorporate automatic alternation to select first one pump, then the second pump to run as the lead pump for successive pump starts. Alternation shall occur at the end of a pumping cycle, or in the event of excessive run time.
- D. The liquid level control system shall be model PC3000XC, as manufactured by Primex Controls or equal. The PC-3000XC is a general purpose pump controller designed to sequence pumps on and off in response to changes in level. The primary sensor input to the controller shall be a 4-20 ma loop as provided by the submersible level transducer as specified herein. A loop power supply shall included in the PC-3000XC controller to provide excitation voltage to the transducer.
- E. The PC-3000XC shall provide a front panel user interface for field setup and level setting adjustments. Connection to the level controller shall be made by means of a removable terminal block assembly on the back cover, facilitating replacement if necessary without the need to remove individual wires to the controller. The block assembly shall unplug directly without need of removing/disconnecting individual wires.
- F. The PC-3000XC shall incorporate the following features as a minimum:
- G. A 32-character alpha-numeric liquid crystal display for level, status, and setpoint information. An alternation selection switch shall be provided on the front panel to enable the operator to turn alternation on, and allow the manual designation of the lead pump if alternation is off. The controller shall provide a simple menu structure for easy display and modification of pump operating setpoints and setup configuration.

END OF SECTION

**SECTION 40 71 12**  
**ELECTROMAGNETIC FLOW METER**

PART 1 – GENERAL

1.01 GENERAL

- A. There shall be furnished a Flanged Electromagnetic Flow Meter. The meter shall be the ISOMAG model MS2500 Flow Sensor and MV110 Converter/Transmitter.

1.02 FLOW METER DESCRIPTION

- A. An inline electromagnetic flow meter system shall be furnished and installed as shown on the plans and in accordance with the manufacturer's recommendations.
- B. The flow metering system shall operate on the principle of electromagnetic induction, with a pulsed DC excitation frequency, and shall produce a signal output that is directly proportional and linear with the volumetric flow rate of the liquid flowing through the flow sensor.
- C. The system shall include a flanged flow sensor, remote mount converter/transmitter and (2) grounding rings. The 33ft. interconnect sensor coil and electrode cables shall be dual shield for high noise immunity designed specifically for use with electromagnetic flow sensors.

1.03 FLOW SENSORS- MS2500

- A. The 6" flow sensor tube shall be constructed of 304 stainless steel lined with NSF61 rated Polypropylene and rated for a working pressure up to 285 psi.
- B. The flow sensor shall be a flanged design. Flange rating shall be ANSI class 150#.
- C. Installation shall be accomplished by installing the flow sensor between two ANSI class 150# mating flanges.
- D. The flow sensor shall have two flow measuring electrodes and one internal ground electrode. The electrode material shall be 316 Stainless Steel.
- E. The flow sensor housing shall be constructed of corrosion resistant epoxy coated carbon steel, welded at all joints. It shall be capable of permanent submergence in 6' of water.
- F. Flow Sensor shall be properly grounded via provided Integral ground electrode.
- G. Sensor shall be factory calibrated and written certification provided to the Owner & Engineer.

#### 1.04 CONVERTER/TRANSMITTER-MV110

- A. The converter/transmitter shall be microprocessor based and shall energize the detector coils with a digitally controlled pulsed DC signal.
- B. The converter/transmitter shall include a non-volatile memory chip capable of storing all programmable data and accumulated totalizer values in the event of a power interruption.
- C. Automatic zero stability, low flow cut-off, bi-directional flow measurement, empty pipe detection and full diagnostics shall be standard features of the converter/transmitter.
- D. The converter/transmitter shall include a backlit graphic alphanumeric display which may be user configured in the field to display the following values:
  - a. Flow Rate in user selected engineering units.
  - b. Forward totalizer in selected volume units.
  - c. Reverse totalizer in selected volume units
  - d. Error or alarm messages.
- E. The converter/transmitter shall include a 3-button programming keypad. The programming functions shall be available in a user-friendly, plain English, menu driven software through the backlit graphic alphanumeric display.
- F. In addition to the backlit graphic alphanumeric display, the converter/transmitter can provide:
  - a. Erection drawings with equipment mark numbers.
  - b. Complete operating instructions for controlling, modifying, and operating the equipment provided for this facility.
- G. The power requirement of the converter/transmitter shall be 100-240Vac.
- H. The converter/transmitter enclosure shall be housed in a non-metallic IP67/NEMA 6 enclosure for remote wall mounting.
- I. The converter/transmitter shall be supplied with a rechargeable battery backup and charger and be supplied with a USB cable type A/USB Mini B for PC programming, 2 Micro SD Cards 32 gigabytes.
- J. The converter/transmitter shall be supplied with two (2) 4-20mA analog outputs.

#### 1.05 SYSTEM PERFORMANCE AND CALIBRTION

- A. The metering system shall perform to an accuracy better than  $\pm 0.40\%$  of rate over a flow velocity range from 1.0 to 36 feet per second.
- B. The metering system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 5.0 ms/cm.
- C. The system measuring repeatability shall be 0.1% full scale.
- D. Each meter shall be hydraulically calibrated in an ISO 9001 or NIST certified calibration laboratory, which utilizes a gravimetric testing method with a measuring uncertainty of 0.1%. The accredited calibration laboratory must also conform to ISO17025 standards. Each sensor shall be provided with a calibration certificate with a calibration factor.

END OF SECTION

**SECTION 46 21 24  
VERTICAL CYLINDRICAL SCREEN**

**PART 1 - GENERAL**

**1.01 SUMMARY**

A. The CONTRACTOR shall furnish, install and place into satisfactory operating condition the number of vertical cylindrical screens noted in paragraph 1.03.C.1. for removing floating, particulate, or fibrous material from wastewater as shown on the Drawings and described in the Specifications.

B. Related Sections

1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section.

**1.02 REFERENCES**

- A. American Gear Manufacturers Association (AGMA)
- B. American Institute of Steel Construction (AISC)
- C. American Society of Civil Engineers (ASCE)
- D. American Society of Testing and Materials (ASTM)
- E. American Welding Society (AWS)
- F. National Electrical Manufacturers Association (NEMA)

**1.03 SYSTEM DESCRIPTION**

A. Each unit shall consist of a stationary, vertical cylindrical screen basket, concentric screw conveyor/dewatering screw, screenings press with drive unit, support structure, and electrical control system.

B. Screens other than vertical cylindrical screens, will not be considered for this project.

C. Design

1. Number of Vertical Cylindrical Screens ..... 1
2. Average Flow per Screen, mgd ..... 1.1
3. Maximum Clean Water Capacity per Screen, mgd ..... 1.5
4. Wet Screenings Conveying Capacity, cubic feet per hour ..... 15
5. Nominal Screening Basket Diameter, inches ..... 13
6. Screen Perforation Diameter, inches ..... 1/4
7. Screen Perforation Centerline-to-Centerline Distance, inches . 5/16

8. Inlet Connection Pipe Diameter, inches .....	10
9. Nominal Screw Conveyor Diameter, inches.....	10
10. Minimum Inlet Pipe Centerline to Grade, inches.....	3.15
11. Minimum Grade to Screenings Discharge Height, inches.....	4.17
12. Speed Reducer Minimum Torque Rating, in.-lb .....	(15,700)
13. Speed Reducer Minimum Thrust Rating, lb <sub>f</sub> .....	(5,800)
14. Drive Motor Size, hp.....	2
15. Electrical Power Characteristics, VAC – Hertz – Phase.....	460 – 60 – 3
16. Motor and Solenoid Valve Electrical Classification.....	Non-Hazardous
17. Compaction Chamber Flush System Flow Rate, gal/min .....	5
18. Compaction Chamber Flush Minimum Pressure, psig.....	30
19. Liquid Level Sensing System Type.....	Hydrostatic
20. Electrical Enclosure Type.....	NEMA 4X stainless steel

#### 1.04 PRE-QUALIFICATION

- A. All equipment manufacturers not listed in the specifications shall submit a “Qualification Package” for the substitute or “or equal” equipment which the manufacturer proposes to furnish in lieu of products identified in the Contract Documents with their bid submittal. The Bidder shall submit the Qualification Package under separate cover with bid. Each Qualification Package shall be bound with protective cover, identify the specification section number and title, and the product manufacturer’s name on a cover sheet. The manufacturer shall submit the Qualification Package in a sealed envelope contained in the bid package. This section outlines the procedures for proposal of substitute or “or equal” items by “Alternate” manufacturers.
- B. The use of this qualification package requirement is intended to protect the OWNER and Bidders so that no one Bidder gains an unfair bid price advantage by quoting a lower price for a screen that does not comply with the minimum performance and salient features set for by this section.
- C. The “Qualification Package” for the substitute or “or equal” equipment item of products the manufacturer proposes to furnish shall include but not be limited to, the following information as defined in 1.04.D.
- D. The Qualification Package submittal requirements for the equipment shall be as follows:
  - 1. The quality assurances set forth in paragraph 1.08 for the substitute or “or equal” equipment item.
  - 2. A complete set of drawings, specifications, catalogue cut-sheets, and detailed descriptive material of proposed equipment items or products shall be provided. This information shall identify all technical and performance requirements stipulated on each drawing and in each specification section.
  - 3. Detailed vendor information shall be submitted for all buy-out items such as hardware, motors, bearings, reducers, belts, sheaves, motor controllers, and

instrumentation (field device, major control panel device, and anticipated control panel layout).

4. List showing materials of construction of all components, including all buy-out items.
  5. Certification that the stainless-steel passivation process that is outlined in paragraph 2.07.B. does not produce any hazardous waste by-products.
  6. Certification that the specified machining noted in paragraph 2.08.F. of all mating surfaces is part of the manufacturing process for the specified screen.
  7. Certification that the drive speed reducer manufacturer is a member of AGMA and that the torque and thrust rating are in accordance with AGMA standards.
  8. Fabrication facility AISC category certification and AWS welding inspector certifications in accordance with paragraph 2.08.G.
  9. Manufacturer's recommended spare parts, including all buy-out items.
  10. Information on equipment field erection requirements including weight of assembled components and weight of each sub-assembly.
  11. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period, including all buy-out items.
  12. Process equipment electrical requirements and schematic diagrams.
  13. Provide a copy of this specification with a check next to each item to which the proposed equipment meets the specified standard. Where the proposed equipment does not strictly meet the requirements of this specification, provide information on the proposed exception to the specification that would bring the proposed, equipment into compliance with the requirements of this section.
  14. Data from three (3) separate tests proving compliance of the screen with the "Paint Filter Test" as described in EPA Publication SW-846 Method 9095B.
  15. **Submittal Review Deposit, in the form of a certified bank check in the amount of \$2,000 made payable to the OWNER, will be used for ENGINEER'S review of substitute equipment. The ENGINEER'S review time will be deducted at a rate of \$175.00 per hour for reviewing substitution requests, regardless of whether the substitution is approved or rejected. The OWNER will return any unused funds to the petitioner within 30 days of the bid date.**
- E. If the Bidder fails to furnish all of the preceding information which has been deemed necessary by the ENGINEER to evaluate a proposed substitute or "or equal" equipment, the proposed substitute or "or equal" qualification package will be rejected by the ENGINEER.

- F. The ENGINEER shall be the sole authority for determining conformance of a proposed substitute or “or equal” equipment item or product with the minimum requirements of the Contract Documents. Under no circumstances will the ENGINEER be required to prove that an “Alternate” major equipment item or product is not equal to the specified equipment item or product.
- G. Failure to furnish the preceding information shall be cause for rejection of a proposed substitute or “or equal” equipment item or product for use on this project.
- H. Submit the expected decrease in cost to the OWNER should the “Alternate” or the “or Equal” item be selected.

#### 1.05 PERFORMANCE

- A. The vertical cylindrical screen shall be designed to handle the maximum clean water hydraulic capacity noted in paragraph 1.03.C.3.
- B. The vertical cylindrical screen shall be designed to convey a minimum wet screenings volume as noted in paragraph 1.03.C.4.
- C. The screen shall be a stationary vertical cylindrical perforated plate screen with an integral screw for cleaning the screen, conveying, and compacting the screenings.
- D. The screen shall use a single drive for screening, conveying, dewatering, and compacting screened material.
- E. The design of the screen shall be such that there are no metal-to-metal wearing surfaces in the screening, transport, and compaction/dewatering sections of the screen to minimize maintenance labor and replacement parts costs.
- F. The screenings shall be conveyed up the transport tube via a screw conveyor and through a compaction/dewatering chamber. The complete removal procedure shall be encased to reduce odors.
- G. The screening equipment shall produce dewatered screenings capable of passing the EPA Paint Filter Test as described in method 9095B of EPA Publication SW-846.
- H. Due to the presence of large objects in raw wastewater, the screen shall be capable of picking up objects 3-1/8 inches in diameter and depositing them for washing and passage through the compaction and dewatering zone. The screen design shall prevent objects larger than 3-1/8 inches in diameter from entering into the screenings transport tube to prevent jamming.
- I. The control system shall be designed so that the cleaning characteristics of the screen and compaction chamber flush system can be changed via the programmable logic controller. Systems that do not offer this feature will not be considered for this project.



## 1.06 SUBMITTALS

- A. Shop drawing submittals shall be provided in accordance with Section 01 33 00 submittals procedure.

## 1.07 MATERIALS QUALITY

- A. All fabricated components of the vertical cylindrical screen shall be AISI Type 304 stainless steel including the screen basket, screw conveyor, outer screw conveyor housing, and support structure. Materials thicknesses identified in PART 2 - PRODUCTS are the minimum requirements for this project. Materials with increased thicknesses will be acceptable.
- B. All fabricated components shall be manufactured in the United States. To ensure prompt service and to ensure spare parts availability in a timely manner and at a reasonable cost, foreign fabricated materials of construction for the components identified in paragraph 1.09.A. will not be acceptable for this project.

## 1.08 QUALITY ASSURANCE

- A. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that all equipment called for under this Section shall be supplied by a single manufacturer. The equipment manufacturer shall, in addition to the CONTRACTOR, assume the responsibility for proper installation and functioning of the equipment.
- B. Naming a manufacturer in paragraph 2.01 does not relieve them from complying with the performance features, the salient features, and the Made in the U.S.A. requirements of the Contract Documents. The Contract Documents represent the minimum acceptable standards for the screening equipment for this project and act as a basis of bid. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. Equipment that is a "standard product" with the manufacturer shall be modified, redesigned from the standard mode, and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. The vertical cylindrical screen assembly shall include all necessary equipment and appurtenances as manufactured by Lakeside Equipment Corporation, of Bartlett, IL, or approved equal.

### 2.02 VERTICAL CYLINDRICAL SCREEN

- A. Screen Basket

1. The screen shall be designed and built to withstand maximum possible static hydraulic forces exerted by the liquid to the screen. All structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screening, conveying and pressing operations. All submerged components and all components of the screen in contact with the screened solids shall be of stainless-steel construction.
2. The nominal diameter of the screening basket shall be as noted in paragraph 1.03.C.5.
3. The screen basket shall use perforated plate for capturing solids in the wastewater flow stream. The perforated plate screen orifice opening diameter shall be as noted in paragraph 1.03.C.6. with an orifice centerline spacing as noted in paragraph 1.03.C.7. The perforated plate screen shall have a minimum thickness of 0.12 inches for heavy-duty applications to minimize tearing.
4. The screen basket shall be of a vertical cylindrical shape and installed in the housing perpendicular to the direction of liquid flow. The screen shall be furnished with a 5/8-inch thick minimum upper basket support flange for mating to the screenings screw conveyor body. After welding, the face of the screenings basket support flange shall be machined in accordance with paragraph 2.08.F.
5. The bottom of the screen body shall be welded to an inflow box. The upper end of the inflow box shall be open and serve as an emergency bypass overflow. The inlet piping diameter shall be as noted in paragraph 1.03.C.8. The invert of the inflow connection into the inflow box shall be designed to prevent flow from backing up into the inlet pipe and causing increased run time for the screen. Designs with a pipe inlet that does not incorporate an inflow box will not be acceptable for this project.

#### B. Screenings Conveyor and Screenings Dewatering Press

1. The vertical cylindrical screen shall be cleaned by a shaftless screw conveyor with helical flights designed to operate and to convey screened material. Screw conveyor designs fabricated of material that is not AISI designated stainless steel will not be acceptable for this project. Designs that form the shaftless portion of the screw out of bar stock shall be fabricated from AISI Type 316Ti stainless steel to prevent stress relieving after fabrication and shipment.
2. As material is conveyed into the enclosed transport tube, there shall be a transition section from the nominal screen diameter noted in paragraph 1.03.C.5. to a nominal screenings transport tube diameter as noted in paragraph 1.03.C.9. The transport tube shall be fabricated of stainless steel with a wall thickness equal to or greater than that provided by Schedule 10S pipe to minimize deflection.
3. The screw conveyor flights for cleaning the screen in the basket area shall be fabricated with 3/8-inch minimum stainless-steel plate. The screenings transport screw shall transition to 3/16-inch minimum stainless-steel flights from the top of the basket area through the length of the transport tube to the beginning of the compaction zone. Flight thickness shall be increased on the last flights to 3/8-inch in the compaction zone. Where the transport screw passes through the discharge

section a reverse stainless steel flight spiral shall be provided to cut off the compacted material plug to drop down and angled discharge chute into the receiving receptacle.

4. The screenings transport screw flights shall be welded to a 3-inch minimum diameter stainless steel Schedule 40S minimum torque tube. The upper screenings conveyor torque tube shall be fitted with a removable shrink-fit stainless steel stub shaft that is welded after fabrication. The torque tube and upper stub shaft shall be machined in accordance with paragraph 2.08.F.
5. Attached to the screw conveyor flights the full length of the perforated screen basket shall be a stainless steel backed brush composed of plastic bristles. Brush shall be attached to the shaftless screw conveyor with stainless steel holder clips and stainless-steel fasteners.
6. A 3/4-inch-thick minimum basket support plate flange shall be welded to the lower end of the screenings transport tube to attach the screen basket and to provide for attachment of the screenings basket. A 3/4-inch-thick minimum drive support flange shall be welded to the upper end of the screenings transport tube for attachment of the drive assembly. After all welding of components to the screenings transport tube have been completed the fabrication shall be placed in a lathe to machine the face of the upper drive flange and to machine the face of the lower basket support plate flange for mating the basket in accordance with paragraph 2.08.F.
7. To prevent rotation of the material in the transport tube and to provide maceration of screenings during transport, there shall be a minimum of four (4) 1/4-inch minimum thick stainless-steel anti-rotation bars equally spaced at 90-degree intervals along the inside axis of the transport tube. Anti-rotation bars shall be welded to the inside of the transport tube.
8. In the transition section from the screen to the transport tube there shall be four (4) replaceable bearing bars to support laterally the screw conveyor when the unit operates. These replaceable bearing bars shall prevent the transport screw flights from wearing on the anti-rotation bars or on the cleaning brush. The bearing bars shall be replaceable without having to remove the screw conveyor from the screenings transport tube for ease of maintenance. Bearing bars shall be a special ultra high molecular weight polyethylene material filled with molybdenum disulfide and oil for superior life. The bearing bars shall be held in place via a stainless-steel backing housing with a bolted connection for ease of field replacement. Designs that support the screenings screw using bolted bearing bars or welded bearing bars mounting on the inside of the transport tube will not be acceptable for this project.
9. A compaction zone shall be an integral part of the screenings screw conveyor and transport tube design. The compaction zone shall be designed to form a screenings plug of material and to return water released from the screened material back to the wastewater through circular holes that are machined into the screenings transport tube. Compaction zone shall be fabricated from 12-gauge minimum thick stainless steel welded to the screenings transport tube to provide a watertight screenings pressate collection chamber. Compaction zone housings that are non-metallic and

which require seals to prevent leakage around the screenings transport tube will not be acceptable for this project. Compaction zone housing shall be furnished with a gasketed access cover held in place with stainless steel latches as well as a removable dewatering section panel inside the dewatering chamber to allow direct access to the screw conveyor should the compaction zone ever become plugged. Designs that require removal of the drive assembly, discharge head, or screw conveyor to gain access to the compaction zone will not be acceptable for this project.

10. The screen shall be designed with an inlet pipe centerline to grade height as noted in paragraph 1.03.C.10.
11. The screen shall be designed with a minimum grade to discharge height as noted in paragraph 1.03.C.11. as measured from the grade to the lowest point of the discharge chute.
12. The upper end of the screenings conveyor transport tube shall be provided with a 10-gauge thick minimum stainless steel discharge chute for delivering the screenings to a container. The discharge chute shall be designed to match the width of the screenings transport tube and shall be oriented at a maximum 40-degree slope from vertical. The screenings discharge chute shall be provided with a removable cover with stainless steel latches to allow the plant operations and maintenance staff access in the event of blockage in the discharge zone.

#### C. Drive Assembly

1. The screw conveyor shall be driven by a direct-connected, cycloidal-helical, hollow-shaft, high-thrust, in-line speed reducer. The cyclo element of the speed reducer shall be designed to take a 500 percent shock load without damage. The speed reducer manufacturer shall be a member of AGMA. Combination gear motor designs will not be acceptable for this project. The speed reducer shall have a minimum torque rating as noted in paragraph 1.03.C.12. and a minimum thrust rating as noted in paragraph 1.03.C.13. at a maximum design output shaft speed of the reducer. The speed reducer shall be bolted to the drive adaptor flange at upper end of the screenings transport tube. The reducer shall utilize a taper grip bushing to connect to the upper drive stub shaft of the screw conveyor. The use of keys and keyways will not be an acceptable connection method for this project.
2. The speed reducer shall be driven by a field replaceable NEMA C-flanged, 1,800 rev/min, ball bearing, continuous-duty, totally enclosed, fan-cooled motor with leads to a large conduit box. Motor size shall be as noted in paragraph 1.03.C.14., shall be rated for electrical power characteristics as noted in paragraph 1.03.C.15. and shall be rated for an environment as noted in paragraph 1.03.C.16.

#### D. Dewatering Chamber Flush Water System

1. A dewatering chamber flush water system shall periodically clean the compaction and dewatering zone via a stainless-steel wash nozzle located in the compaction/dewatering chamber. The dewatering chamber flush water system shall

be furnished with a control solenoid valve, stainless steel piping and fittings, flexible reinforced PVC hose and nozzles. Piping, fittings, and valves shall be 3/4-inch diameter minimum. A plant water strainer shall be provided for the incoming plant water supply. The wash water flow requirements shall be as noted in paragraph 1.03.C.17. with a minimum pressure as noted in paragraph 1.03.C.18.

2. The solenoid valve shall be 3/4-inch minimum, brass body suitable for 120 VAC operation with an electrical rating as noted in paragraph 1.03.C.16. Solenoid valve shall be normally closed and rated for up to 100 psig. Solenoid valves shall be slow close type to minimize water hammer. Solenoid valve electrical connectors shall be a metallic design.
3. A water strainer shall be provided suitable for a 3/4-inch connection and a maximum flow rate of 25 gal/min and suitable for a maximum pressure of 125 psig. Water filter shall be a stacked filter element design with washable 80-mesh (200 micron) polyethylene or polypropylene disc elements, polypropylene head and bowl and Buna N gaskets. Wye-type strainers will not be acceptable for this project.

### 2.03 SCREEN SUPPORT SYSTEM

- A. The screen shall be provided with a support system that allows for easy removal of the screen from the structure for maintenance purposes. To ensure operator safety during servicing of the screen, the supports shall be fabricated from 1/4-inch minimum stainless-steel shapes and plates.
- B. The screen shall be provided with lifting eyes for connection of the lifting gear that will allow for installation and removal of the screen.
- C. The screen's upper support shall be a minimum of two (2) supports that either span across the structure opening or are anchored to the structure wall.
- D. The screen's lower support shall be provided with an adjustable structure to support the bottom plate of the screen from the floor according to the drawings.
- E. The screen shall be provided with a guide rail system to allow the screen to be removed from the structure for maintenance purposes. The guide rail system shall be designed to remove the screen without personnel having to enter the structure for safety purposes.
- F. The supports of the guide rail system shall be designed to withstand all static and dynamic loads of the screen.
- G. A sliding shoe on the screen shall be provided with ultra-high molecular weight polyethylene (UHMWPE) plastic to minimize friction.
- H. The screen inlet box shall be provided with a chamfered flange inlet allowing the screen to be repositioned without entering the structure. Equipment mating tolerances shall be 0.1 inch to avoid screenings from bypassing the connection.

## 2.04 CONTROL SYSTEM

- A. Refer to Specification Section 26 29 00 (“Manufactured Control Panels”) for additional requirements.
- B. All controls necessary for the fully automatic operation of the vertical cylindrical screen shall be provided in accordance with NEMA.
- C. The electrical control system shall provide for automatic control of the screen via a high liquid level using a liquid level control system as noted in paragraph 1.03.C.19. in connection with an adjustable time clock. The screen shall operate at a high liquid level and or a pre-determined time sequence to provide a variable time between cleaning operations.
- D. The level control system shall be a Hydrostatic Level Transmitter, or equal.
- E. The CYCLE/RE-SET pushbutton shall allow the control logic to be re-set after the E-STOP pushbutton is pulled out. The CYCLE/RE-SET pushbutton shall also allow the plant operations staff to run the screen through a complete cleaning cycle by holding in the pushbutton for a pre-set time.
- F. A local-mounted main control panel (MCP) suitable for wall mounting shall contain the following items:
  - 1. Door interlocked fused disconnect.
  - 2. Process controller complete with LCD operator interface panel providing field settable/adjustable/access to process parameters and for providing specific indications of each type of fault that may occur. Controller RAM shall be backed up with non-volatile memory, which shall load automatically if RAM is corrupted.
  - 3. Square D Altivar 31, or equal, variable frequency drive (VFD) with line reactor.
  - 4. Control power transformer fused primary and secondary with 120 VAC transient voltage surge suppressor (TVSS). Transformer shall be 5kVA minimum. 120VAC branch circuit breakers shall be provided as follows:
    - a. 15A/1P or 20A/1P breakers as required for all controls/devices as recommended by screen system supplier.
    - b. One (1) 20A/1P breaker for panel-mounted GFCI convenience receptacle.
    - c. One (1) 20A/1P GFCI-EPD (30mA ground fault trip for equipment protection) for Heat Tracing circuitry at the screen as specified on electrical plans.
    - d. One (1) 20A/1P spare breaker for future use.
  - 5. Full-voltage LED pilot lights for the following:
    - a. Control power ON (White)
    - b. Screen RUN (Green)

- c. Multifunctional overload shutdown/screen FAULT (Red)
  - d. High water level ALARM (Amber)
6. HAND-OFF-AUTO selector switches for the following:
    - a. Screen drive
    - b. Dewatering chamber flush water system solenoid valve
  7. FORWARD-OFF-REVERSE selector switch (spring return to center) for screen drive.
  8. E-STOP pushbutton (Red)
  9. CYCLE/RE-SET pushbutton (Black)
  10. Door-mounted elapsed time meter
  11. Remote dry contact outputs for the following:
    - a. Screen RUN
    - b. Multifunctional overload shutdown/screen fault ALARM
    - c. High water level ALARM
  12. One (1) 20A-120V heavy-duty GFCI convenience receptacle with in-use weatherproof cast metal cover on exterior of panel.
  13. 600 VAC terminal block
  14. White phenolic nameplates with black lettering
  15. U.L. label for the project application
  16. Electrical enclosure shall be provided in accordance with paragraph 1.03.C.20.

## 2.05 ANCHOR BOLTS

- A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to anchor securely each item of equipment. Bolts, washers, and hex nuts shall be AISI Type 304 stainless steel unless noted otherwise. Anchor bolts shall be drilled-in - epoxy-type.
- B. Anchor bolts shall be set by the CONTRACTOR. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

## 2.06 SPARE PARTS

- A. The following spare parts shall be provided:

1. One (1) brush assembly with stainless steel mounting hardware
2. One (1) complete solenoid valve assembly
3. One (1) solenoid valve re-build kit
4. One (1) set of four lower bearing bars
5. One (1) set of fuses of each size and type

B. Spare parts shall be individually boxed with the project name and part number clearly identified on each individual box. All spare parts shall be shipped in a separate crate and clearly labeled. Spare parts shall be stored indoors by the CONTRACTOR in a temperature-controlled environment.

#### 2.07 SHOP SURFACE PREPARATION AND PAINTING

- A. Electric motors, speed reducers, and other self-contained or enclosed components shall have manufacturer's standard enamel finish.
- B. Clean all stainless-steel surfaces and provide glass bead blast or chemically passivate all external non-wetted stainless steel to a uniform finish with Citrisurf 2050 and/or 2210. Chemical passivated stainless steel products shall not produce any hazardous wastes during the passivation process. The vertical cylindrical screen manufacturer shall clearly identify the passivation procedure methodology and shall certify that no hazardous wastes were produced.

#### 2.08 SOURCE QUALITY CONTROL

- A. All structural stainless-steel components shall be fabricated in the United States and shall conform to the requirements of "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" published by the American Institute of Steel Construction.
- B. All parts and assemblies shall be fabricated from sheets and plates of AISI Type 304 stainless steel with a finish conforming to AISI 304 and ASTM A666, unless noted otherwise. All rolled or extruded shapes shall be fabricated to conform to ASTM A276. All tubular products and fittings shall be fabricated to conform to ASTM A269, A351 and A403.
- C. All welding in the factory shall use shielded arc, inert gas, MIG, or TIG method. Add filler wire to all welds to provide a cross section equal to or greater than the parent metal. All butt welds shall be full penetration type to the interior surface. Provide gas shielding to interior and exterior of the joint.
- D. Welding of the screen components shall be in accordance with the latest edition of the American Welding Society (AWS) standards. Field welding of stainless steel will not be permitted.



- E. Assembly bolts, nuts and washers shall be AISI 304 stainless steel furnished in accordance with ASTM A193.
- F. All surfaces that are specified to be machined shall be designed and fabricated to provide a runout of not more than 0.005 inches and a concentricity to within 0.005 inches.
- G. Design and fabrication of structural steel members shall be in accordance with AISC and AWS Standards. The manufacturer shall comply with the American Welding Society (AWS) and the American Institute of Steel Construction (AISC) most current listed standards and qualifications in 2004 D1.1, the criteria per the requirements of Section 6 - Inspection - Structural Welding Code. Evidence of such AWS and AISC compliance shall be submitted with shop drawing submittals as follows:
  - 1. The fabrication facility shall successfully meet the quality certification requirements of the AISC Quality Certification Program with a Category I or higher. The AISC Quality Certification Program will confirm that the AISC certified shop has the personnel, organization, experience, procedures, knowledge, equipment, capability and commitment to produce fabricated steel or stainless steel of the required quality for the wastewater treatment equipment.
  - 2. AWS Certified Welding Inspectors shall conform to all standards, current or previous as listed in section 6.1.4 AWS QC1, Standard and Guide for Qualification and Certification of Welding Inspectors.
  - 3. AWS Non-Destructive Testing Inspectors for Magnetic Particle and Ultra-Sonic testing shall conform to all standards, current or previous as listed in and in conformance with The American Society for Non-Destructive Testing (ASNT-TC-1A).

## PART 3 – EXECUTION

### 3.01 FIELD PREPARATION AND PAINTING

- A. The CONTRACTOR shall supply paint for field touch-up and field painting. The CONTRACTOR shall touch-up all shipping damage to the paint and stainless steel as soon as the equipment arrives on the job site.
- B. The CONTRACTOR shall finish paint electrical motors, speed reducers, and other self-contained or enclosed components with oil-resistant enamel.
- C. Prior to assembly, the CONTRACTOR shall coat all stainless-steel bolts and nut threads with a non-seizing compound.

### 3.02 INSTALLATION

- A. The manufacturer shall schedule one (1) trip to the project site for equipment start-up assistance as noted in paragraph 3.02.B. for the CONTRACTOR and for operating training as noted in paragraph 3.05.A. for OWNER personnel.

- B. After the CONTRACTOR has installed the screen and the equipment is capable of being operated, the equipment manufacturer shall furnish a qualified representative for a minimum of two (2) days (up to 16 hours) to perform start-up inspection of the equipment and training for the CONTRACTOR.
- C. After the equipment has been placed into operation, the manufacturer's representative shall make all final adjustments for proper operation and prepare a report certifying the installation meets all the manufacturer's requirements. The report shall be submitted to the OWNER and ENGINEER.

### 3.03 SHOP TESTING

- A. Prior to shipment of the equipment the screen shall be operated for a minimum of four (4) hours at the fabrication location with the specific drive motor that will be furnished for the project at the actual operating angle of the screen for the project.
- B. During the shop test the following parameters shall be recorded:
  - 1. Motor serial number
  - 2. Amperage draw at start-up, after two hours and after four hours during forward operation
  - 3. Amperage draw during reverse operation
- C. A certified shop test report shall be submitted to the ENGINEER.

### 3.04 FIELD TESTING

- A. Prior to final acceptance of the screen, three (3) tests shall be conducted according to the EPA Paint Filter Test as described in method 9095B of EPA Publication SW-846.
- B. Should the system fail to produce screenings capable of passing the "EPA Paint Filter Test", the manufacturer shall at its own expense make all necessary modifications to the equipment until such tests can be passed.

### 3.05 OPERATOR TRAINING

- A. Provide operator training for OWNER'S personnel after system is operational. Training will take place while manufacturer's representative is at the job site for inspection.

END OF SECTION

**SECTION 46 60 01**  
**LAGOON WASTEWATER TREATMENT EQUIPMENT SYSTEM**

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. The equipment and materials covered by these specifications are intended to be standard equipment of proven reliability and as manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated in accordance with the manufacturer's recommendations. The lagoon wastewater treatment equipment system shall consist of the following:

1. Electric Horizontal-Rotor Floating Aeration Equipment

a) There shall be furnished Eight (8) 20-HP electric horizontal-rotor floating aerator(s) for operation as shown on the plans. Aerator(s) shall be the S&N AIROFLO 2200 Series Stainless Steel Floating Brush Rotor(s), as manufactured by S&N AIROFLO, Inc., 1011 Sycamore, Greenwood Industrial Park, Greenwood, Mississippi 38930. Each aerator shall consist of an electric motor, gear reducer, flotation devices, mainframe, cradle frame, adjusting linkage, anchoring system, control panels, and access systems.

2. Electric Nitrification Equipment

a) There shall be furnished and installed Six (6) 10-HP electric floating biofilm nitrification rotor assembly for operation as shown on the plans. Biofilm nitrification rotor shall be S&N AIROFLO 8000 Series Floating Nitrification Rotor (FNR), as manufactured by S&N AIROFLO, Inc., 1011 Sycamore, Greenwood, MS 38930. Each biofilm nitrification rotor assembly shall consist of an electric motor, variable frequency drive, gear reducer, power cord, flotation devices, mainframe, cradle frame, adjusting linkage, anchoring system, and access systems.

3. Floating Baffle Curtains

a) S&N Airoflo, Inc., as the Aerator Manufacturer, shall furnish all baffle curtain materials anchor forms, all hardware, and incidentals required for installing, completing, and readying for operation, the floating baffle curtains indicated on the attachments and as specified herein, to include the concrete anchors and anchor posts. The Aerator

Manufacturer will coordinate with OWNER and CONTRACTOR during construction and installation of the baffle curtains.

#### B. Unitary Responsibility

1. In order to unify responsibility for proper operation of the complete lagoon wastewater treatment equipment system (the system), it is the intent of these Specifications that all system components are furnished by a single supplier (unitary source). Alternate manufacturers not offering a complete system design, including biological treatment design and a performance guarantee, shall not be considered. The system must be of standard catalog design, totally warranted by one manufacturer.
2. Under no circumstances will a lagoon wastewater treatment equipment system consisting of parts compiled and assembled by a manufacturer's representative, distributor, or other third-party source/manufacturer be accepted.
3. It shall be the responsibility of the system supplier to fully integrate and ensure the functionality of a complete lagoon wastewater treatment equipment system.

#### C. Basis of Design

1. The basis of design for these specifications is equipment manufactured by:
  - a) S&N AIROFLO, Inc.  
1011 Sycamore  
Greenwood, MS 38930
2. ENGINEER approved equal will be considered. Any equipment manufacturers wishing to supply equipment for the purposes of this project shall propose equipment that meets or exceeds the requirements set forth through these specifications, to include design documentation by a qualified water professional whose expertise includes the design of similar sized wastewater treatment equipment systems and is a registered professional engineer. The proposed equipment and relating treatment design must be approved by the ENGINEER.

### 1.02 REFERENCES

- A. American Gear Manufacturers Association (AGMA)
- B. National Electrical Manufacturers Association (NEMA)
- C. American Society for Testing and Materials (ASTM)
- D. American Welding Society (AWS)

E. American Society of Civil Engineers (ASCE)

### 1.03 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications – Aeration Equipment

1. Consideration will be given only to the aerators of well-established and reliable manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of aerators for the type of aeration basin geometry shown on the plans. The manufacturer shall have a basic aerator design that has twenty-five (25) years' experience. The manufacturer shall certify to not less than five (5) successful operating installations in the United States meeting the performance specifications as evidence of meeting the experience requirement.

#### B. Manufacturer's Qualifications – Nitrification Equipment

1. Consideration will be given only to the equipment of well-established and reliable manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of floating equipment used in wastewater treatment.

#### C. Manufacturer's Qualifications – Baffle Curtains

1. The manufacturer of the floating baffle curtain shall have at least ten years of experience in the construction of floating baffle curtains utilizing dielectric and / or hot wedge sealing fabrication methods. No sewn seams shall be permitted.
2. The manufacturer of the floating baffle curtains shall have manufactured a of no less than five-thousand linear feet of baffle curtains for tanks, ponds, and open water applications.

### 1.04 SUBMITTALS

#### A. Shop drawing submittals for aeration equipment shall include at least the following:

1. Certified shop drawings showing all details of construction, dimensions, anchor bolt location, and field connection.
2. Descriptive literature, bulletins, and catalogs of the equipment.
3. Installation, operation, and start-up procedures including lubrication requirements.
4. Complete motor data.
5. Total weight of the equipment including the weight of the single largest item.

6. A complete bill of materials for all equipment within the O&M manual along with maintenance schedules and procedures. No samples will be required.
  7. A list of spare parts that are supplied or can be requested with the equipment.
  8. Aeration equipment manufacturer shall provide documentation of experience including, but not limited to, twenty-five (25) years or more of aeration equipment manufacturing experience and installations treating municipal wastewater of equivalent nature. Aeration equipment manufacturer shall provide documentation of five (5) or more referenced aeration installations having been in continuous service for three (3) years or more.
  9. Based on motor output power and field transfer conditions, manufacturer must provide a minimum of five (5) separate installations demonstrating the desired treatment having used an SAE at field conditions of 2.3 lb O<sub>2</sub>/HP-hr in the design (See 1.4. Quality Assurance: ASCE Standard O<sub>2</sub> Transfer Rate of 3.0 lb O<sub>2</sub>/HP-hr)
- B. Shop drawing submittals for nitrification equipment shall include at least the following:
1. Certified shop drawings showing all important details of construction, dimensions, anchor bolt location, and field connection.
  2. Descriptive literature, bulletins, and catalogs of the equipment.
  3. Installation, operation, and start-up procedures including lubrication requirements.
  4. Complete motor data.
  5. Total weight of the equipment including the weight of the single largest item.
  6. A complete bill of materials for all equipment within the O&M manual along with maintenance schedules and procedures. No samples will be required.
  7. A list of spare parts that are supplied with the equipment.
- C. Submittals for the baffle curtain system must first be approved by the ENGINEER and shall include the following:
1. Shop Drawings with dimensioned construction details of each of the floating baffle curtains.
  2. Floating baffle curtain manufacturer including contact name, address and telephone number.
  3. Product data and physical properties of the floating baffle curtain material along with fabric manufacturer name, contact, address, and telephone number.

4. Product data with specifications covering all components used in the fabrication of the floating baffle curtain.
  5. Installation instructions.
  6. Operation and maintenance instructions.
- D. Submit operations and maintenance manuals for the aeration and nitrification equipment in compliance with the Contract Documents, 30 days prior to shipment. Manuals shall include:
1. Name, address, and telephone number of the nearest competent service representative who can furnish parts and technical service.
  2. Pictorial illustrations of handling, installing, preventative maintenance, and major component replacement.
  3. Operating, maintenance and troubleshooting information.
  4. Complete maintenance parts list.
  5. Complete connection, interconnecting and assembly diagrams.
  6. Complete bill of materials.

#### 1.05 DELIVERY, STORAGE AND HANDLING

##### A. Packing, shipping, Handling and Unloading

1. Aeration and nitrification equipment shall be transported, unloaded, handled, and stored in accordance with the manufacturer's recommendations for the equipment.
2. Deliver materials to the Site to ensure uninterrupted progress of the Work. Packaging of the floating baffle curtain shall be the responsibility of the floating baffle curtain manufacturer so that the floating baffle curtains shall not be damaged during shipment.

##### B. Storage and protection

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

#### 1.06 PERFORMANCE REQUIREMENTS

- A. The aeration equipment, as installed, shall comply with the following:

1. Each aerator shall provide an oxygenation capacity of 720 lb O<sub>2</sub> per 24-hour period of continuous operation at standard conditions (20 hp x 3.0 lb O<sub>2</sub> HP-hr x 24 hr).
  2. Each aerator shall develop an oxygen transfer efficiency of no less than 3.0 lb O<sub>2</sub>/HP-hr based on motor output power at standard conditions.
  3. The performance requirements for each aerator must be met at an amp loading no greater than 90% of full load amps.
- B. The nitrification equipment, as installed, shall comply with the following:
1. Each nitrification rotor shall provide a minimum nitrification capacity of 3900 grams (8.58 pounds) per 24-hour period of continuous operation at standard conditions.
  2. Each nitrification rotor shall provide a minimum ammonia reduction capacity of 4.0 g (0.000817 pounds) NH<sub>3</sub>-N per square meter (square feet) per 24-hour period of continuous operation at a temperature of 20° C.
  3. Each nitrification rotor shall rotate at 3 RPM and at a peripheral speed of 0.2 to 0.28 meters per second (0.7 to 0.9 feet per second).
- C. The baffle curtains, as installed, shall comply with the following:
1. See Part 2 Products – Baffle Curtains

## PART 2 - PRODUCTS

### 2.01 MOTORS

- A. Each aerator shall be driven by single speed, Premium efficiency, minimum 1.25 SF (at full load amps, not to be confused with operational loads) horizontal shaft electric motor. The electric motor shall be an induction motor 20 HP, 3-phase, 1800 RPM, 60 Hertz, 230/460 Volt, TEFC, NEMA premium efficiency. Motor shall operate at 90% or less of its rated full load during normal operation. The aerator manufacturer shall provide certification that the nameplate data affixed to the aerator's electric motor is valid, specific data applicable to that particular motor. The motor shall carry a manufacturer's warranty from the date of installation.
- B. Each nitrification rotor shall be driven by single speed, premium efficiency, minimum 1.15 SF (at full load amps) horizontal shaft electric motor. The electric motor shall be an induction motor 10 HP, 3-phase, 1800 RPM, 60 Hertz, 230/460 Volt, TEFC, NEMA premium efficiency. Motor shall operate at 90% or less of its rated full load during normal operation. The manufacturer shall provide certification that the nameplate data (affixed to the electric motor) is valid and specific to that particular motor. Separate power cables shall be furnished for each unit in accordance with the manufacturer's recommendations for the proposed location of each unit.



## 2.02 GEAR REDUCERS – AERATION EQUIPMENT

- A. Each aerator shall have a new constant-duty AGMA class III gear reducer possessing a minimum 2.0 service factor based on manufacturer's recommended loading. The gear reducer shall connect directly to the rotor shaft by a twin tapered bushing. The gear reducer shall be connected inline to the electric motor and driven by a coupling with an elastomeric element. The coupling shall be attached to the motor and gear shafts by a taper lock bushing. Gear reducer shall be manufactured by Dodge and shall include a Dodge Raptor elastomeric coupling.
- B. Each gear reducer shall be equipped with a Vented Breather modified to attach to the gear reducer to extend the life of the gear oil and reduce maintenance costs. As the thermals change in the cavity of the gear reducer, moisture vapor is trapped in the proprietary media to be released through the bottom of the breather housing. This prevents the accumulation of moisture in the cavity of the gear reducer reservoir. The Modified Vented Breather lowers and stabilizes the relative humidity inside the reservoir leading to a lower dew point. Lower dew point means no condensation, even when the machine is shut down. These Vent Breathers shall provide protection from moisture for a minimum of two years before replacement is required.
- C. Each gear reducer shall be fitted by the aerator manufacturer with external seal guards to provide a labyrinth of protection to the gear reducer seals. Protection of the seal must include not only protection from splashed water but also protection from atmospheric moisture. The seal guards consist of a Teflon seal plate with an additional barrier of grease over the seal area for extra protection from atmospheric moisture. Each gear reducer shall be drilled and tapped to accept a UHMW hold down ring to stabilize the seal plate. Gear reducers without external seal guards shall not be acceptable.
- D. Gear reducers shall be mounted in an open area. Location of gear reducers shall allow convenient access for maintenance and for free-flowing air to prevent heat buildup and the possible need for external cooling devices.

## 2.03 GEAR REDUCERS – NITRIFICATION EQUIPMENT

- A. Each rotor shall have a new constant-duty AGMA class III gear reducer possessing a minimum 2.0 service factor. The gear reducer shall connect directly to the rotor shaft by a tapered bushing and spanner nut. The gear reducer shall be connected to the electric motor and driven by a banded and cogged ARAMID fiber (non-stretchable) belt via a double-grooved pulley. Thermal ratings shall not exceed a maximum sump temperature of 200° F and an ambient temperature of 100° F.
- B. Schaeffer 293A Gear Lube shall be used in the gear reducer reservoir. Ester based synthetic oils shall not be accepted. Other oil besides PAO based synthetic can reduce the life of some seals and o-rings.

- C. Each gear reducer shall be equipped with a vent breather modified to attach to the gear reducer to extend the life of the gear oil and reduce maintenance costs. As the thermals change in the cavity of the gear reducer, moisture vapor trapped in the proprietary media shall be released through the bottom of the vent housing to prevent the accumulation of moisture in the cavity of the gear reducer reservoir. The modified vent breather shall lower and stabilize the relative humidity inside the reservoir leading to a lower dew point to prevent condensation even when the machine is shut down. Neither diaphragm nor desiccant style breathers shall be acceptable. Breathers shall operate at ambient pressure.
- D. Each gear reducer shall be fitted by the rotor assembly manufacturer with external seal guards to provide a labyrinth of protection to the gear reducer seals. The seal guards shall provide an extra layer of protection to each of the three seals in the gear reducer. The seal guards shall consist of a rubber or Teflon seal plate (depending on the gears design) with an additional barrier of grease over the seal area. Each gear reducer shall be drilled and tapped to accept a UHMW hold down ring to stabilize the seal plate. Gear reducers without external seal guards will not be accepted. Simple v-rings or slingers will not be acceptable.

#### 2.04 DRIVE ASSEMBLY, SHIELDS AND MOTOR COVER – AERATION EQUIPMENT

- A. The drive design employed shall be “Flex Drive” as approved by Dodge Engineering. Drive assemblies with “bolt on” or “locked mounted” gear reducers shall not be acceptable. A shaft mounted gear using a face mounted plate, is attached to the frame with heavy pins to allow tri-axial movement. The movement allowed by the pin and plate arrangement eliminates critical alignment issues, thus eliminating misalignment pressure on the bearings in the gear reducer. Further reduction of possible alignment issues is greatly reduced through the use of an elastomeric coupling between the motor and the gear.
- B. The Extended Vertical Shield (EVS) on the drive end of the aeration equipment rotor consists of an 8’ wide shield and a structural framework, attached to the main frame. The EVS is sized and designed to provide a clean dry area around the motor and gear reducer. The shield system construction shall incorporate protection of the seal and bearing area of the gear. The construction shall not allow wastewater to be transmitted along the rotor shaft by use of a floating rotor shaft seal.

#### 2.05 DRIVE ASSEMBLY COVER – NITRIFICATION EQUIPMENT

- A. A 304 Stainless Steel “clam shell type” drive assembly cover will be mounted to the frame over the motor, belt drive, and gear reducer. Cover will be hinged on one side allowing for ease of use to gain access to drive assembly. The cover shall be open at the bottom to prevent accumulation of dirt and debris.

#### 2.06 HORIZONTAL ROTOR ASSEMBLY AND TAIL BEARING – AERATION EQUIPMENT

- A. The Rotor assembly shall consist of an 8-5/8” O.D. flanged torque tube with a 41 1/2” overall diameter. The flanges shall be indexed to fit the stub shaft hub. The rotor stub shafts

shall consist of a fabricated hub stress relieved to 1200 degrees Fahrenheit and fitted with a 1045 carbon steel shaft. The shaft to hub fit shall be a heavy shrink fit, performed as the final step of the fabrication. A specific combination of rotor length and number of blades will provide the required HP to meet the performance requirements of the aerators called for in this specification.

- B. All blades shall be C-shaped, reduced-impact blade design. The blades for a 41 1/2" diameter rotor shall be attached in banks of four blades of the same length, with the length of the blades in each bank alternating between 16-3/4" and 13-3/4". Rotor assembly shall be balanced to prevent vibration. Each bank of blades shall be welded to the torque tube using a specific off set to form a helix design to eliminate shock loadings. The vertical sides of the C-shaped rotor blade shall serve as gussets to reinforce the vertical strength of the blade and to relieve pressure on welded connections. Bolt-on blades are not acceptable.
- C. Rotor and blades shall be constructed from 304 stainless steel.
- D. The Rotor shall be supported by a tail end stub shaft and a face mounting plate designed in conjunction with an elastomeric coupling to allow tri-axial movement of the gear to avoid undue misalignment pressure on the bearings in the gear reducer.
- E. Each unit shall possess a wastewater lubricated tail bearing, requiring no greasing or any other source of additional lubrication. The body of the bearing is constructed of UHMW polyethylene. The shrink fitted bronze bushing is designed to wear against the ultra-high molecular weight (UHMW) polyethylene. The inside of the bi-metallic bushing, also shrink fitted to the shaft is carbon steel and serves as a visual indicator of wear and as additional mass to extend the normal wear process and to protect the stub shaft. The manufacturer shall supply instructions for the replacement of the bi-metallic wear bushings. The bearing shall be constructed of UHMW polyethylene, with a minimum bearing surface width of 4". The top side, of the outboard side, of the bearing is cut away for easy visual inspections. Mechanical bearings requiring greasing, either manual or automatic, will not be accepted.

#### 2.07 NITRIFICATION ROTOR ASSEMBLY AND BEARINGS:

- A. The rotor assembly shall consist of an 8-5/8" O.D. flanged torque tube with a 56" overall diameter. The flanges shall be indexed to fit the stub shaft hub. The rotor stub shafts shall consist of a fabricated hub stress relieved to 1200 degrees Fahrenheit and fitted with a 1045 carbon steel shaft. The shaft to hub fit shall be a heavy shrink fit, performed as the final step of the fabrication.
- B. The structural design of the rotor shall consist of multiple sets of wheel like spoke and rim structures attached by welding to the torque tube hub. The spoke and rim structures shall divide the rotor into sections for strength and for the purpose of controlling the movement of the plastic media. The ends and sides of the rotor shall be covered with expanded metal that is welded to the rim of the spoke and rim structures. Each section of the rotor shall include an access hatch.
- C. Rotor shall be constructed of 304 Stainless Steel.

- D. The rotor shall be supported by two (2) external, wastewater lubricated, maintenance free UHMW bearings.
- E. Each unit shall possess two (2) bearings to support the rotor, an external drive bearing, and an external tail bearing. Both the drive shaft of the rotor assembly and the tail shaft shall be fitted with wastewater lubricated bearings which require no external water source. Both shafts shall be shrink fitted bi-metallic bushings. Bronze shall be used on the outside of the bi-metallic bushing to wear against the ultra-high molecular weight (UHMW) polyethylene. The inside of the bi-metallic bushing shall be carbon steel and serve as a visual indicator of wear, serve as additional mass to extend the normal wear process, and to protect the stub shaft. The manufacturer shall supply instructions for the replacement of the bi-metallic wear bushings. The bearing shall be constructed of UHMW polyethylene, with a minimum bearing surface width of 4" on the drive end and 4" on the tail end. The block shall have a 1-1/2" port in the top for inspections. Mechanical bearings requiring greasing, either manual or automatic, will not be accepted.

## 2.08 FLOTATION DEVICES – AERATION AND NITRIFICATION EQUIPMENT

- A. Each unit shall contain Two (2) Stainless Steel flotation devices capable of floating and stabilizing the unit. Each float shall be fabricated from Type 304 stainless steel having a minimum thickness of 0.0625 inches. All seams shall be welded for strength. Flotation devices shall be internally reinforced and filled with high-density polyurethane foam and completely sealed from the environment. Flotation stability is mandatory. Prior to assembly, flotation devices shall be sealed, and pressure tested at 3.0 psig.

## 2.09 MAIN FRAME

### A. Aeration Equipment

- 1. The horizontal beams of the main frame shall be constructed from 2" x 3" 304 stainless steel structural tubing. All frame connections shall be welded for strength. The main frame shall have lift brackets sufficient for handling purposes. Each end of the frame shall have a non-skid platform, welded in place for added structural integrity and to provide convenient platforms for inspections and maintenance. A splash guard shall be welded to the main frame and extend downward into the water to help protect the drive assembly from splash created by the rotor.

### B. Nitrification Equipment

- 1. The horizontal beams of the main frame shall be constructed from 3" x 3" structural 304 Stainless Steel tubing. All frame connections shall be welded for strength. The main frame shall have lift brackets sufficient for handling purposes. Each end of the frame shall have a non-skid platform, welded in place for added structural integrity, and to provide convenient platforms for inspections and maintenance. A splash guard shall be welded to the main frame and extend downward into the water to protect the drive assembly from splash created by the rotor.

## 2.10 CRADLE FRAME

### A. Aeration Equipment

1. A cradle frame shall attach the Flotation devices to the main frame and provide adjustment points to allow adjustments to rotor blade operating depth and respective motor operating amperage. Cradle frames shall 304 stainless steel. The frame shall be connected to the anchoring system in a way that the forces resulting from wave action and other movement are not transferred to the Flotation system. Rubber pads shall also be provided for isolation of the floats from the cradles.

### B. Nitrification Equipment

1. A cradle frame shall attach the flotation devices to the main frame and provide adjustment points for adjusting the operating depth and respective motor operating amperage. Cradle frames shall be constructed out of 304 Stainless Steel. The frame shall be connected to the anchoring system in a way that the forces resulting from wave action and other movements are not transferred to the flotation system. Rubber pads shall also be provided for isolation of the floats from the cradles.

## 2.11 ADJUSTING LINKAGE

### A. Aeration Equipment

1. Each unit shall have adjusting linkage attached to each corner of the main frame. Adjusting linkage shall be capable of changing the operating depth of the horizontal-rotor blades, the horsepower requirements, and amp draw, and provide leveling of the aerator. Adjusting linkage shall be fabricated from 304 stainless steel rods with brass adjusting nuts to prevent seizing. Adjusting linkage shall not be connected directly to the anchoring system nor shall it mechanically depend on the anchoring system for it to be effective. These adjusting points shall adjust rotor submergence, thus operating the rotor at the performance levels for oxygen transfer and mixing, as prescribed by the specification. Floating rotors without these adjustments shall not be acceptable.

### B. Nitrification Equipment

1. Each unit shall have adjusting linkage attached to each corner of the main frame. Adjusting linkage shall be capable of changing the operating depth of the rotor, the horsepower requirements, and amp draw, and provide leveling of the nitrification rotor. Adjusting linkage shall be fabricated from Type 304 stainless steel rods with brass adjusting nuts. Adjusting linkage shall not be connected directly to the anchoring system nor shall it mechanically depend on the anchoring system to be effective.

## 2.12 ACCESS SYSTEM

## A. Aeration Equipment

1. The access system shall provide for safe and convenient access to the units for the performance of scheduled maintenance inspections and simple repairs. Airoflo EZ Access system shall consist of, but not be limited to, the following:
  - a. Float Mounted Platforms (FMP) attached on the ends of each float to allow safe and convenient access to both ends of the rotor, without using a boat. The FMP is strapped around the end of the floats and provides a non-skid surface and a hand rail, for easy on & off access.
  - b. Safety Masts; (2) Per Unit. The Safety Masts is an “L” shaped bracket attached to the frame at each end of the rotor for the attachment of a safety harness, supplied by the customer. A chain allows linkage adjustment to allow the operator the bend as low as required, but limit movement beyond a certain point.
  - c. Vertical Hand Holds (VHH): (2) Per Unit. VHH is simply a vertical bar attached to the frame in a location convenient to operators for the transition step from the float platform to the frame.
  - d. Hot Dipped Galvanized Levee Access Walkways: S&N Airoflo hot dipped galvanized access walkways designed for use in conjunction with the S&N EZ Access systems and the S&N Airoflo floating horizontal brush rotors. Walkway widths are approximately 3' and the handrails will extend the entire length. Level variations of the levee structure will be adjustable with drop steps included on the end of each walkway. Individual access walkways will be included for both the Drive End and Tail End of each aerator.

## B. Nitrification Equipment

1. Float mounted platforms shall be attached to the floats at the drive-end of the unit. These platforms will be constructed of Type 304 Stainless Steel and provide a non-skid surface and a handrail for safe and convenient access for scheduled O&M inspections and light repairs.

## 2.13 ANCHORING SYSTEM

### A. Aeration Equipment

1. The custom anchoring system shall secure the main frame of the aerator in the desired position and limit its lateral movement potential. It shall not restrict the unit's flotation and shall allow for continuous aerator operation with fluctuations in water surface elevation required by the specific application. This system will be supplied with a Levee Anchoring System (LAS); Thirty (30) feet in extension length. The 30' LAS will allow the unit to float level and operate at the various water levels required for the lagoon application.

## B. Nitrification Equipment

1. The anchoring system shall secure the main frame of the nitrification rotor in the desired position and limit its lateral movement potential. It shall not restrict the unit's flotation and shall allow for continuous operation with fluctuations in water surface elevation. The anchoring system shall be as shown on the construction drawings and as recommended by the manufacturer. In this application, Thirty (30) ft. levee anchoring system shall be provided for each rotor unit to float level and operate at the various water levels required for the lagoon application.

### 2.14 AERATOR CONTROL PANEL

- A. The Aerator Manufacturer shall furnish One (1) simplex Aerator Control Panel for each 20 HP, 3 phase, 460 volt aerator, supplied with the following for each aerator:
  1. Thermal Magnetic Breakers for each rotor
  2. Motor Starters with ambient compensated overload relays for each rotor
  3. 24 Hour Time Clocks for each rotor
  4. CPT with primary and secondary fusing properly sized by the manufacturer
  5. Oil-tight HOA Switch
  6. Green "ON" indicator light
  7. Red "OFF" indicator light
  8. Amber "ALARM" indicator light
  9. Control relays as required
  10. NEMA 4X Enclosure
- B. Refer to Specification Section 26 29 00 ("Manufactured Control Panels") for additional requirements.
- C. Aerator Manufacturer shall furnish each aerator with type SOOW electrical cable along with flexible conduit to a bank mounted disconnect adjacent to the motor end of the levee anchoring. Aerator manufacturer shall determine cable gauge size and length of cable required per unit. Contractor is to install aerator control panel as shown on the plans. All electrical to be installed according to the National Electric Code.
- D. Materials of construction for the aforementioned control panels shall comply with all more stringent requirements which may exist in the electrical section of these specifications.

### 2.15 NITRIFICATION SYSTEM CONTROL PANEL

- A. Refer to Specification Section 26 29 00 ("Manufactured Control Panels") for additional requirements.
- B. The unit control will be based on the Control Techniques Unidrive M400 Variable Frequency AC Drive (VFD) from Nidec Motor Corporation. This VFD smart drive is used to create the extremely low speed rpms required to accomplish the treatment performance as required from the attached growth process. The AC drive includes the capability to provide motor protection and other functions as expected in a municipal wastewater

control environment. The AC drive shall be derated by at least one standard motor size. Refer to specification section 26 29 00 for panel thermal management requirements.

- C. Each rotor drive/VFD shall be installed within a triplex NEMA 4X SS panel (complete with main breaker, CPT with primary/secondary overcurrent protection, etc.) as indicated on plans. The panel will be sized for outside operation uncovered in the open. The panel will be attached to a hot dipped galvanized frame for easy field installation.
- D. Each VFD shall be provided with:
  - a. Thermal Magnetic Breaker
  - b. HOA selector switch for manual control (when in HAND mode)
  - c. Green "ON" indicator light
  - d. Red "OFF" indicator light
  - e. Amber "ALARM" indicator light
- E. Rotor Manufacturer shall furnish each rotor with type SOOW electrical cable along with flexible conduit to a bank mounted j-box adjacent to the motor end of the levee anchoring. Rotor manufacturer shall determine cable gauge size and length of cable required per unit. Contractor is to install rotor triplex control panel as shown on the plans. All electrical to be installed according to the National Electric Code.
- F. Materials of construction for the aforementioned control panels shall comply with any more stringent requirements which may exist in the electrical section of these specifications.

## 2.16 SPARE PARTS AND HANDLING TOOLS

- A. Includes one (1) spare elastomeric element for the coupling on the rotor.
- B. One (1) Lifting Bar to ensure the safe and proper handling of the aerators during unloading and installation.
- C. One (1) spare ARAMID fiber non-stretchable belt.

## 2.17 BAFFLE CURTAIN SYSTEM

### A. Description:

1. The baffle curtains shall consist of a fabric wall that is anchored at the bottom by a galvanized chain in a sealed pocket and is floated at the top by buoyant logs that are also in a sealed pocket. The floating baffle curtains shall be constructed in multiple sections resulting in the specified dimension of each curtain. Weight and ease of handling at the job site shall be taken into account when determining the lengths of the prefabricated floating baffle sections. The floating baffle curtains shall be delivered to the jobsite ready to install and the only fabrication required at



the jobsite shall be the connection of the floating baffle sections. The floating baffle curtains shall be floated into position for installation.

#### B. Design Criteria:

2. A total of Two (2) floating baffle curtains are required:
  - a. One (1) floating baffle curtain Six (6) ft deep by approximately 600 ft long (CONTRACTOR to verify pond dimensions and baffle lengths with manufacturer) floating baffle curtain with tapered end to fit a 1 to 1 slope, and the other end vertical to terminate in the pond. Ballast chain and / or cable connections to the shore anchor posts shall be constructed to a sufficient length to allow for installation. Baffle curtain to separate lagoon into aeration chamber and ammonia polishing contact area.
  - b. One Eight (8) ft deep by approximately 35 ft long (CONTRACTOR to verify pond dimensions and required baffle dimensions with manufacturer) floating baffle curtain with tapered end to terminate in pond. Baffle curtain to form multiple chambers with opposing windows to facilitate maximum detention time and flow for contact with Manufacturer's Ammonia Polishing Biological Contactor.
  - c. MANUFACTURER to verify that an average depth of six (6) feet exists within the lagoon treatment basin prior to installation of any treatment equipment.

#### C. Details of Construction

##### 3. Flotation

- a. The flotation consists of 6-inch diameter (minimum) flotation logs made of closed cell polyfoam logs, having the buoyancy of at least 60 pounds per cubic foot.
- b. The flotation shall be completely enclosed inside the floating baffle curtain by means of a thermal seal. Each flotation log shall be sealed in its own chamber along the top of the floating baffle curtain.

#### D. Anchoring

##### 1. Bottom Ballast

- a. The floating baffle curtain shall be anchored in position by a galvanized chain thermally sealed into a pocket along the bottom of the curtain.
- b. The chain shall be continuous from berm through each floating baffle curtain section, connected to each other with a stainless-steel rapid link. The ballast shall be 1/4" (minimum) galvanized proof coil chain.

## 2. Concrete Anchors

- a. Concrete anchors shall be placed along the upstream side of the ballast chain at 18' intervals beginning at the toe of the levee. The concrete anchors shall be attached to the ballast chain using a stainless-steel rapid link or marine grade rope. The connection shall be secured to the ballast chain through cutouts in the ballast chain pocket forming an opening exposing the ballast chain for attachment of the concrete anchors. The concrete anchors shall be made using a five-gallon bucket, filled with concrete with a 3/8" x 9-inch-long or greater galvanized eyebolt, flat washer and two nuts, inserted into the concrete at least 6" to 7" to form an attachment. The eyebolt shall be of a size to accept a 3/8" stainless steel rapid link thru the eye of the eyebolt.

## 3. Retrieval Rope

- a. The concrete anchors shall be made retrievable by securing one end of a 3/8" diameter marine grade rope through the ballast chain and the other end of the rope secured to a stainless-steel grommet paced in the flotation collar located at the top of the floating baffle curtain.

## 4. Shore Anchor Post

- a. The shore anchors shall consist of a 4" diameter by 8' long 304 stainless steel schedule 20 pipe buried a minimum of six feet in concrete. Concrete should encase the post at a minimum diameter of 2'. The shore anchor post shall also be filled with concrete. The shore anchor posts shall be located on the levee side slope approximately 1' off the top of the levee.

## E. Cable

### 1. Tension Cable

- a. The cable shall be 1/4" diameter, stainless steel sealed in a pocket on the lower side of the flotation collar and shall be continuous from berm through each floating baffle curtain section, connected to each other with 3/8" stainless steel rapid links. The cable shall have the breaking strength of at least 12,000 lb.

## F. Connections

### 1. End Connection

- a. The end connections shall consist of 1/4" x 4" x 12" stainless steel predrilled plates that shall be attached to the floating baffle curtain with 3/8" diameter by 1-1/2" long stainless-steel nuts and bolts to "sandwich" the end of the floating baffle curtain between the end

plates. The tension cable or connection chain shall connect the anchor posts to the stainless-steel predrilled plates at both top and bottom of the curtain. No grommets shall be used for the connections to the shore anchor posts.

2. Baffle Connection

- a. The floating baffle curtain sections shall be joined with the use of 3/16" x 1-1/2" x 10" long stainless-steel predrilled plates and 3/8" diameter by 1-1/2" long stainless-steel nuts and bolts. The plates shall be applied to the outside of each floating baffle curtain section, then bolted together to "sandwich" the joining sections together.

3. Miscellaneous Hardware

- a. All hardware provided for the floating baffle curtains shall be type 304 stainless steel. The galvanized ballast chain shall be the only exception.

G. Baffle Curtain Material

- 1. The baffle material shall be a reinforced synthetic material. The material supplied under these specifications shall be a first quality product specifically designed and manufactured for this application and demonstrated to be suitable and durable for the construction of floating baffle curtains.

2. Physical Specifications:

- a. Color: Black
- b. Base Type: Polyester
- c. Fabric weight: 7 oz/yd<sup>2</sup>
- d. Finished Coated Weight: 30.0 +/- 2.0 oz/yd<sup>2</sup>
- e. Grab Tensile: 550/525 lbs/in
- f. Minimum Adhesion: 10 lbs/in
- g. Minimum Hydrostatic Resistance: 500 psi

- 3. The material shall be 6730 XR-5 as manufactured by the Seaman Corporation of Wooster, Ohio.

H. Manufacturers

- 1. S&N Airoflo, Inc./Engineered Textile Products, Inc.
- 2. Or approved equal.

PART 3 - EXECUTION

3.01 EXECUTION – AERATION AND NITRIFICATION EQUIPMENT

- A. The floating aerators shall be installed by the contractor. The Manufacturer shall be responsible for providing proper installation instructions to assure proper alignment and tolerances.
- B. Upon completion of installation, the manufacturer shall conduct installation certification, start-up, O&M review, and the initial inspection of the unit(s). It will be the on-site personnel's responsibility to conduct the 60-day inspection and return a completed inspection form (inspection form can be found in Part 2 of the O&M manual) to S&N Airoflo, and the Engineer and Owner. The 60-day inspection and completed inspection form returned to S&N Airoflo is required in order to execute the start of the warranty.
- C. S&N Airoflo warrants their equipment to be free from defects in material and workmanship for a period of one (1) year following operation start-up and acceptance. During this one (1) year period, S&N Airoflo will replace or repair (F.O.B., factory) any part (or parts) returned that have failed under normal use and service. The electric motor and gear reducer warranties shall be as stated by the manufacturers.
  - 1. The S&N Airoflo warranty period ends twelve (12) months after the start-up date.
  - 2. Any damages resulting from acts of God, vandalism, animals, or high or low voltage will not be covered under warranty.

### 3.02 EXECUTION – BAFFLE CURTAINS

- A. CONTRACTOR to verify dimensions of the lagoon and to determine exact location of the shore anchor posts with the manufacturer prior to ordering floating baffle curtains.
- B. The floating baffle curtains shall be installed into position as shown on the project plans. The floating baffle curtains shall be installed in accordance with manufacturer's shop drawings, instructions and recommendations.
- C. MANUFACTURER to provide to ENGINEER Certification that the floating baffle curtains were installed in accordance with the Contract Documents.
- D. Warranty
  - 1. The baffle manufacturer shall warrant the floating baffle curtain against defects in workmanship and materials for a period of two years from the date of delivery.
  - 2. The floating baffle curtain material shall be warranted by the manufacturer against weathering for a period of ten years, prorated.

## PART 4 - PERFORMANCE GUARANTEE

### 4.01 GUARANTEE

- A. The existing treatment process consists of a facultative lagoon (12 mil gal). The effluent cannot satisfy the new NPDES permit limits on ammonia-N of 4.5 mg/L (monthly average summer limit) and on CBOD5 of 7 mg/L (monthly average summer limit) and 25 mg/L (monthly average winter limit). The limits on effluent ammonia in winter (monthly average) of 20 mg/L and on suspended solids (90 mg/L monthly average) can be achieved by the existing lagoon system. Typical effluent ammonia-N concentrations are in the 4 to 18 mg/L range. Thus, this facility needs to upgrade its nitrification efficiency. The design will be based on the critical summer period, and a current effluent ammonia-N concentration of about 20 mg/L during the peak summer months. Typical effluent CBOD5 concentrations are in the 13 to 31 mg/L range. Typical effluent TSS concentrations are in the 15 to 60 mg/L range. Dividing the lagoon into two aerated cells and one nitrification cell and providing efficient effluent filtration will be necessary to satisfy the new NPDES effluent limits. All calculations are based upon, and this guarantee will require for validation, an average treatment lagoon depth of six (6) feet from the water surface to the top of any sludge buildup.
- B. S&N Airoflo, Inc. (S&N) has recommended Six (6) Bioflo units to reduce the ammonia nitrogen concentration.
- C. During summer conditions, almost complete nitrification should be achieved by the biofilm nitrification units. This facility should consistently meet the effluent limit of 4.5 mg/L ammonia-N. The BIOFLO units also should reduce the ammonia-N to acceptable levels during winter conditions. With good CBOD removal in the two aerated cells and effluent filtration, the stringent summer effluent CBOD5 limit of 7 mg/L (monthly average) should be achieved on a consistent basis. The winter CBOD5 limit of 25 mg/L (monthly average) also should be achieved on a consistent basis.
- D. S&N shall provide an equipment performance warranty that the equipment will effectively reduce the ammonia nitrogen dissolved in the wastewater from the OWNER's Wastewater treatment facility to a level not to exceed 4.5 mg/L ammonia-N.
- E. The equipment performance warranty is for a period of 60 consecutive days of operation of the system by CONTRACTOR/OWNER personnel and/or people or persons contracted (and/or hired at Contractor's expense) to operate the system for that timeframe. This performance warranty time shall begin after the system has reached operational stability during the start-up process and is for the purpose of demonstrating to OWNER that the system can meet the required effluent quality of 4.5 mg/L of ammonia nitrogen on a consistent basis under varying operating conditions. If the system doesn't consistently achieve the required effluent quality during the entire performance warranty period, S&N shall provide whatever studies and corrective measures necessary to modify the equipment, operation, and/or construction to provide OWNER with a treatment system which will meet the required 4.5 mg/l of ammonia nitrogen for 60 consecutive days. In the event that a second 60-day performance warranty period is necessary, this additional effort will be solely at S&N'S expense and shall be conducted with the minimal elapsed time between the initial performance period and the second.

- F. To document performance, the amount of ammonia nitrogen in the wastewater effluent shall be tested a minimum of three times each seven days during each performance warranty period. Sampling and testing shall be performed in accordance with standards required by the OWNER'S NPDES permit at the expense of the OWNER. Copies of test reports shall be submitted to the Engineer.
  
- G. In the event that the system provided, constructed, and operated by OWNER cannot meet the required effluent limit of 4.5 mg/L ammonia nitrogen on a consistent basis (defined as seven (7) consecutive 24-hour days) over a 60 day period, and S&N has been afforded an opportunity to make any and all modifications which S&N deems necessary, and the wastewater influent characteristics are within the limits specified herein, and S&N has had an opportunity to provide proof of performance for a second 60 day period, S&N shall be considered in default of the equipment performance warranty. Additional units will be added at the expense of S&N Airoflo in order to achieve the required effluent limit.

END OF SECTION

**SECTION 46 61 42  
CLOTH MEDIA DISK FILTER**

**PART 1 – GENERAL**

**1.01 SECTION INCLUDES**

- A. Furnish all labor, materials, equipment and incidentals required for automatic backwash filter system as shown on the plans and as specified herein, installed, tested and ready for operation.
- B. The Cloth Media Disk Filter shall consist of individual disks of the number required; support columns and frames, a centrally located rotating shaft with vacuum shoe assemblies mounted thereto, 304 stainless steel swivel joints, filtrate pipes, drive mechanism complete with sprockets and non-metallic drive chain, automatic Allen Bradley MicroLogix 1400 PLC control panel with 10" color touch screen.
- C. Filter system shall be designed for installation as shown on the contract drawings/plans and installed in a 304 stainless steel tank.

**1.02 MEASUREMENT AND PAYMENT**

- A. No separate payment will be made for work required under this section. Contractor will include all costs of the requirements of this section in the appropriate bid item(s) on the bid form.

**1.03 QUALITY ASSURANCE**

- A. Applicable Standards
  - 1. ASTM – American Society for Testing and Materials
  - 2. AISI – American Iron and Steel Institute
  - 3. AGMA – American Gear Manufacturer’s Association
  - 4. NEMA – National Electrical Manufacturer’s Association
  - 5. NEC – National Electrical Code
- B. To assure unity of responsibility, all components of the disk filter system shall be supplied by a single manufacturer.
- C. Acceptable Manufacturer:
  - 1. Five Star Filtration, LLC - Five Star Cloth Media Disk Filter
  - 2. AQUA AEROBICS SYSTEM INC. – Aqua Mini Disk
  - 3. Pre-Approved Equal

**1.04 SUBMITTALS**

- A. Submit according to Section 01 33 00 – Submittal Procedures.

- B. Submit dimensioned, to-scale drawings of equipment showing its proposed installation in this facility. Where piping, structural components, etc. are involved, drawings shall show clearly that the proposed equipment will fit into the plant design without significant modifications and will function as intended in conjunction with other plant items. Modifications to plant structures, piping, electrical, etc. shall be made at the Contractor's expense and only after approval by the Engineer.
- C. Information required for approval by the Engineer prior to incorporation into the project shall include the following as a minimum requirement:
  - 1. Certified dimension prints detailing all required anchor bolt locations and conduit stub-outs. Submit dimensioned to-scale drawings showing installation of screening equipment for this specific application.
  - 2. Specifications for all electrical and mechanical components and complete wiring diagrams for all components.
  - 3. Manufacturer's recommended procedures for jobsite storage and handling of equipment.
- D. Operation and Maintenance Manuals: Prior to delivery of equipment and updated as required during installation of the equipment, the manufacturer shall furnish complete and detailed installation, operation and maintenance manuals which shall include the following information as a minimum requirement:
  - 1. Assembly, installation and adjustment instructions.
  - 2. Lubrication and maintenance instructions.
  - 3. Complete descriptive literature of all materials and components furnished.
  - 4. Erection drawings with equipment mark numbers.
  - 5. Complete operating instructions for controlling, modifying, and operating the equipment provided for this facility.

1.05 PERFORMANCE REQUIREMENTS

- A. The disk filter system shall be capable of meeting the following performance requirements while receiving treated secondary effluent wastewater:

<b><u>PERFORMANCE CRITERIA</u></b>	<b><u>VALUE</u></b>
Design Daily Flow (DDF):	174 USgpm (0.25 MGD) Design
Peak Flow (PDF):	695 USgpm (1 MGD)
Filtration area available:	180 ft <sup>2</sup>
Filter Area flow rate (DDF)	0.97 gpm/ ft <sup>2</sup>
Filter Area flow rate (DDF 1 disk removed)	4.63 gpm/ ft <sup>2</sup>
Influent to Filters	TSS Average < 30 mg/L
Effluent	TSS Average < 10 mg/L



### **FILTER DESIGN DATA**

Filter Cloth Material	Polyester, multi-layer
Number of Filter Units	1
Number of Filter disk per unit	6
Filter Disk Diameter, ft.(m)	4.5
Effective Filter Surface Area per disk, ft <sup>2</sup>	30 minimum
Effective Filter Surface Area per unit, ft <sup>2</sup>	180
Backwash Arm Rotational Speed, RPM	1.1
Materials of Construction	304 SS

### **FILTER DRIVE UNIT**

Drive Motor (1 per unit)	0.33 HP, 480v, 3 phase, 60 Hz.
Drive Motor Service Factor	1.3
	Parallel Helical Gear w/Non-Metallic Chain and Sprocket

### **BACKWASH CLEANING SYSTEM**

Number of Backwash Vacuum Shoes per Disk	2
Backwash Pumps (2 per unit)	3 HP, 480, 3 phase, 60 Hz.
Backwash Flowrate, gpm	250 @ 15' TDH
Backwash Flow, % of Influent	< 2% @ PF(2Hr)

- B. The automatic backwash disk filter system shall be suitable for filtering domestic wastewater after conventional treatment. The filter shall be designed to operate on a continuous basis at Peak Flow Rate and shall be designed to operate while receiving varying flow rates.
- C. Each disk shall be isolatable, one from the other with permanently mounted knife gate valve. Each disk shall be removable without dewatering the filter tank or taking unit out of service.
- D. Cloth media disk filter must provide for redundancy by accommodating 100% of Peak Flow with one complete filter disk out of service while continuing to meet effluent quality requirements.

- E. Cloth media disk filter must be certified under Ca. Title 22 Reuse Standards as listed in the Treatment Technology Report for Recycled Water dated December 2009 that lists all acceptable manufacturers who have achieved "Title 22" quality certification.

## 1.06 EXPERIENCE

- A. It is desired that ONLY equipment which has undergone thorough development as provided by successful service in at least 100 similar installations for a minimum of 10 years shall be accepted for this project. Manufacturers who do not meet the experience requirements shall not be acceptable. Bonds or cash deposits are not an option in lieu of experience.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

- A. All welding shall conform to the latest standards of the American Welding Society. Filter cloth shall be multi-layered polyester bags with seal arrangements to allow for easy removal and installation. Cloth media that requires bolting to hold it in place is unacceptable and is not allowed. Filter cloth support grid shall have a deflection of less than 0.25 inches over the entire 4.5-foot span of the disk.

### 2.02 EQUIPMENT

#### A. Filter Tank

1. The filter tank shall be constructed of a minimum 3/16" (5 mm) thick 304 stainless steel.
2. All structural shapes shall be designed for the intended use and of adequate strengths to withstand all loads during fabrication, shipping and operations.
3. The filter tank shall incorporate one (1) 12" inlet nozzle with an influent trough designed to evenly distribute the flow across the width or length of the filter tank.
4. The filter tank shall incorporate one (1) 12" effluent nozzle connected to a filtrate trough designed to remove the entire flow of the filter tank.
5. The filter tank shall incorporate one (1) 4" backwash nozzles connected to a center rotating backwash manifold within the tank. The backwash manifold shall be constructed of 304 stainless-steel. Each end of the center rotating backwash manifold shall be connected to a 304 stainless steel swivel joint with a permanently lubricated bearing designed for submerged service. The filter tank shall incorporate a drain/sludge removal port with a minimum 3" nozzle. Inside the tank shall be a perforated drain plate sized adequately and designed to evenly remove settled sludge from the filter tank.

#### B. Filter Disk

1. The filter disk frame shall be constructed entirely from Type 304 stainless steel as an integral unit completely welded and supported for all operating and installation loads.
2. Each disk shall have grid support structure incorporated into the disk frame and it shall be designed to secure the grid in place and minimize wear to the filter cloth bags.
3. Each disk shall have a single top mounted effluent pipe adequately sized for the application and shall include a lifting eye for easy removal and placement of the ONE PIECE disk assembly.
4. Each disk shall be attached to the effluent trough independently to allow disk isolation. Only one wall connection point per disk shall be allowed. The disk filter design shall insure the ability to sample filtrate from each disk independently. Each disk shall have a knife gate valve for complete isolation and shutoff while the disk is removed from the operating filter.

#### C. Support Frame

1. Each disk shall be secured in place in the filter tank by a 304 stainless steel guide frame. The guide frame shall be designed to withstand all loads of the disk and the rotating shaft assembly.
2. The frame designed to maintain the disk location in the center of the filter tank and directly above the rotating backwash manifold assembly.
3. Each vertical frame member shall be flared 15 degrees to minimize damage to the filter disk and cloth as it is being installed and removed from the frame.

#### D. Rotating Backwash Assembly

1. Each filter unit shall incorporate a centrally located rotating backwash manifold that will operate as the rotating mechanism for the vacuum shoe assembly and also act as the transmission pipe for the backwash water being drawn by the backwash pumps located externally to the filter tank.
2. The center shaft/backwash manifold shall be constructed from 304 stainless-steel pipe.
3. The center shaft shall be supported and secured on each end. Each end of the center rotating backwash manifold shall be connected to a 304 stainless-steel swivel joint with a permanently lubricated bearing designed for submerged service.
4. The backwash manifold / rotating shaft is welded to a sprocket hub constructed of 304 stainless steel with a UHMW split-ring sprocket designed for the rotational speed requirements of the application.

5. Each vacuum shoe (two for each filter disk) shall be parallel to the disk face. The system shall incorporate a mechanism designed to maintain the proper tolerance of the vacuum shoe/disk interface. The filter backwash shoe shall be in contact the cloth media to insure backwash efficiency and effectiveness. If the backwash shoe does not contact the cloth, the design is unacceptable.
6. Each vacuum shoe assembly shall be located 180 degrees from the shoe on the opposite side of the same disk.
7. Filter designs that utilize a horizontal vacuum tube, coupled to a 4-point lifting device to vertically raise and lower the backwash header is not acceptable. With no adjustment between the backwash manifold and the cloth media surface, damage may occur to the cloth or uncontrolled wear will occur making this design unacceptable. Designs that incorporate reversed gravity flow and compressed air to backwash the cloth are unproven and unacceptable.

#### E. Swivel Joints

1. The swivel joints shall be designed to allow rotation of the backwash assembly and center shaft during the backwash cycle.
2. Construction of the swivel joint shall be 304 stainless-steel with a permanently lubricated bearing designed for submerged service. Stainless steel shafts shall be precision ground with the machined bearing to insure a precise tolerance.

#### F. Drive Mechanism

1. The drive assembly shall be designed to rotate the backwash assembly and center shaft during the backwash cycle.
2. The drive assembly shall consist of a parallel helical gear drive unit coupled to the shaft with a non-metallic sprocket and a nylon chain assembly with stainless steel pins.
3. The gear motor shall be a SEW Eurodrive gearbox directly coupled to a TEFC induction motor, SEW Model K57R37DRS71S4. Gear ratio to be 615.0. The motor shall be rated for 0.33 HP, 480v, 3-phase, 60Hz. operation.
4. Reducer design end rating shall be equal or exceed AGMA requirements. Speed reducer shall be selected for not more than AGMA class I service.
5. Drive chain shall be NH78 non-metallic with stainless steel pins
6. Drive sprocket shall be a NH78, 11 tooth shear pin sprocket assembly, 9.26 inch P.D., nylon body with UHMW segmental rim, 304 stainless steel hardware and 6061 aluminum shear pins.

7. Reduction sprocket shall be a NH78, 30 tooth segmental sprocket rim, split UHMW.
8. The drive motor assembly shall be mounted on a 304 stainless steel motor bracket that incorporates adjustable placement capabilities and a removable chain guard.

#### G. Control Panel and Operation

1. The disk filter shall have its own control system and shall be supplied by the disk filter manufacturer and shall include but not be limited to the following components:
  - (a) 36" x 30" x 12" NEMA 4X "UL Listed" 304 stainless steel wall mounted enclosure with 3-point external latching.
  - (b) NEMA motor starter with over-current protective devices and overloads for unit drive and backwash pumps
  - (c) Selector switches and pilot lights as outlined herein
  - (d) Door mounted circuit breaker for main breaker mechanism
  - (e) Magnetic circuit breakers for unit drive and backwash pumps
  - (f) Control power transformer with circuit breaker
  - (g) Circulation/vent fan
  - (h) 20-amp quad receptacle
  - (i) Allen-Bradley MicroLogix 1400 PLC with Maple Systems 10" touch screen
  - (j) Submersible liquid level transmitter
2. Refer to Specification Section 26 29 00 ("Manufactured Control Panels") for additional control panel requirements.
3. The automatic controls for the disk filter operation shall be furnished as an integral part and shall be provided in a NEMA 4X 304 stainless steel enclosure with 3-point latching. The control panel shall be 480v, 3-phase, 60 Hz. with 120v, 1 phase, 60 Hz. control voltage (powered through local CPT within control panel).
4. The main disconnect shall be enclosed in the control panel, with a handle mechanism extending through the door.
5. The backwash cycle is initiated by the level transmitter located in the filter tank. The filter drive unit and the backwash pumps are activated, and an electric actuated valve opens to begin backwashing the filter. After a pre-set time has elapsed, the backwash valve closes; if the water level (headloss) has been reduced; then the system shuts down the backwash system; if not then the system will repeat the sequence until the water level (headloss) is reduced to an acceptable level.
6. The panel operational sequence shall include a sludge draw-off adjustable timer. This timer shall be pre-set and field adjustable from the control panel OIT.
7. All pre-set timers shall be adjustable at the control panel OIT.

8. The control panel shall incorporate a complete manual override system and all switches, lights and necessary components shall be furnished.
9. The contractor is responsible for all field wiring and interconnecting conduit between the supplied control panel and the disk filter equipment. The filter supplier shall provide all necessary diagrams and schematics for a complete system.

#### H. Backwash Pumps

1. The backwash pump(s) shall be WEMCO Weir self-priming centrifugal pumps mounted on a fabricated steel base and coupled to a 3 HP, 1800 RPM, 460/3/60, TEFC Electric Motor.
2. Design duty condition: 250 GPM @ 15' TDH
3. Pump shall handle 2" solids.
4. Pumps shall have 3" suction and 3" discharge flanges.
5. Pumps shall be provided with a 5-year manufacturer's warranty.

#### I. Automatic Backwash Control Valves

1. The backwash valves shall be Bray Series 31 Lug style Electric Actuated Butterfly Valve.
2. Valves shall be 115VAC operated and controlled by the PLC.
3. Valves shall have manual override and position indicator.
4. Valves shall be UL Listed and housed in a NEMA 4/4X enclosure and be permanently lubricated with a mechanical brake.
5. Valves shall move from fully closed to fully open in 25 seconds and have a stall torque of 300 in-lb. with a 25% duty cycle. Thermal overloads shall be included.

#### J. Manual Isolation Valves (Backwash Pumps)

1. The manual backwash valves shall be Bray Series 31 Lug style Butterfly Valves.
2. Valves shall be rated for 150 psi.
3. Valves shall have stainless steel shaft and shall be blow-out proof.
4. Valves shall be a lug body design, fully supported flange bolt holes, be full bodied with v-notch EPDM liner.

#### K. Filter Cover

1. Filter to be completely covered to protect the filter from sunlight and reduce algae growth within the filter tank. The cover system shall have one or more covers that will work together to allow access inside the filter tank.
2. Retractable covers to be constructed from aluminum or 304 stainless steel with a height profile of less than 15 inches. The cover shall provide a handle for easy opening. The open cover design shall provide complete unobstructed access to the internal filter components.
3. Cover shall be provided with a lockable tab for safety and security.

#### L. Spare Parts

1. Two (2) one-piece filter cloths that cover 100% of a filter disk.

### PART 3 – EXECUTION

#### 3.01 INSTALLATION

##### A. General

1. Install the disk filter system per the manufacturer's directions and the drawings. Provide all supports and anchoring device required to install the disk filter unit. The Equipment Manufacturer will provide adequate crating and protection of the disk filter equipment for shipment to the project site.
  2. Installation Instructions will be provided that specifically outline installation of the equipment.
  3. Lifting instructions will be provided to assist the installing contractor.
- B. Field Services: The equipment manufacturer shall furnish the service of a factory-trained representative for two (2) working day and one (1) trip.
- C. Warranty: The equipment shall materially conform to the description in this Specification and the Contract Documentation and shall be free from defects in material and workmanship. Warranty periods are 1 year from final acceptance.
- D. Manufacturer shall supply the Owner with written certification that all equipment is installed and operating correctly. The one-year warranty will begin after the Owner has received the certification of installment.

END OF SECTION

**SECTION 46 66 53**  
**NON-CONTACT ULTRAVIOLET DISINFECTION EQUIPMENT**

PART 1 – GENERAL

1.01 SCOPE OF SUPPLY

- A. Manufacturer shall furnish a complete in-line pipe flanged, low pressure high intensity (LPHO) Ultraviolet (UV) Non-Contact disinfection system to provide required disinfection of plant effluent waters prior to ultimate plant discharge.
- B. UV systems that require lamps with input power greater than 145 watts shall not be considered.
- C. Amalgam lamps shall not be considered, system with quartz sleeve surrounded lamps shall not be considered.
- D. The equipment shall essentially be automatic in operation, with no automated cleaning apparatus. Separate cleaning apparatus', integrated wiper mechanisms, quartz sleeves, O-rings, or lifting cranes shall not be required as part of the non-contact UV disinfections system.
- E. The system shall be complete with power enclosures, power distribution and system controls shown on the contract drawings and specified herein.

1.02 SUBMITTALS

- A. The Manufacturer shall furnish electronic submittals consisting of the following information:
  - 1. Mechanical/ assembly drawings.
  - 2. Power/Control wiring single line diagrams.
  - 3. Manufacturer's catalog information consisting of descriptive literature, specifications and materials of construction for all components.
- B. After successful startup, Manufacturer shall provide certification that the ultraviolet disinfection system is commissioned and is ready for service.
- C. Manufacturer shall furnish the OWNER with one (1) hard copy and electronic copies of maintenance data on all machinery and equipment furnished for the system. The manuals shall include the following:
  - 1. Equipment operating and maintenance instructions
  - 2. Parts lists



3. Assembly and disassembly instructions
4. Equipment specifications and guaranteed performance data
5. Recommendations for preventive maintenance
6. Step-by-step operating and start-up procedures
7. Lists of spare parts, tools, and supplies
8. Wiring diagrams of all control circuits
9. Software programming as updated after final acceptance
10. Troubleshooting instructions

### 1.03 QUALITY ASSURANCE

#### A. Manufacturer's Qualification Requirements

1. The equipment manufacturer shall be regularly involved in the manufacture and supply of low-pressure high output UV Disinfection systems for a minimum period of ten (10) years, and with a history of at least one hundred (100) successful Municipal Wastewater installations of non-contact UV systems.

#### B. UV Design Criteria

1. The equipment to be supplied and installed shall disinfect an effluent with characteristics as listed in Table below:

Peak Hydraulic Wet Weather Flow (Peak Disinfection Capacity)	1.0 / 694	MGD / GPM
UV Transmittance *	60.0	% UVT (Minimum)
Total Suspended Solids*	< 20.0	mg/l (30-day average)
BOD*	< 20.0	mg/l (30-day average)
Target Indicator Organism	E. Coli/Fecal Coliform	
Permit Criteria*	126/200	(CFU)/100 ml Monthly Geomean
UV Dose (manufacturer calculated UV Dose)	30.0	Minimum UV dose of 30.0 mJ/cm <sup>2</sup> . After applying certified Lamp End of Lamp Life (EOLL) of .87, Fouling Factor of .89.
Mean Particle Size*	<30.0	Microns
Total Iron*	<0.3	mg/l
Turbidity*	<5.0	NTU
Process Redundancy	Two banks in series (U), each capable of treating 50% of the PHWW Flow with the largest bank out of service.	

\*Note: Industry standard parameter used for UV Dose calculations.

C. Effluent Standards to be Achieved:

1. The UV reactor shall be designed to deliver minimum UV dose of 30.0 mJ/cm<sup>2</sup> at Peak Disinfection Flow, after application of Lamp End of Lamp Life (EOLL) of 87%, and Fouling Factor of 89% and shall produce an effluent as follows:
  - a. Monthly Geomean (CFU): 126.0 CFU/100 ml E. Coli Monthly GEOMEAN 200 CFU/100 ml Fecal Coliform.
2. Effluent standards based on influent characteristics in accordance with Section 1.3-A.1.
3. Effluent indicator organism quantities based on a two single day grab samples and as a 30 Geometric Mean. Grab samples shall be taken in accordance with the Microbiology Sampling Techniques found in Standard Methods for the Examination of Water and Wastewater, 19th Ed.

1.04 HEAD LOSS

A. Head loss thru the reactor shall be as follows:

1. Peak Disinfection Flow:  
< 22.0 inches (flange to flange head loss at peak flow through UV reactor)

1.05 OPERATING CONDITIONS

- A. Outdoor installations shall require a cover for protection against the elements. The cover of the UV unit shall be supplied by the CONTRACTOR.
- B. The UV system shall be designed to operate at a maximum pressure of less than 20 psi. Pumped flow through the UV unit shall require a pressure relief valve for protection against over pressurization/surges and appurtenances for air/vacuum release. The valve(s) to be installed shall be sized by the Manufacturer, reviewed by the engineer and supplied and installed by the CONTRACTOR.
- C. The location and placement of the valves shall be as per the engineer's direction.

1.06 ACCEPTABLE MANUFACTURERS

- A. The equipment manufacturer shall be regularly involved in the manufacture and supply of low pressure high output UV Disinfection systems for a minimum period of ten (10) years, and with a history of at least fifty (50) successful Municipal Wastewater installations of non-contact UV systems.
- B. Basis of Design for non-contact UV disinfection system and components shall be equipment manufactured and supplied by Enaqua, 1350 Specialty Drive, Ste. D/F, Vista, CA. All alternate manufacturers must meet all performance,

warranty, control and experience criteria.

- C. Alternate equipment for the Basis of Design may be accepted for consideration if Seller of alternate equipment (Seller) adequately demonstrates to Buyer, at Buyer's sole discretion, that:
1. The proposed alternate equipment shall be equal to the Basis of Design equipment and shall meet the design and performance criteria described herein, have the same warranty, shall maintain compliance of wastewater treatment plant discharge permit(s), rules, and regulations, and not result in any adverse impacts on OWNER, including, but not limited to, additional capital or operational costs.
  2. Seller shall indemnify buyer from any and all patent infringement claims that may arise from the purchase of seller's equipment.
  3. Seller shall pay all costs to Buyer to re-design and re-schedule the Project and revise the Contract Documents as necessary for the incorporation of the proposed alternate equipment.
  4. Seller shall provide documentation showing compliance with all sections of this specification at time of bid.

## PART 2 - EQUIPMENT

2.01 The Ultraviolet Disinfection (UV) system shall consist of the following components:

- A. Reactor Model No: C2t.06041U
1. Number of reactors: 1
  2. Each reactor shall consist of the following:
    - a. Number of Banks per Reactor 2 (U Configuration)
    - b. Number of AFP Tubes 24
    - c. Number of Lamp Racks/Reactor 5
    - d. Number of Lamps per Lamp Rack 8
    - e. Number of Lamps per bank 40
    - f. Total number of lamps per reactor 40
    - g. Total number of ballasts per reactor 40
  3. The UV system shall include the following controls/monitoring:
    - a. Radar Level Sensor 1 (1 per UV reactor)
    - b. UV Intensity Monitor: 2 (1 per UV Bank)
    - c. ADRX: 1
    - d. AIO xx.
    - e. PIO 1

- f. EDC: 1 (1 per UV reactor)
- g. UV Control Panel (HMI Panel): 1
- h. Power Disconnect Panels: 1
- i. Air to Air HE assemblies 2

4. Spare parts consisting of the following:

- a. Spare Lamp Rack 1
- b. UV Lamps 6
- c. UV ballasts 4
- d. Operator Safety Kits: 2
- e. Cleaning Kit: 1

PART 3 – WARRANTY

3.01 PERFORMANCE/DISINFECTION GUARANTEE

- A. The manufacturer shall guarantee that the proposed UV disinfection system shall produce an effluent that meets or exceeds the requirements of this specification, listed in Section 1.3 C. The effluent quality exiting the UV system must be equal to or better than the specification requirements, as long as the wastewater flow and quality remains in the range(s) specified in the Design Criteria in Section 1.3.B.1, and the UV reactors are operated in accordance with the UVSS O&M Manual.
- B. The equipment furnished (excluding lamps, ballasts) shall be warranted to be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 12 months from substantial completion of the installed UV system.
- C. UV LAMPS: UV lamps shall be warranted for a minimum of 14,000 hours operating time under the conditions specified herein prorated after 9,000 hours. In the event of premature UV lamp failure, the UV system supplier shall offer the following:
  - a. Lamp failure before 9,000 hours – send a replacement lamp free of charge.
  - b. Lamp failure after 9,000 hours – issue a credit proportional to the hours not used.

3.02 BALLASTS

- A. Electronic ballasts are fully warranted for 3 years, extended to 5 years with first purchase of (1:1) replacement lamps from ENAQUA lamps within three years of installation.

3.03 AFP TUBES

- A. AFP tubes shall be warranted for twenty years as long as the wastewater flow and quality remain in the range(s) specified in the Design Criteria, and the UV system is operated in accordance with the O&M manual.

## PART 4- PRODUCTS

### 4.01 DESIGN, CONSTRUCTION AND MATERIALS

#### A. General

1. All module welded metal components in contact with effluent shall be Type 304 stainless steel.
2. All wetted metal components shall be Type 304 stainless steel with the exception of the Lamp Rack Assembly, which shall be constructed of aluminum and be capable of sustaining intermittent pedestrian traffic on the lamp racks.
3. All wiring exposed to UV light within the UV reactor, or electrical ballast enclosure shall be Teflon™ coated.
4. All wires connecting the lamps to the ballasts shall be enclosed inside the frame of lamp rack and not exposed to the effluent.
5. The effluent water shall be conveyed through the UV reactor via AFP840™ tubes – there shall be no contact with effluent and quartz sleeves at any time during normal operation.
6. All wetted components in the UV reactor shall be: AFP840™, 304SS, PVC, ABS or other non-reactive, non-corrosive material.
7. The UV system (ballasts, lamps, and controls) shall be capable of 24 on/off cycles per 24-hour day for the full specified warranty life of the lamps and ballasts.

#### B. Lamp Array Configuration:

1. The lamp array configuration shall be the uniform array with all lamps parallel to each other and to the flow.
2. The UV reactor shall be designed to avoid any immersion of UV lamps in the Effluent.
3. The UV lamps shall be arranged around the outside of the AFP840™ tubes in such a way that each AFP840™ tube shall have no less than 6 lamps irradiating it at all times.

#### C. Inlet/Outlet Flow Distribution:

1. Each UV reactor shall have an inlet and outlet tank. Plant effluent piping shall connect to each of the tanks to convey effluent through the UV reactor.
2. Connection to inlet and outlet tanks of UV reactor:  

Diameter: 8.00" Diameter (ASME/ANSI B16.5, CL 150 Flanges)
3. Each UV reactor shall have a flow distribution sheet, so as to distribute wastewater efficiently through the AFP840™ tubes.
4. The tanks and inlet flow distribution sheet shall be made of 304SS material. All material which comes in contact with the wastewater shall be non-corrosive.

D. AFP840™ Tube Ultraviolet reactor:

1. Within the ultraviolet reactor, AFP840™ UV transmitting tubes are arranged in a horizontal and vertical array. These AFP840™ tubes are in a parallel mode and are attached at one end to the inlet flow distributor sheet and to the outlet flow distributor sheet with appropriate leak proof fittings. The AFP840™ tubes shall be adequately supported.
2. In between and around the AFP840™ tubes, lamp rack assemblies shall be placed in such a fashion so as to provide uniform and adequate ultraviolet light intensity. The lamp racks slide in and out between and around a row of AFP840™ tube array.
3. Within the AFP840™ UV reactor, all UV sensitive materials shall be protected from the UV light.
4. The flow path through the AFP840™ tubes shall achieve optimized plug flow regime. The flow of wastewater should be in sufficient turbulent mode; therefore, the Reynold's number in each UV reactor would be greater than 50,000 at peak flow. A turbulent flow shall be in such a way that it scours the inner walls of the AFP840™ tube to help prevent scaling or fouling.
5. The UV reactor shall be covered from five sides with either coated aluminum or stainless panels. The sixth side (top) shall have access door(s). The lamp racks shall be accessible through these doors.
6. The air temperature inside the AFP840™ UV reactor shall be maintained between 32 - 49 deg C or 90-120 deg. F by means of a heat exchanger. The control of the reactor temperature shall ensure optimum UV light emissions from the UV lamp.
7. A temperature sensor shall be installed within the UV reactor for protection against heat build-up under no or low flow conditions.

E. UV Lamps: The UV lamps shall have the following characteristics:

1. A low pressure, high output (LPHO) non-amalgam mercury vapor lamp of the hot cathode type.
2. The filament shall be of the clamped design, significantly rugged to withstand shock and vibration.
3. Each lamp will produce at least 90% emissions at the germicidal frequency of 253.7 (254nm) nanometers.
4. The power consumption shall be a maximum of 138 input watts per lamp, total including ballasts losses shall not exceed 145 watts including ballast losses.
5. The rated UV output at 253.7 nanometers (nm) shall be a nominal 57 UVC Watts at 100 hours of operation.
6. The lamp shall have a minimum UV intensity of >400 microwatts/cm<sup>2</sup> at 1 meter.
7. Each lamp shall have a rated life of 12,000 hours.
8. Each lamp shall be single ended. Each lamp shall have a nominal arc length of 1400 millimeters.
9. Each lamp has a minimum length of 1554 mm.
10. Each lamp shall produce no measurable amount of ozone.
11. Each lamp envelope is made of fused quartz and is capable of transmitting at 90% of UV light at 253.7 nm.
12. Electrical connections shall be at one end of the lamp and have six (6) pins, dielectrically tested for 2,500 volts. Lamps that have 2-4 pins (instant start) may be considered. However, to be considered as an alternate, instant start lamp systems shall supply replacement spare lamps equal to 20% of the total number of lamps in the system.
13. Each UV lamp shall have a smart lamp Module (an integral unique lamp identification chip) embedded in the lamp pin connector that enables the lamp position in the UV reactor to be altered independent of a lamp holder. The smart lamp module shall be capable of measuring and storing at a minimum the following data for each UV lamp in a reactor:
  - a. Part and Serial number (unique identification) of each individual UV lamp

- b. Total accrued run time hours
- c. Lamp ON/OFF cycles

F. UV Lamp Racks

1. The UV lamp racks shall be placed between rows of the AFP840™ tubes.
2. The lamp racks shall typically slide in and out within a track that shall be attached to the main frame of the UV reactor.
3. The use of cranes, hoists or other mechanical lifting devices shall not be required.
4. The lamp rack assemblies shall be made from aluminum.
5. Electrical mounting sockets shall be attached to one end of the lamp rack.
6. The other end of the rack shall have slotted holes to slide lamps in and out during installation and removal of lamps.
7. Quick power disconnects allow quick disconnect of the lamp rack assembly to the main power at the UV reactor chassis.
8. Each lamp rack shall be equipped with its own on/off switch and fuse.
9. Each lamp rack shall be equipped with an LED indicator to identify the operating condition of each lamp on the lamp rack.
10. Lamp Racks shall be removable for service during UV operation without impacting Hydraulic flow and still maintaining plug flow regime in the reactor.
11. Each lamp shall be controlled by an individual ballast. Systems that have one ballast controlling multiple lamps shall not be considered.
12. There shall be no quartz sleeves, O rings, seals, glands or retainers required to be around the lamps when installed in the lamp racks.

G. Electronic Ballasts:

1. The ballast used to energize the UV lamps shall be high frequency electronic ballasts. The ballasts shall be housed in the lamp rack assembly as an integral part of the lamp rack.
2. The electronic ballasts shall be rated at 120-277 V +/- 10% without discernible change of characteristics.
3. The electronics ballast shall have the following features:



- a. Power factor greater than or equal to 0.95.
- b. Electrical conversion efficiency greater than or equal to 90%.
- c. Ballast shall have high frequency phase returns from the UV lamps.
- d. The ballast operating frequency shall be between 40 and 150 K Hz.
- e. The ballast shall have a thermal overload protector to protect against overheating when ballast skin temperature reaches 75 deg. C.

H. Electrical:

- 1. The UV reactor shall be powered from its own incoming power supply (to be supplied by others).
- 2. All cabling, conduit runs and wiring from the plant power supply to the UV reactor shall be as shown on the construction drawings.
- 3. The CONTRACTOR shall be responsible for bringing main and control power to the UV reactor through a Branch Circuit protections device (disconnect) as shown on the drawings.
- 4. Electrical power required shall consist of the following:

Main power to reactor(s):	277/480VAC, 3 phase (Y), 4 Wire (3 Ph + N) plus ground
Control power to reactor(s):	120VAC, 1 phase, 2 wire plus ground
Power to UV Control Panel:	120VAC, 1 phase, 2 wire plus ground

I. Power Panel:

- 1. The power panel(s) for the UV system shall consist of a UL 508-A NEMA 4X rated electrical enclosure. The power panel shall house the following:
  - a. All contactors, disconnects, terminations and fuses required to power the appropriate bank.
  - b. Electrical safety lock-out.

PART 5- CONTROL

5.01 CONTROL COMPONENTS

A. Port Input Output Modules (PIO)

- 1. One (1) PIO module per reactor shall be supplied in the UV control panel. PIO modules provide for one Analog Input (4-20 mA) and Switch Inputs and Relay Outputs. Switch Inputs may be remote start signals from a PLC or HOA (Hand-Off-Auto) switch. Relay Outputs can be programmed to provide an Alarm signal, System Operating and/or Cooling Control.
- 2. Features of PIO modules:

- a. 2RJ 45 Ethernet ports for network integration with EDC module
- b. Daisy chain up to 2 PIO's
- c. One Simple Analog Input – 4~20mA
- d. 4 Switch Inputs – Dry Contact
- e. 4 Relay Outputs – Switch 120VAC @ 6A
- f. 2 Temperature Probe Inputs

B. Local Control and Monitor (ADRX)

1. Each reactor shall be equipped with an Active Data Router Extended (ADRX) to control and monitor each bank of the reactor. The display for each bank shall be equipped with the following:
  - a. 20 Character, 4 row LCD display
  - b. Keypad
  - c. 2 Switch Inputs
  - d. 2 Output Relays:
    - i. Status of unit ON/OFF
    - ii. General alarm (Low UV or Lamp out via powered relay)
  - e. Displays for:
    - i. Individual lamp on indication
    - ii. Individual lamp hours
    - iii. UV Intensity
2. Each UV reactor bank shall be equipped with three-way lamp control consisting of; HAND, OFF and AUTO.
  - a. In Hand: Shall provide local lamp control.
  - b. In Off: Shall power off the lamps in the reactor.
  - c. In Auto: Shall provide automatic lamp control from remote signal.

C. Electronic Data Center (EDC)

1. Each UV reactor shall be equipped with a supervisory microcontroller called Electronic Data Center (EDC). The EDC shall collect all the data from individual UV lamps, UV and other sensors in the system and shall display it at the HMI and remotely to the plant operation console. The Local display panel (HMI) shall show at a minimum the following data:
  - a. UV Bank in Duty/Stand-By
  - b. On/Off status of lamps.
  - c. Error Status of lamps and sensors.
  - d. Lamp Hours
  - e. An advanced signal for lamp service or replacement.

- f. Flow through UV system (Optional if a 4-20 mA signal from plant flowmeter is integrated with UV Control System)
  - g. UV intensity per Bank.
  - h. The type and location of the alarm.
  - i. The frequency of alarms shall be counted and stored.
  - j. Alarms and historical operating data shall be stored in a removable storage device in comma delineated format.
2. Communication between each UV reactor and the EDC shall be via CAT5 Ethernet cable.
  3. Integration of alarms between the UV Control Panel and the EDC and the plant's SCADA system PLC shall be via Modbus TCP. Communication between the UV Control Panel and the plant PLC shall be via CAT6 Ethernet cable.
    - a. All registers of the EDC shall be available to the plant's SCADA system PLC.

D. UV Control Panel (HMI Panel)

1. The HMI for Enaqua's EDC is installed and mounted in a UL 508-A NEMA 4X type 304 SS rated electrical enclosure to provide graphic interface for monitoring and control.
2. The HMI interface shall be 19" NEMA 4X Touchscreen Industrial Display (Hope Industries Model HIS-ML19 (Rev. G)) with VIA Technologies Windows 10 PC (AMOS-3005-1Q12A2), and shall display all system operational data, system operational history and shall allow access via remote internet connection for troubleshooting and system upgrades.
  - a. The UV Control System enclosure shall house the following:
    - i. 19-inch color touchscreen display
    - ii. Windows 10 Industrial PC
    - iii. Ethernet Switch, 8 port 10/100BaseT(X) (RJ45 connector. Weidmuller Model IE-SW-BL08-8TX
    - iv. Electronic Data Center (EDC) EDC GEN 2- Part # 62.010037
    - v. PIO (Enaqua I/O Modules). Part # 062.01003600
    - vi. AIO (Enaqua Analog IO Module)
    - vii. 24 V DC Power Supply. IDEC Slim Line Model PS5R-SB24
    - viii. 600 VAC UPS. Allen Bradley MODEL 1609-B600N
  - b. There shall be a three-way HOA control for allowing OFF, HAND, or AUTO (automatic) operation of the reactor providing control for the following:
    - i. HAND: Shall provide local lamp control.

- ii. OFF: Shall power off the lamps in the reactor.
  - iii. AUTO: Shall provide automatic lamp control from remote signal.
3. Refer to Specification Section 26 29 00 (“Manufactured Control Panels”) for additional requirements.

E. UV Intensity Monitor

1. The UV reactor shall have a minimum of two UV intensity sensors (one per bank) which responds to the germicidal portion of light generated. The sensor shall not degrade after prolonged exposure to the UV light or effluent.
2. The sensor shall measure only the germicidal portion of the light emitted by the UV lamps as measured at 254 nm. It shall have sensitivity at 254 nm of greater than 95%. Sensors whose sensitivity to other wavelengths amounts to more than 5% of the total sensitivity shall not be allowed.

F. Radar Level Sensor

1. The inlet tank of each UV reactor shall include a radar level sensor and transmitter provided by Manufacturer of the non-contact UV disinfection equipment, which will monitor the water level in the inlet box and transmit a signal to the EDC for activation and de-activation of UV lamps based on the level in the influent tanks.
2. The radar level sensor/transmitter shall conform to the following requirements:

a. Range:	Rod & coaxial: 9.8’ (3m) Cable: 18’ (5.5m)
b. Accuracy:	± 3mm
c. Dead band:	Top: 4” (10cm), Bottom: 2” (5cm)
d. Repeatability:	< 2mm
e. Resolution:	< 2mm
f. Configuration:	WebCal® PC Windows® USB 2.0
g. Supply voltage:	10-30 VDC
h. Max. consumption:	< 50mA @ 24 VDC
i. Signal output:	4-20mA, 3-wire
j. Signal fail-safe:	4mA, 20mA, 21mA, 22mA or hold last
k. Dielectric:	> 1.8
l. Process temp.:	F: -40° to 302°, C: -40° to 150°
m. Ambient temp.:	F: -40° to 185°, C: -40° to 85°
n. Pressure:	-14.5 to 250 PSI (-1 to 17 bar)
o. Enclosure rating:	NEMA 4
p. Encl. material:	Aluminum
q. Feed through mat.:	316L SS & PEEK
r. Conduit entrance:	(1) 1/2” NPT connector
s. Probe material:	Rod: 316L SS Coaxial: 316L SS or galvanized

	Cable: 316 SS
t. Process mount:	3/4" NPT (3/4" G)
u. Classification:	General purpose
v. Certification:	cCSAus, NRTL
w. Compliance:	CE, CRN, RoHS

3. The radar level sensor/transmitters shall be Flowline EchoWave® LG10-11 Guided Wave Radar Level Transmitter or approved equal.
4. The radar level sensor/transmitter(s) shall be mounted atop a section of pipe passing through the removeable lid of the inlet tank and extending to within one inch (1") of the bottom of the inlet tank. The vertical pipe shall serve as a stilling basin for the radar level sensor transmitter and prevent false or no readings caused by water turbulence in the inlet tank.

#### G. Remote Monitoring and Control

1. The Run command for the UV reactor shall be via hard wired connections from the Main Plant's SCADA/PLC to Enaqua PIO (port input output) module located inside the UV control panel. The UV reactor can be turned on or off as required by the Main Plant's SCADA/PLC system by opening or closing dry contacts.
  - a. With the switches for each bank in the AUTO position, the reactor shall be controlled externally from the HMI panel.
  - b. Local control (on reactor): The switches shall override the control from HMI panel.
  - c. Remote Start: Both banks of the UV reactor are designed to be ON always, one remote start is required as a dry contact.
2. The UV reactor shall have the capability of providing basic remote monitoring/control via the plants main console (or other designated computer). The plant shall provide either an Internet IP address specific to the UV system or allow access through its network and via secure website.
3. Connection/integration to the main console (or customer SCADA system) shall be via MODBUS TCP.

#### H. Alarms:

1. Minor alarms shall be provided by the EDC's PIO module (Discrete I/O Module) via dry contact, or via MODBUS TCP to the Main Plant's SCADA/PLC that maintenance attention is required. Alarms shall include:
  - a. Low UV Intensity shall be pre-set at the factory for 70% of the intensity after 100 hours. Alarm set point shall be field adjustable.
  - b. Single Lamp Out

2. Major alarms shall be provided by the EDC's PIO module (Discrete I/O Module) via dry contact, or via MODBUS TCP to the Main Plant's SCADA/PLC to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. Alarms shall include:
  - a. Low UV Intensity Alarm. This alarm shall be pre-set at the factory for 25% of the intensity after 100 hours' burn-in of the lamps. The alarm set point shall be field adjustable. A low intensity alarm shall not cause any bank to turn off.
  - b. Lamp rack power failure.
  - c. Contiguous lamp failure

#### I. Control Strategy

1. Remote Start: The UV system shall be turned on by the Main Plant's PLC/SCADA system by opening or closing dry contacts. The plant PLC shall be programmed to produce an output (dry contact), 5 minutes before the start of effluent entering, this contact closure shall be used by the Main Plant's PLC/SCADA system to produce a start signal (contact closure) for the UV reactor in duty. The PLC shall be programmed to OPEN the dry contact after effluent stops flowing through the UV reactor. The UV reactor shall be programmed to remain operational for a minimum of 5 minutes after the remote start signal ceases.
2. Level Pacing (UV Dose Pacing): The UV system shall employ a level pacing technique in which the lamps that are not required for maintaining the proper dosage are turned completely off in accordance with the level of the UV inlet channel, while ensuring minimum UV dose delivery at all times. Depending on the water level in the inlet channel, the turndown range (ratio of lamps in lamp rack to lamps used based on liquid level) shall be from as low as 33.0 % to 100.00 %. Determining water level shall be provided via an integral level sensor using a 4-20 mA signal terminated at the HMI panel.

### 5.02 INSTALLATION

- A. Equipment shall be installed by CONTRACTOR in accordance the manufacturer's recommendations, drawings and specifications to provide a complete installation.
- B. Installation Responsibilities of the CONTRACTOR
  1. Provide Manufacturer with at least two (2) week notice prior to any changes in the installation date previously agreed upon by the OWNER and Manufacturer.
  2. Sufficient space for moving into place and placement of all equipment supplied by Manufacturer.
  3. Equipment anchoring and grouting including anchor bolts.

4. All required permits.
5. Structural work such as concrete pads, mezzanines for elevating equipment items, etc.
6. Interconnecting electrical outside of the UV Skid limits.
7. Connection and sealing of all flanges, fittings and connections to the adjacent plan processes.
8. All flanges, reducers, elbows, valves and other plumbing appurtenances not specified within these specifications shall be by the CONTRACTOR.
9. All electrical outside the skid limits including, transformers and disconnect switches. Equipment electrical supply shall be detailed on the shop drawings.
10. Protecting the UV reactor from damage between the time of delivery and installation.
11. Analytical testing.
12. Equipment unloading, moving and rigging into position.

C. Installation Responsibilities of Manufacturer

1. Equipment packaging for transportation from Manufacturer Factory to the job site.
2. All labor to complete the tasks listed as Manufacturer's responsibility shall be performed as straight time rates by employees of Manufacturer, non-union company, or our designated subcontractors.
3. Any deviations from this assumption shall require approval of a Change Order.

D. Startup Responsibilities of the CONTRACTOR

1. Provide Manufacturer with a two (2) week notice prior to any changes in the start-up date previously agreed upon.
2. Availability of all required utilities.
3. Availability of typical feed water quality and quantity.

E. Joint Responsibility of Manufacturer and CONTRACTOR

1. Final assembly of and loading of the UV lamps supplied by Manufacturer.

F. Startup Responsibilities of Manufacturer

1. Manufacturer's representative for the equipment specified herein shall be present at the jobsite for a minimum amount of workdays for services listed below. Excluded from these time requirements shall be travel time spent, time spent during shipping of equipment, time spent at the jobsite correcting any fabrication or manufacturing errors, and time spent preparing and operating the equipment to meet performance requirements including all performance testing. The Bid shall include all associated expenses incurred by the technical representative during the jobsite visits. The following services shall be provided:

a. Two workdays (8 hours each) for maintenance training, maintenance assistance, classroom and on-site equipment operation instructions, troubleshooting, and other post-startup services.

5.03 ELECTRICAL CONNECTIONS AND CONTROLS

A. Wiring and conduits for electrical power, controls, and instrumentation shall be provided by the CONTRACTOR.

END OF SECTION



## APPENDICES

Appendix A – Electromagnetic Flow Meter Data Sheets

Appendix B – Equipment

Appendix C – Submittal Identification and Contractor's Approval Statement

Appendix D – NPDES Permit

Appendix E – Stream Lake & Wetlands Report

Appendix F – ERA Lab Results of Sludge Analysis

Appendix G – ERA Lab Influent Pump Station Sample Report

Appendix H – Ebara Pump Start-Up Report

Appendix I – Screens Installation Inspection Report

Appendix J – Five Star Pre-Startup Checklist

# APPENDIX A

## ELECTROMAGNETIC FLOW METER DATA SHEETS

# MV110

## AC or DC OPERATED CONVERTER FOR ISOMAG ELECTROMAGNETIC FLOW METERS

### Next generation solution for full-pipe flow measurement

The new MV110 converter is designed for applications in water, wastewater and other industrial markets where basic measurement requirements or output protocols are required.

- Accuracy:  $\pm 0.4\%$  of the reading
- Repeatability:  $\pm 0.2\%$
- Programmable through keypad on front panel or via PC connected through mini USB cable adapter
- Flexible mounting so that display can be seen from the top or from the front
- Galvanic separation: all inputs and outputs are separated from each other and from the power supply
- Housing material: Nylon reinforced with 15% fiberglass, or Aluminum
- Protection rating: NEMA 6 (IP 67) IP68 on request

#### Standard features:

- Compatible with any Isomag® flow sensor
- Low flow rate cut-off
- Bidirectional measurement
- Peak cut-off
- Empty pipe detection
- Alarm limits
- Large back-lit LCD display with protective cover

#### Available accessories:

- Rechargeable backup battery (assures the measurement in case of power loss)
- 4 GB data logger
- Built-in Verificator (BIV) for verifying electrical characteristics of the sensor

#### Available communications

- Hart or Modbus RTU protocol
- RS485 communications
- One or two 4-20mA outputs
- Two (2) pulse/frequency open collector outputs
- One (1) digital open collector input



*MV110 converter with graphics display and flip-up protective cover mounted on an MS2500 flow sensor with Rilsan liner.*

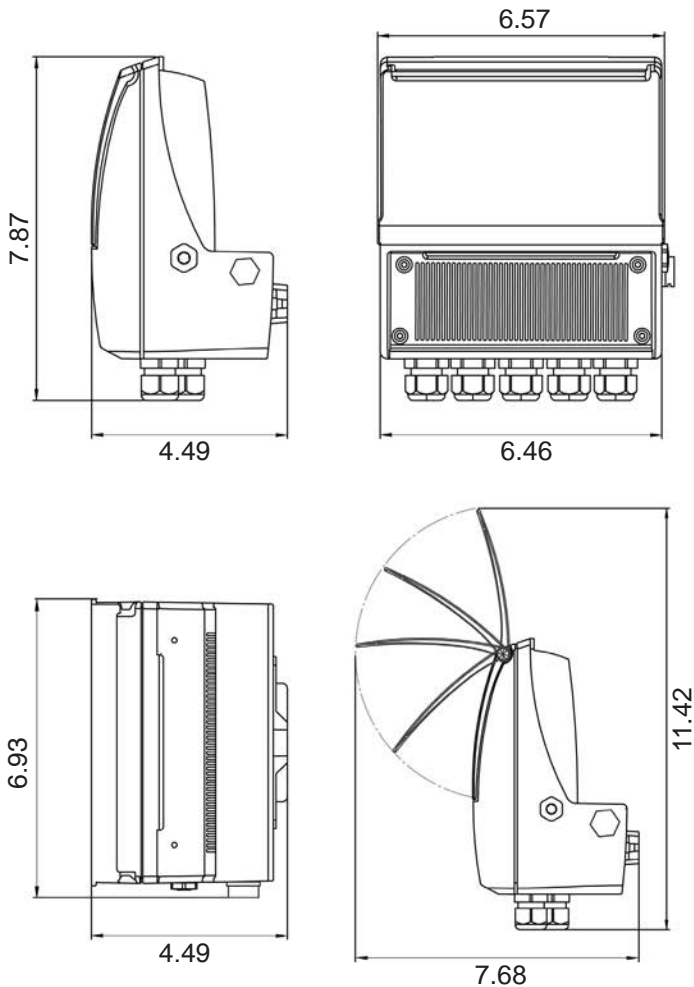
**ELECTROMAGNETIC FLOWMETER**

# FLOMOTION MV110 ENGINEERING SPECIFICATIONS

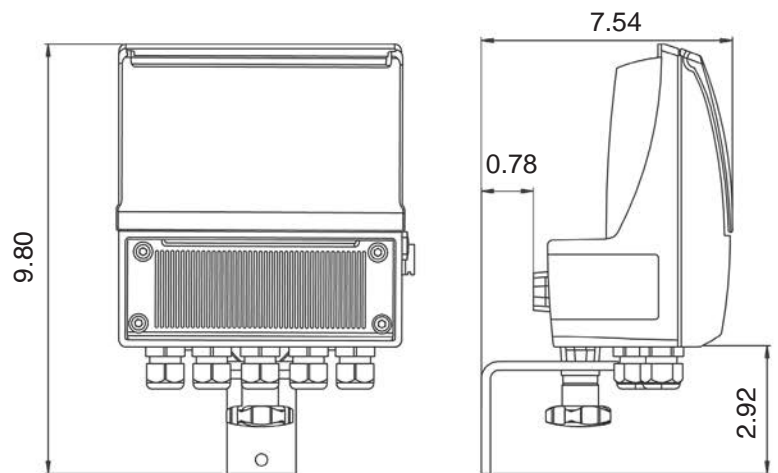
- Accuracy to  $\pm 0.4\%$  of rate
- Repeatability:  $\pm 0.2\%$
- Ambient Temperature
  - 4 to 140°F (Aluminum Housing)
  - 4 to 104°F (Nylon Housing)
- Humidity Range: 0-100%
- Environmental Rating: NEMA 6 / IP67
- Fluid Conductivity: 5  $\mu\text{S}$  (min, compact mount)
- Power Supply Options: 12-48VDC or 100-240 VAC. 44-66Hz. 1.5w sensor only, 5w all loads.
- 4-20mA output maximum load: 1000 $\Omega$ , 24VDC.
- Inputs/outputs are galvanically isolated from power supply up to 250 V
- USB cable type A/USB MINI B required for PC programming
- Values stored in memory in case of power failure
- Graphic display 128x64 pixels w/back light
- 3 external programming keys
- Digital Outputs, 1250 Hz, 100mA, 30 Vdc (max)
- MicroSD Memory Card 4 - 32 GBytes
- Cable glands - PG11

## DIMENSIONS

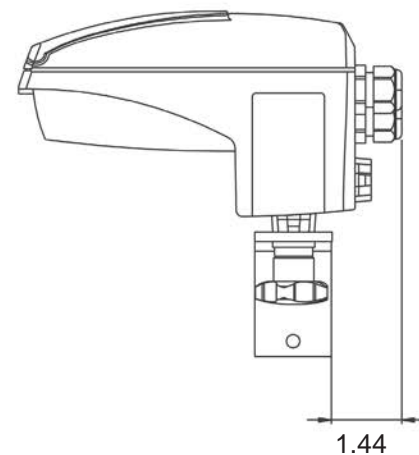
### Compact Version



### Vertical Separate Version



### Horizontal Separate Version



DIMENSIONS IN INCHES

### FLOMOTION SYSTEMS Inc.

3 North Main St.  
 Middleport, NY 14105  
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 Fax: 716-691-1253  
 Email: [info@flomotionsystems.com](mailto:info@flomotionsystems.com)  
[www.flomotionsystems.com](http://www.flomotionsystems.com)



# MS2500

ISOMAG



FLOMOTION  
SYSTEMS

## ELECTROMAGNETIC FLOWMETERS

Reliable full-pipe flow measurement with high accuracy,  
ease of installation and low operating cost



The MS2500 is certified  
to NSF/ANSI Standard  
61 for 1" to 80" sensors.



The MS2500 is available with Rilsan, Polypropylene, Ebonite, PTFE or PFA liner with compact or remote mounted converter. Shown here with Rilsan liner and MV210 Converter.

### TYPICAL APPLICATIONS

- Water
- Polymers
- Wastewater
- Lime Slurries
- Dyes
- Process Chemicals
- Brine
- Caustics
- Slurries
- Acids
- Starches
- Paper Stock
- Concrete

### MS2500 FEATURES

- Accuracy to  $\pm 0.2\%$  of rate from 1 to 33 ft/sec.
- 1" to 96" Pipe Diameters
- Flow ranges from 2.4 to 179,400 GPM
- Pressures to 5600 PSI
- Volumetric flow rate measurement independent of fluid viscosity, density and temperature
- No moving parts for zero maintenance
- Bi-directional flow measurement
- No pressure drop through sensor
- Integral ground electrode
- Minimal straight pipe run required
- Every sensor is factory wet-calibrated



The MS2500 shown with stainless steel body, PTFE liner and junction box for remote mounted converter.

ELECTROMAGNETIC FLOWMETER

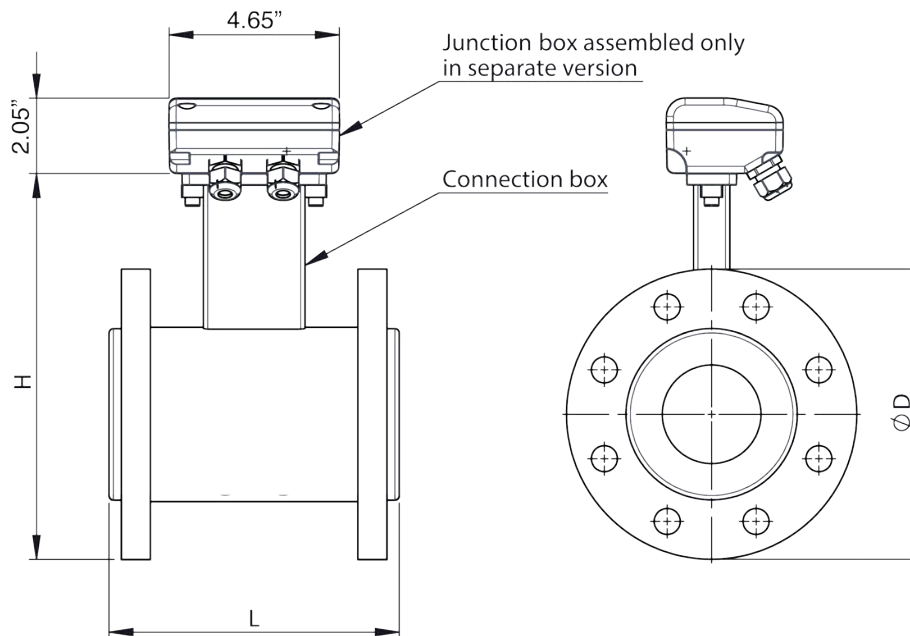
# FLOMOTION MS2500 ENGINEERING SPECIFICATIONS

- Accuracy: See relevant converter data sheet
- Repeatability:  $\pm 0.1\%$
- Temperature (max liquid temperature)
  - 4 to 158°F (-20 to 70°C) with Rilsan lining
  - 32 to 140°F (0 to 60°C) with Polypropylene lining
  - 23 to 176°F (-5 to 80°C) with Ebonite lining
  - 4 to 212°F (-20 to 100°C) with PTFE lining compact version
  - 4 to 356°F (-20 to 180°C) HT PTFE (PFA) lining remote version
- Fluid Conductivity: 5  $\mu\text{S/cm}$  (min)
- Process Connections: ANSI Flange
- Liner Material: PTFE, PFA, Ebonite, Polypropylene, Rilsan or Abreal
- Standard Pressure (ANSI 150 Flanges) Higher pressures upon request.
  - Polypropylene & Rilsan: 275psi
  - Ebonite: 928psi
  - PTFE: 580psi / PFA 232psi
- Flow Tube: 304 S.S.
- Body & Flange Material: Carbon steel with two-part epoxy coating (316 SS optional)
- Electrode Material: 316 SS, Hastelloy C, Titanium, Tantalum or Platinum
- Number of Electrodes: 3 (2 measure, 1 ground)
- Environmental Rating: NEMA 6/6P

## AVAILABLE SIZES AND DIMENSIONS (ANSI 150)

Size (in.)	1	1-1/4	1-1/2	2	3	4	6	8	10	12	14	16
Min Flow Rate (gpm @ 1 ft/sec)	2.4	3.89	6.08	9.49	24.30	37.97	85.44	151.9	237.3	341.8	465.2	607.6
Max Flow Rate (gpm @ 33 ft/sec)	77.9	127.6	199.3	311.5	797.4	1246	2803	4984	7787	11,213	15,262	19,934
Length (L below)	7.87	7.87	7.87	7.87	7.87	9.84	11.81	13.78	17.72	19.68	21.65	23.62
Height (H below)	7.13	7.28	8.15	8.74	10.20	11.34	13.43	15.79	18.15	20.75	22.91	25.16
Flange Dia. (D below)	4.24	4.57	5.00	5.98	7.52	9.02	10.98	13.50	15.98	19.02	20.98	23.50

Size (in.)	18	20	24	26	30	34	36	42	48
Min Flow Rate (gpm @ 1 ft/sec)	768.9	949.4	1367	1604	2136	2744	3076	4187	5468
Max Flow Rate (gpm @ 33 ft/sec)	25,229	31,147	44,852	52,639	70,082	90,016	100,918	137,360	179,400
Length (L below)	23.62	23.62	23.62	25.59	29.53	33.46	35.43	39.37	47.24
Height (H below)	25.16	29.57	34.09	36.26	40.63	45.24	47.48	54.37	58.66
Flange Dia. (D below)	23.50	27.52	32.01	34.25	38.74	43.74	45.98	52.99	57.28



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 Fax: 716-691-1253  
 Email: [info@flomotionsystems.com](mailto:info@flomotionsystems.com)  
[www.flomotionsystems.com](http://www.flomotionsystems.com)



# GROUNDING RINGS

## FOR GROUNDING OF ELECTROMAGNETIC FLOWMETERS

Improves performance in lined or non-metallic pipes



*Flomotion Systems GR Series grounding rings are available for all standard magmeter sizes.*

### FEATURES

- Sizes: 1-1/2 to 48 inches
- Thickness: 1/8 inch
- Materials: 316 SS (other materials upon request)
- Designed for 150# flanges
- Integral connection point for grounding wire

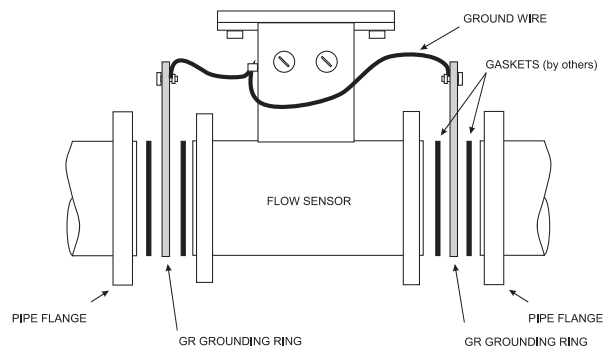
### DESCRIPTION

Flomotion Systems GR Series grounding rings provide improved performance with electromagnetic flowmeters when used in lined or non-metallic piping systems by eliminating stray AC or DC electrical noise present in the fluids.

GR Series grounding rings are installed before and after the flow sensor, between the sensor and the pipe flanges. Grounding connections are made using the extended tab.

GR Series grounding rings also help to protect the leading edge of the flow sensor liner from wear when used with abrasive fluids.

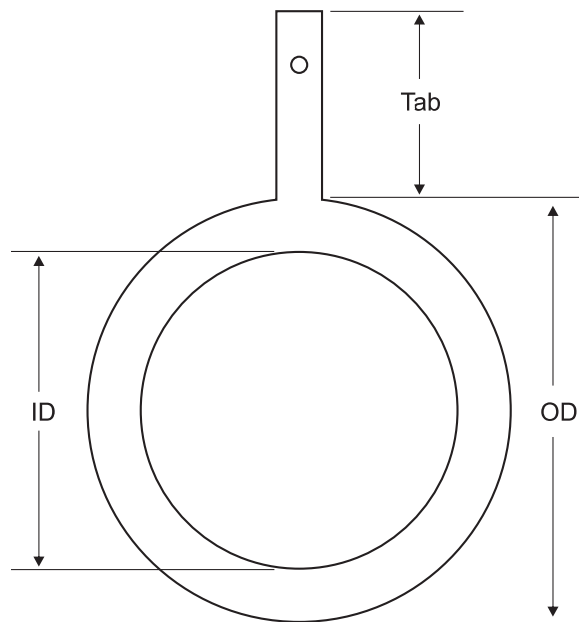
Standard grounding rings are available in 316 SS with other materials available upon request.



**GROUNDING RINGS**

## DIMENSIONS

Part No.	Flange Size	ID (in)	OD (in)	Tab (in)	Thickness (in)
GR40SS	1-1/2	1.53	2.53	2	0.125
GR50SS	2	2.06	3.62	4	0.125
GR80SS	3	3.14	5.00	4	0.125
GR100SS	4	4.13	6.19	4	0.125
GR150SS	6	6.23	8.50	5	0.125
GR200SS	8	8.18	10.63	5	0.125
GR250SS	10	10.21	12.75	5.75	0.125
GR300SS	12	12.16	15.00	5.75	0.125
GR350SS	14	13.33	16.25	5.75	0.125
GR400SS	16	15.33	18.50	5.75	0.125
GR450SS	18	17.39	21.00	5.75	0.125
GR500SS	20	19.33	23.00	5.75	0.125
GR600SS	24	23.27	27.25	5.75	0.125
GR750SS	30				
GR900SS	36				
GR1200SS	48				



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APPENDIX B

EQUIPMENT

# Budgetary Proposal

August 31, 2020



Jim Aitkenhead  
630/837-5640, ext. 230  
jra@lakeside-equipment.com

TO	PROJECT
Bart Taft The Kelley Group	Wedowee, AL

EQUIPMENT	UNIT	QTY	TOTAL
<b>Lakeside Raptor® Vertical Micro Strainer</b> <b>Model '16MS-V-219</b>			

*Due to the current volatility of stainless steel prices, budgetary cost of equipment may be subject to change.*

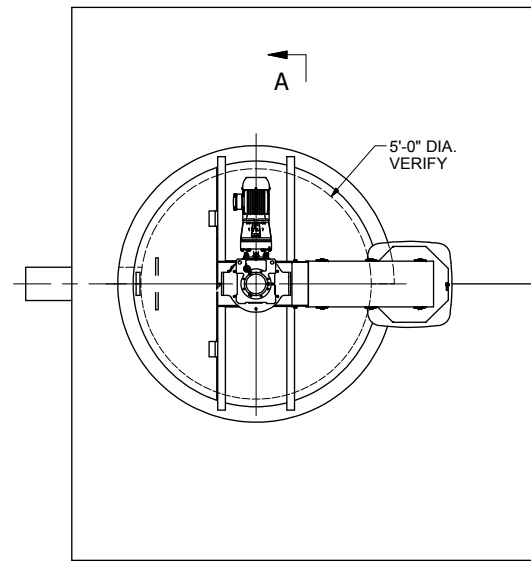
SPECIFICATION	
Unit Capacity:	1.10 mgd
Inclination:	90 degrees
Hole Diameter:	0.25 inches (6 mm)

SCREEN	CONTROL PANEL
AISI 304 stainless steel construction	NEMA 4X - 304 stainless steel main control panel
Structural support with anchorage	No local control station
Perforated plate screenings basket	Fusible disconnect switch with door handle
Screw conveyor with helical flights	Control power transformer
2 hp drive unit	Eaton 800 series intelligent relay controller
3-Zone wash system with solenoid valves	Variable frequency drive with line reactor
Ultrasonic level sensor	Selector switches
	Indicator lights

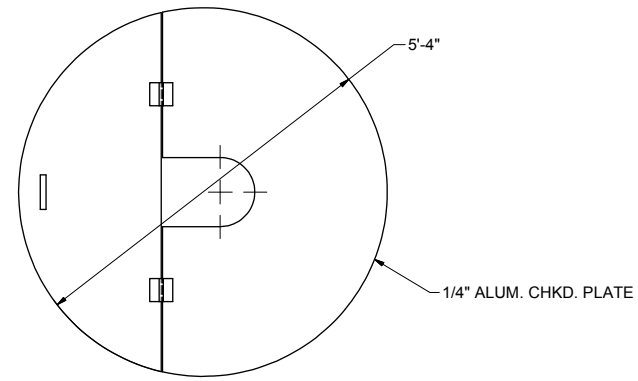
EXCLUSIONS	
Grating across channel	Discharge chute
Handrail around perimeter of channel	Slide gates
Screenings collection containers	Manual bar screen
Piping, valves or fittings, unless noted otherwise	Spare parts or special tools
Interconnecting conduit or wiring	



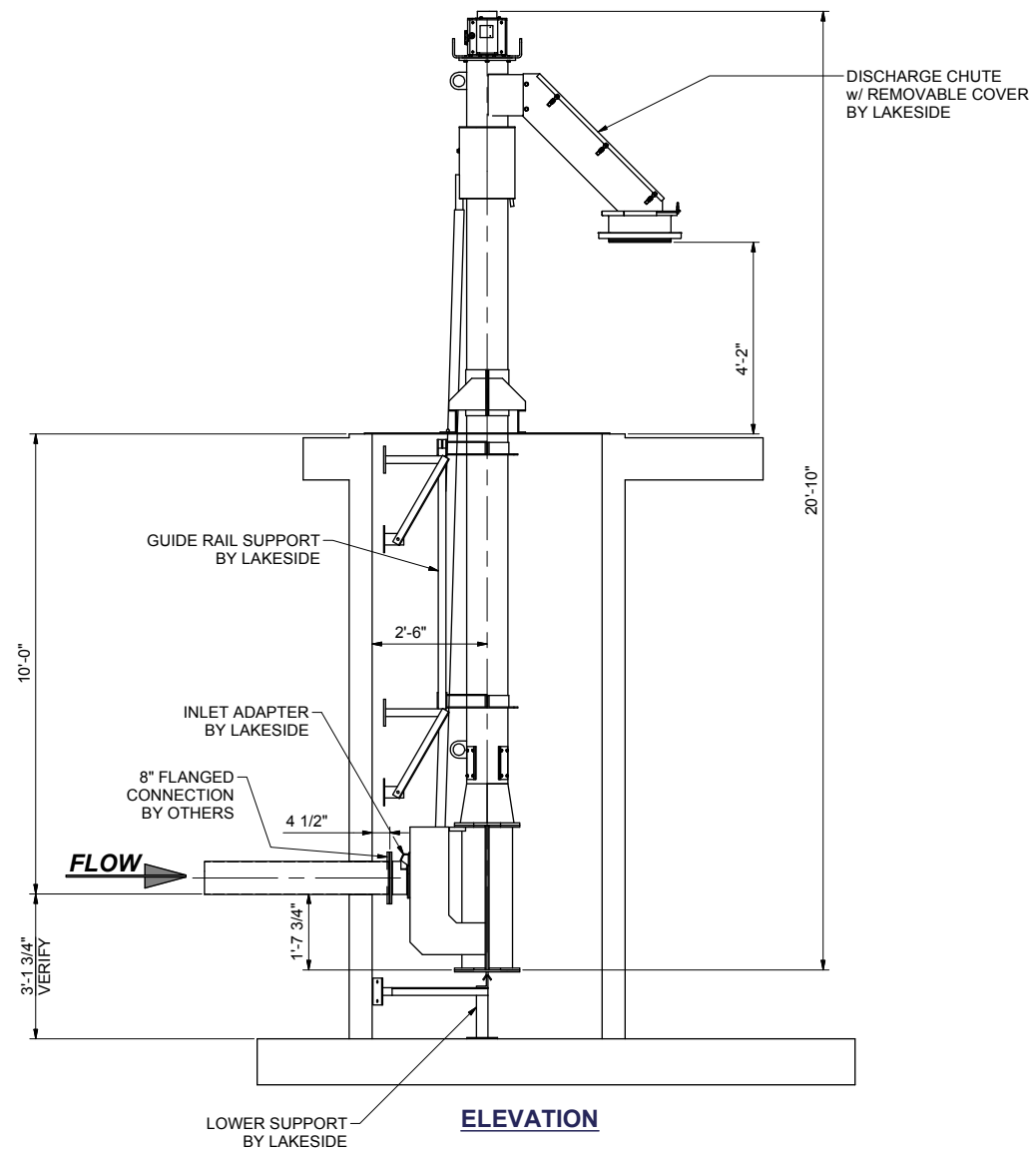
NOTES			
FOB:	Chariton, Iowa	Approvals:	6 to 8 weeks
Freight:	Freight allowed to jobsite	Shipment after Approval:	18 to 20 weeks
Start-Up Service:	2 days in 1 trip	Weight per Screen:	1,500 lbs
Warranty:	One (1) year	Installation Time per Screen:	32 hours



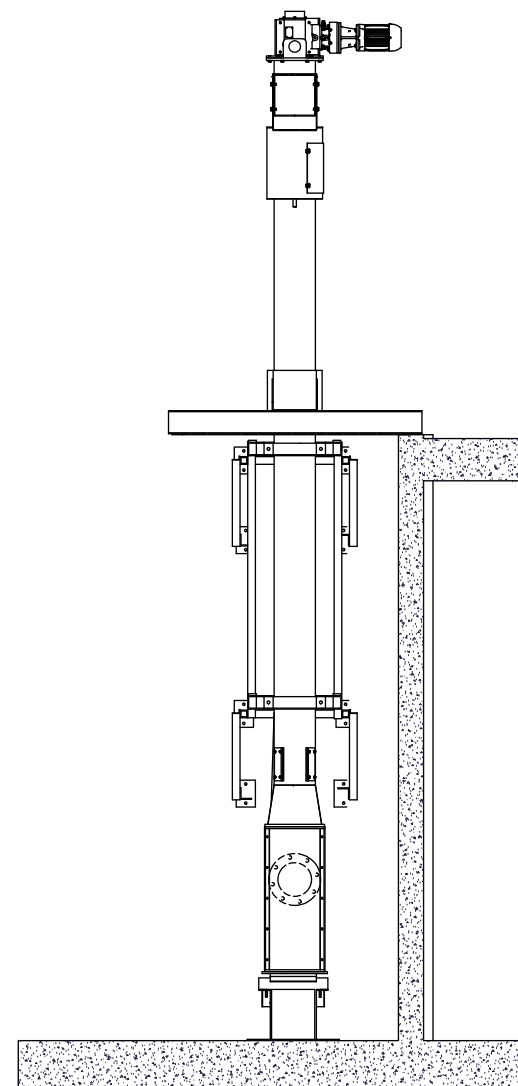
**PLAN**



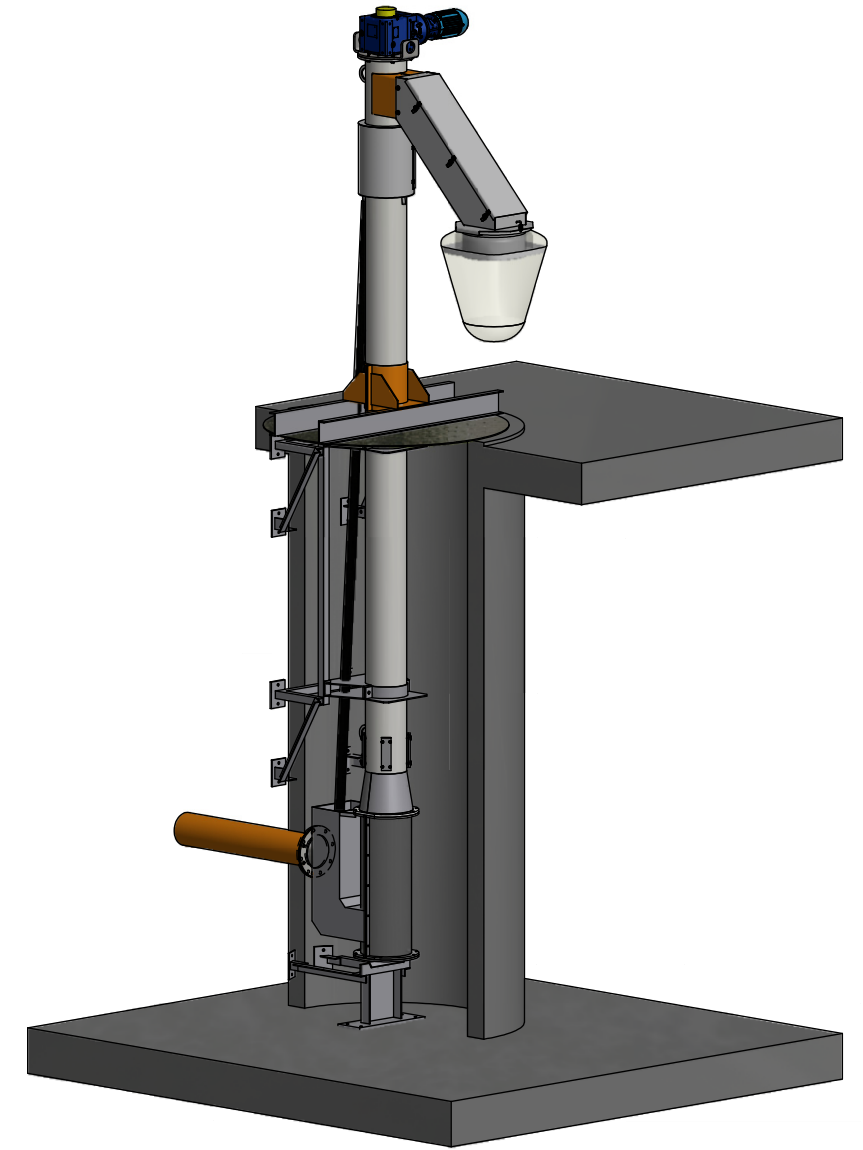
**HINGED ACCESS COVER**




**ELEVATION**



**SECTION A-A**



		PROJECT		ADEL, GA.	
		TITLE		RAPTOR® MICRO STRAINER PROPOSAL MODEL 16MSV-190	
DRAWN	DATE	SIZE	S.O. #	DWG NO.	REV
TH	6/7/2018	D		D104521-S	
CHECKED	DATE	SCALE	FILE NO. 250		
COPYRIGHT © 2018 LAKESIDE EQUIPMENT CORPORATION					



# EBARA

**EBARA International Corporation**  
Fluid Handling Division  
1651 Cedar Line Drive, Rock Hill, SC 29730 | 803.327.5005 | 803.327.5097 (fax)  
pumpsebara.com

**Packaged Pump System**

**Installation and Application**



**City Of Southside, Alabama Selects EBARA Packaged Pump System For Emergency Lift Station Upgrade**



## Project Highlights

**End User:**

Southside Water Works and Sewer Board, Southside, AL

**Industry:**

Municipal wastewater, sewage

**Problem:**

Emergency Lift Station Rehabilitation

**Result:**

Cost effective, expedited and simplified installation

**Products Installed:****EBARA Model EP1 Duplex Packaged Pump System**

- Factory pre-assembled and sole source responsibility for complete station provided
- Two, 30HP model DLFU submersible cast iron wastewater, sewage pumps
- Pumps rated to deliver 150 GPM at 145' TDH with K-series impeller design to reduce clogging
- R7 insulated fiberglass enclosure with large doors
- Pre-cast reinforced polymer concrete base provide resistance to H<sub>2</sub>S corrosion
- Dual four-inch liquid filled pressure gauges protected from wastewater by pressure isolator ring
- Standard check valves
- Emergency by-pass connection
- Thern portable hoist

## Southside, AL Selects EBARA EP1 *Expedited, Cost Effective Solution For Emergency Lift Station Upgrade*

### OVERVIEW

The city of Southside, Alabama has experienced tremendous growth over the last decade. Located on the banks of the Coosa River, Southside is a relatively small, but progressive city and is always looking for ways to improve the quality of life for its residents. Just as so many other municipalities face aging infrastructure challenges, Southside determined a need to upgrade and replace one of its main lift stations that had become troublesome and costly for many years.

### SCOPE OF CHALLENGE

The traditional suction lift station located on Highway 77 is one of Southside's main lift stations and has been in service since 1991. The station had experienced several problems over the last few years including multiple failures due to the age and strain on the system. As a result of these failures, the high costs for repairs and the encroaching seasonal inclement weather, the situation was quickly considered an emergency installation. A quick turnaround was very critical in order to meet the needs of the flows coming into the system and the system not being out of service for a very long time.





## THE SOLUTION

CDG Engineers & Associates worked with The Eshelman Company to select and install an EBARA EP1 duplex packaged pump system to replace the existing self-priming system that failed. Two, 30 HP submersible model DLKFU pumps each rated to deliver 150 GPM at 145' TDH were specified as part of the system to accommodate the current conditions and allow for the anticipated expansion the system faces. The K Series design was specified to reduce clogging from fibrous waste (non-dispersibles) and thereby reduce maintenance and increase efficiency of operation.

The old station was removed and the 20' deep wet well cleaned and epoxy coated prior to installation. The EBARA packaged system is pre-assembled at the factory and shipped directly to the site ready to be installed.

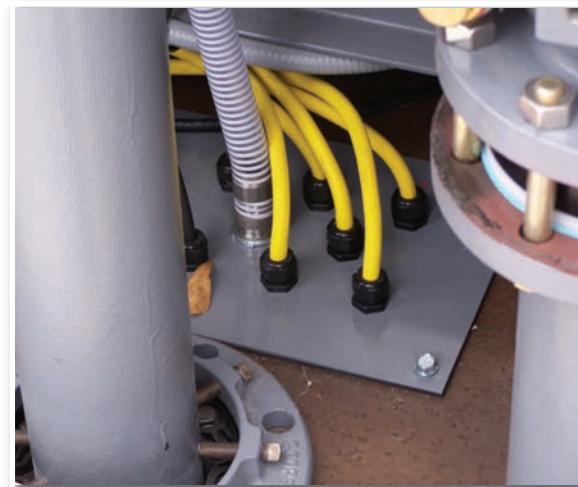
EBARA's standard package design includes a corrosion resistant, steel reinforced, polymer concrete base. Wet-well access covers are pre-cast into the base frame providing durability and sturdiness. All discharge piping, valves and controls are protected inside an R7 insulated, weatherproof fiberglass enclosure. Large doors on both sides of enclosure provide easy access to system components.

Safety grates protect personnel from falling into the wet well when the access doors are open. Penetrations for the piping and cables are sealed from the wet well to prevent harmful gases from entering the enclosure. Dedicated pressure gauges and sensing piping for each pump are standard on the EBARA system. Onyx pressure sensor rings isolate the gauges from the pumped wastewater to eliminate clogging of pressure gauge lines and ensure accurate, repeatable pressure readings.

"Everything is at 'head and hand' level," explained Jeff Harrison, PE, CDG Engineers & Associates. "This eases maintenance and removes the need to send personnel into dangerous confined spaces present in traditional below ground valve vaults."

The station runs on 460/3/60, and is designed with a float switch level control system with reduced voltage soft starters to limit inrush current to the station.

This station was loaded with nearly optional features, including individual board mounted discharge gauges, an emergency bypass connection and a (Thern) portable hoist; these options making regular maintenance more manageable and efficient.





## THE RESULT

The installation concluded with a “clean-water” (accommodated by The City of Southside’s Fire and Rescue Department) start-up and testing with minimal onsite adjustments made to the controls and floats to ensure optimal performance.

Once the EBARA EP1 packaged station arrived on site, it was installed and on line at the end of the second day. It was a very quick retrofit, which kept downtime and bypass pumping to a minimum and was delivered and installed well within the city of Southside’s capital budget.

What would have taken 2 months to install a new system, the city of Southside was able to complete in 2 days due to the refurbishment of the existing wet well and the selection of the single-source and complete EBARA packaged pump system.

“The package station concept incorporates all the necessary equipment in one factory built unit with a company that has decades of experience providing reliable sewage pumps,” said Ed Moore, Vice President, The Eshelman Company. “We feel confident the EBARA packaged system is going to be a cost effective solution for any city looking to put in a replacement – or new – lift station.”

[Click here or scan the code to watch the video!](#)



**“... going with the EBARA system was going to be the best solution...”**

**Jeff Harrison**  
CDG Engineers & Associates

**Engineered for Performance**

**EBARA International Corporation**  
Fluid Handling Division

1651 Cedar Line Drive, Rock Hill, SC 29730  
t (803) 327-5005 | f (803) 327-5097

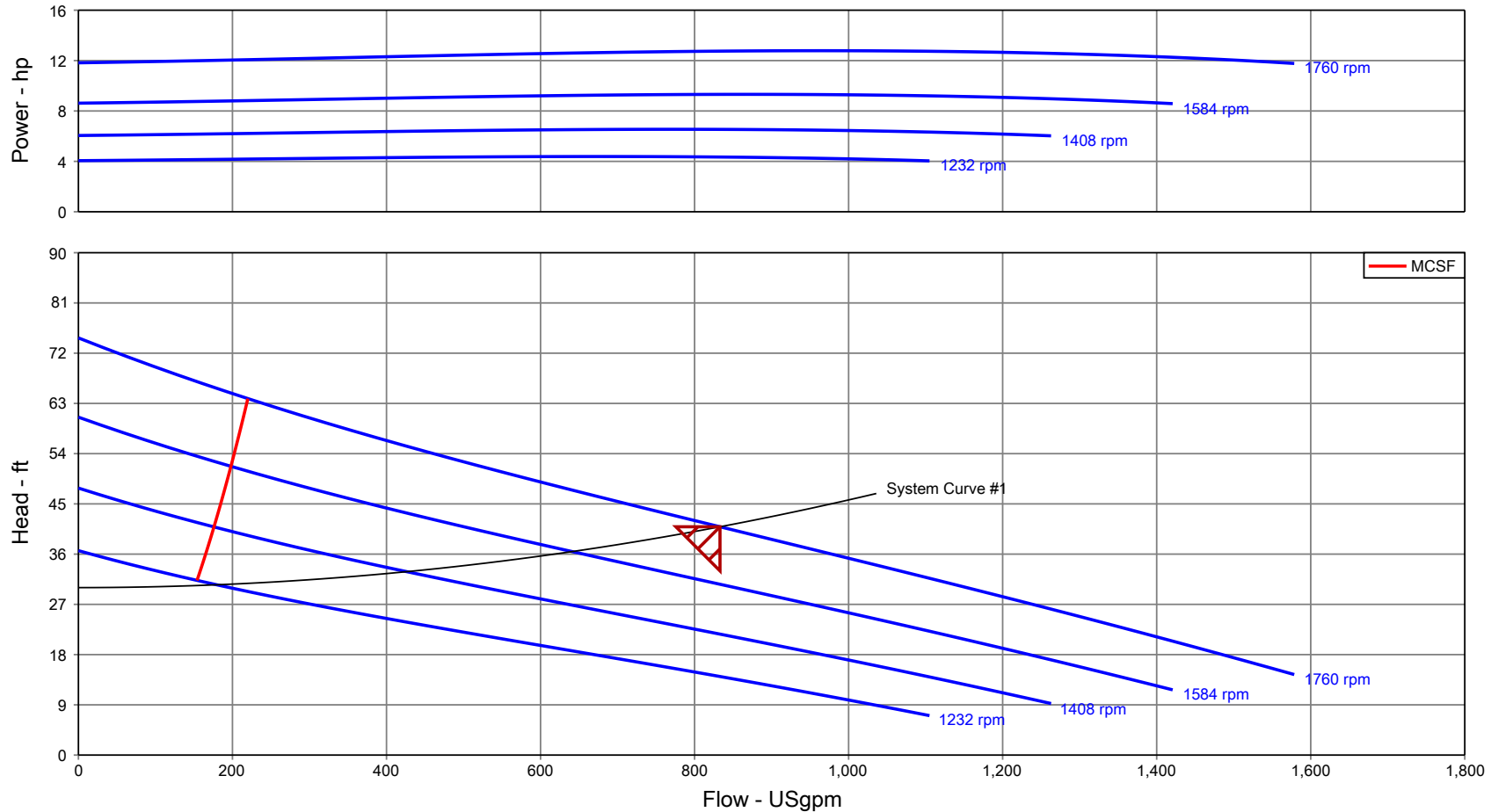
**www.pumpsebara.com**



Customer :  
Reference :

# Multi-Speed Performance Curve

Ebara Quotation System 21.0.0



Item number	: 001	Product Description	: 150DLKFU611	Flow, rated	: 833.0 USgpm
Service	:	Stages	: 1	Differential head / pressure, rated	: 40.90 ft
Quantity	: 1	Efficiency	: 67.48 %	Speed, rated	: 1760 rpm
Quote number	: 1048021	Power, rated	: 12.75 hp	Impeller diameter, rated	: 9.61 / 5.65 in
Based on curve number	: DLK-C623-9203	NPSH required	: -	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 16 Feb 2021 2:04 PM	Site Supply Frequency	: 60 Hz	Viscosity	: 1.00 cP
		Nominal speed	: 1765 rpm	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00





## **S&N AIROFLO *Design Recommendation***

**For:**

**Date: November 2, 2021**

### **Wedowee WWTP**

**Wedowee, Alabama**

### **0.25 MGD Design for Lagoon Upgrade (Alternate Design for CBOD and NBOD Removal - revised)**

**Prepared by:**

#### **S&N AIROFLO**

**1011 Sycamore Avenue  
Greenwood, MS 38930  
877.247.6356 – Toll Free  
662.453.0797 – Fax**

**In association with:**

*Proudly Represented by:*



**S&N AIROFLO Recommended Lagoon Upgrade**  
**for the Wedowee, Alabama**  
**Wastewater Treatment Plant (WWTP)**

**Wedowee WWTP Description:**

The existing treatment process consists of a facultative lagoon (12 mil gal). The effluent cannot satisfy the new NPDES permit limits on ammonia-N of 4.5 mg/L (monthly average summer limit) and on CBOD<sub>5</sub> of 7 mg/L (monthly average summer limit) and 25 mg/L (monthly average winter limit). The limits on effluent ammonia in winter (monthly average) of 20 mg/L and on suspended solids (90 mg/L monthly average) can be achieved by the existing lagoon system. Typical effluent ammonia-N concentrations are in the 4 to 18 mg/L range. Thus, this facility needs to upgrade its nitrification efficiency. The design will be based on the critical summer period, and a current effluent ammonia-N concentration of about 20 mg/L during the critical summer months. Typical effluent CBOD<sub>5</sub> concentrations are in the 13 to 31 mg/L range. Typical effluent TSS concentrations are in the 15 to 60 mg/L range. Dividing the lagoon into two aerated cells and one nitrification cell and providing efficient effluent filtration will be necessary to satisfy the new NPDES effluent limits.

**Wedowee WWTP Loading:**

1) Design Influent Flow:	1.0 MGD Peak (estimated) 0.25 MGD Ave.
2) Influent BOD <sub>5</sub> :	150 mg/L = 313 lb/day (peak month)
3) Influent TSS:	125 mg/L = 261 lb/day (reported)
4) Influent Ammonia-N:	40 mg/L = 83 lb/day (estimated)
5) Influent TKN:	42 mg/L = 88 lb/day
6) Influent COD:	400 mg/L = 834 lb/day

## DESIGN FOR CBOD REMOVAL

### **Aerator Performance:**

Providing aerobic treatment to wastewater requires taking two primary factors into consideration. The two factors are oxygen transfer and mixing of the wastewater. In addressing these two issues, one will control the amount of aeration equipment required.

Standard Oxygen Transfer Rate (SOTR) and Standard Aeration Efficiency (SAE) are means by which to measure the effectiveness of an aerator in providing oxygen transfer to wastewater. ASCE (American Society of Civil Engineers) devised a way for comparing surface aeration equipment by using a standard clean water test (ANSI 92-1) for determining the SOTR. Actual testing by a reputable third party using clean water test procedures showed that S&N AIROFLO's horizontal rotor aerator produced some of the industry's leading results. Although the standard conditions by which the SOTR is determined do not exist in wastewater treatment situations, adjustments made for field conditions still indicate that S&N AIROFLO aerators provide excellent field oxygen transfer rates.

For municipal wastewater at elevations up to 900 feet above sea level and water temperature of 28°C, S&N AIROFLO aerator's design oxygen transfer rate is approximately 1.8 lb/(HP-hr) at field conditions. The aerators are designed to maintain 2.0 mg/L of dissolved oxygen in the two aerated cells at design loadings. The oxygen transfer rate is based upon field conditions with the aerators operating at 90% of full motor load amperage.

In addition to oxygen transfer, an aerator must be proficient in mixing of the wastewater. S&N AIROFLO aerators provide an excellent pumping rate of more than 2100 gpm/HP. Provisions of this high pumping rate and mixing are suppressed algal growth in lagoons and superior wastewater treatment. Movement of the surface water provides surface turbulence, thereby restricting most algal growth, which reduces suspended solids in wastewater effluent. Sub-surface mixing provided by the aerator allows more complete exposure of influent wastewater to oxygen rich waters, leading to efficient biological treatment.

### **WWTP Design Requirements for CBOD Removal:**

The lagoon will be partitioned into three cells (2 aerated cells and 1 nitrification cell). The first aerated cell (completely mixed) will be approximately 4 mil gal in volume; the second aerated cell (partially mixed) will be approximately 7.8 mil gal in volume; the third (nitrification) cell will be approximately 0.2 mil gal in volume. The design for CBOD removal below is for the two aerated cells.

***Design of the First Aerated Cell (Completely Mixed):****Oxygen Requirement:*

Influent BOD<sub>5</sub>  $\cong$  150 mg/L

Design Flow  $\cong$  0.25 MGD

BOD loading/day = 0.25 MGD x 150 mg/L x 8.34 = 313 lb BOD/day

O<sub>2</sub> Requirement = 313 lb BOD/day x 1.5 lb O<sub>2</sub>/lb BOD = 470 lb O<sub>2</sub>/day\*

\*Oxygen requirements for nitrification are not included because most of the ammonia-N entering the lagoon will be removed by S&N BIOFLO units in the third (nitrification) cell. Most of the oxygen for nitrification will be provided when the fixed film BIOFLO units rotate out of the water and are exposed to the atmosphere. Oxygen for nitrification will enter the fixed film (biomass) attached to the plastic media via oxygen penetration into the biomass layer from the atmosphere.

**Horsepower (HP) Required for Treatment:**

\*Assume 80% BOD removal will occur in the first aerated cell.

Oxygen required in first cell = 0.8 x 470 lb O<sub>2</sub> /day = 380 lb/day

Aeration horsepower required for O<sub>2</sub> transfer in the first cell  
 = 380 lb O<sub>2</sub> /day ÷ (1.8 lb/HP-hr x 24 hr/day)  
 = 8.8 HP

***Mixing Requirements in First Aerated Cell:***

For adequate mixing in the first aerated cell, use a mixing intensity of 20 HP/mil gal.

Horsepower for mixing = 20 HP/ mil gal x 4 mil gal  
 = 80 HP

Thus, mixing requirements control aerator design in the first cell.

***Design of the Second Aerated Cell (Partially Mixed):****Oxygen Requirement:*

Influent BOD<sub>5</sub>  $\cong$  30 mg/L

Design Flow  $\cong$  0.25 MGD

BOD loading/day = 0.25 MGD x 30 mg/L x 8.34 = 63 lb BOD/day

O<sub>2</sub> Requirement = 63 lb BOD/day x 1.5 lb O<sub>2</sub>/lb BOD = 95 lb O<sub>2</sub>/day\*

*Horsepower (HP) Required for Treatment:*

\*Assume 70% BOD removal will occur in the second aerated cell.

Oxygen required in second cell = 0.7 x 95 lb O<sub>2</sub> /day = 67 lb/day

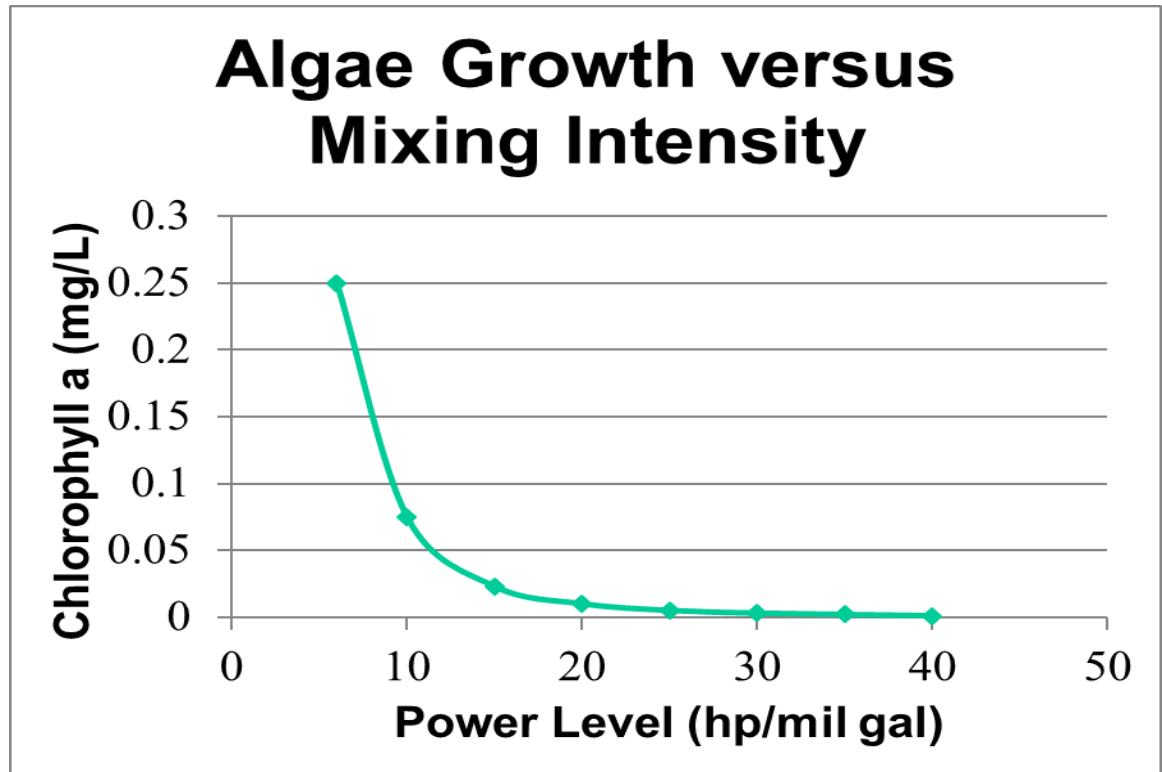
Aeration horsepower required for O<sub>2</sub> transfer in the second cell  
 $= 67 \text{ lb O}_2 / \text{day} \div (1.8 \text{ lb/HP-hr} \times 24 \text{ hr/day})$   
 $= 1.6 \text{ HP}$

*Mixing Requirements in Second Aerated Cell:*

We recommend that the second aerated cell have a mixing intensity of 10 HP/mil gal to control algae growth, thereby reducing the solids loading on the effluent filters and ensuring that the filters perform well in removing TSS from the effluent. See the figure (adapted from Rich, 1999) below for guidance.

Horsepower for mixing = 10 HP/ mil gal x 7.8 mil gal  
 $= 78 \text{ HP}$

Thus, mixing requirements control aerator design in the second cell.



**Thus, mixing requirements control aerator design in the two aerated cells. Use four 20-HP S&N aerators in Cell #1. Use four 20-HP S&N aerators in Cell #2. In order to satisfy the effluent CBOD<sub>5</sub> limit of 7 mg/L (monthly average) in summer, effluent filtration must be provided after the treated wastewater exits the third (nitrification) cell. See the explanation below:**

Effluent soluble CBOD<sub>5</sub> from the third cell will be about 2 mg/L. Assuming the CBOD<sub>5</sub> of the effluent TSS will be about 0.5 mg CBOD<sub>5</sub> per mg TSS, the effluent TSS must be less than 10 mg/L to satisfy the effluent CBOD<sub>5</sub> limit in summer.

## DESIGN FOR AMMONIA-N REMOVAL

### Performance of S&N BIOFLO Biofilm Nitrification Unit:

#### *Nitrification Design:*

S&N BIOFLO units (floating biofilm nitrification units) will be used in the third (nitrification) cell to achieve nitrification of the effluent.

Design criteria = 1.5 g NH<sub>3</sub>-N per m<sup>2</sup> per day (summer conditions; conservative design)

Assume the nitrification zone influent will have about 20 mg/L of ammonia-N.

Ammonia-N loading to nitrification zone = 20 mg/L(0.25 mgd)(8.34)  
= 42 lb/day  
= 19,100 g/day

Each BIOFLO unit is 4.5 feet in diameter and 10 feet long and has 2,400 m<sup>2</sup> of attached growth surface area. Kontakt media (with UV inhibitors and greater surface area) will be used.

Number of BIOFLO units required = 19,100 g/day ÷ 1.5 g/m<sup>2</sup>/day ÷ 2,400 m<sup>2</sup>/unit  
= 5.3 units

**Thus, use six S&N BIOFLO units to achieve the desired nitrification. The units will be placed in the third cell, and the units will operate in series. All six units will direct flow toward the bank, and they will be spaced about 30 feet apart (center to center). Dr. Moore should be consulted prior to designing a baffle near the outlet to ensure efficient flow through the BIOFLO units. The initial estimate is that the third cell will have dimensions of 30 feet (width), 200 feet (length), and 6 feet (depth).**

### Expected Effluent Quality from the Wedowee WWTP:

During summer conditions, almost complete nitrification should be achieved by the biofilm nitrification units. This facility should consistently meet the effluent limit of 4.5 mg/L ammonia-N. The BIOFLO units also should reduce the ammonia-N to acceptable levels during winter conditions. With good CBOD removal in the two aerated cells and effluent filtration, the stringent summer

effluent CBOD<sub>5</sub> limit of 7 mg/L (monthly average) should be achieved on a consistent basis. The winter CBOD<sub>5</sub> limit of 25 mg/L (monthly average) also should be achieved on a consistent basis.

Estimated third cell effluent quality that will be entering the filters is:

	<u>Summer</u>	<u>Winter</u>
CBOD <sub>5</sub>	10 to 20 mg/L	10 to 25 mg/L
TSS	20 to 40 mg/L	10 to 30 mg/L
Ammonia-N	0.5 to 4 mg/L	5 to 10 mg/L
TKN	4 to 9 mg/L	8 to 14 mg/L
Total N	17 to 22 mg/L	16 to 21 mg/L
Total P	1 to 3 mg/L	1 to 3 mg/L

Estimated final effluent quality (after filters) is:

	<u>Summer</u>	<u>Winter</u>
CBOD <sub>5</sub>	2 to 7 mg/L	10 to 15 mg/L
TSS	5 to 10 mg/L	3 to 10 mg/L
Ammonia-N	0.5 to 4 mg/L	5 to 10 mg/L
TKN	2 to 6 mg/L	7 to 12 mg/L
Total N	15 to 20 mg/L	15 to 20 mg/L
Total P	0.7 to 2.5 mg/L	0.7 to 2.5 mg/L

### **S&N AIROFLO Design Recommendations for the Wedowee WWTP:**

**The installation of eight 20-HP S&N aerators in the two aerated cells (four in each cell) will provide excellent soluble CBOD<sub>5</sub> removal. Together with settling of biological solids in the second aerated cell and efficient effluent filtration, the effluent CBOD<sub>5</sub> limits will be satisfied. The installation of six (6) S&N BIOFLO units (with new Kontakt media) in the third (nitrification) cell will ensure that effluent ammonia-N limits are achieved on a consistent basis.** The six BIOFLO units should be spaced approximately 30 feet apart (center to center). It is recommended that interior baffles be used in the third cell to ensure that each BIOFLO unit has its own partitioned volume to ensure plug flow through the six BIOFLO units in series.



EBARA



# Submersible Wastewater, Sewage Pump

Model DLFU  
Model DVFU  
Model DDLFU



water | wastewater | flood control



**EBARA** Fluid Handling

*an EBARA International Corporation company*

# Model DLFU, DLKFU, DDLFU



## K-Series, Model DLKFU – Features

Model DLKFU series pumps are designed to tackle clogging challenges with enhanced passage capabilities for handling of fibrous waste. The design features address the most common reasons for clogging caused by fibrous materials:

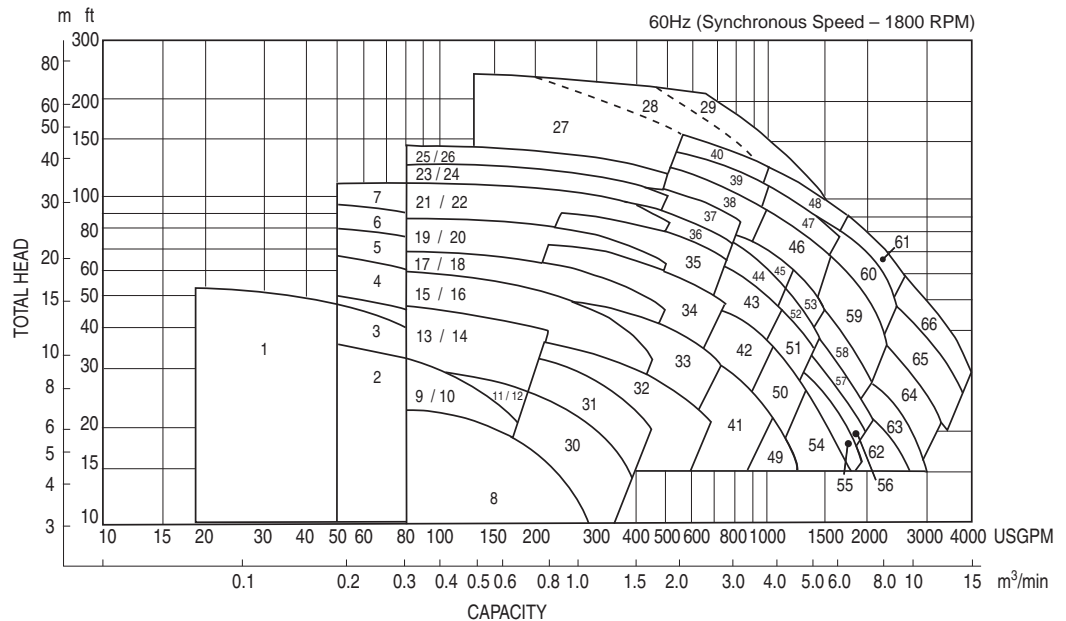
- Reduces material caught on the vane tips
- Increases inlet pressure which keeps debris moving instead of recirculating
- E-liminator groove disrupts the accumulation of fibrous debris.

## DLFU selection chart

1 50DLFU61.5 2HP	34 100DLFU611 15HP
2 80DLMFU61.5 2HP	35 100DLFU615 20HP
3 80DLMFU62.2 3HP	36 100DLFU618 25HP
4 80DLMFU63.7 5HP	37 100DLFU622 30HP
5 80DLMFU65.5 7½HP	38 150DLFU630 40HP
6 80DLMFU67.5 10HP	39 150DLFU637 50HP
7 80DLCMFU611 15HP	40 150DLFU645 60HP
8 100DLFU61.5 2HP	41 150DLFU67.5 10HP
9 80DLFU61.5 2HP	42 150DLFU611 15HP
10 100DLMFU61.5 2HP	43 150DLFU615 20HP
11 80DLFU62.2 3HP	44 150DLFU618 25HP
12 100DLMFU62.2 3HP	45 150DLFU622 30HP
13 80DLFU63.7 5HP	46 200DLFU630 40HP
14 100DLMFU63.7 5HP	47 200DLFU637 50HP
15 80DLFU65.5 7½HP	48 200DLFU645 60HP
16 100DLMFU65.5 7½HP	49 200DLFU67.5 10HP
17 80DLFU67.5 10HP	50 200DLFU611 15HP
18 100DLMFU67.5 10HP	51 200DLFU615 20HP
19 80DLFU611 15HP	52 200DLFU618 25HP
20 100DLMFU611 15HP	53 200DLFU622 30HP
21 80DLFU615 20HP	54 250DLFU611 15HP
22 100DLMFU615 20HP	55 250DLBFU615 20HP
23 80DLFU618 25HP	56 250DLCFU615 20HP
24 100DLMFU618 25HP	57 250DLFU618 25HP
25 80DLFU622 30HP	58 250DLFU622 30HP
26 100DLMFU622 30HP	59 250DLFU630 40HP
27 100DLFU630 40HP	60 250DLFU637 50HP
28 100DLFU637 50HP	61 250DLFU645 60HP
29 100DLFU645 60HP	62 300DLFU618 25HP
30 100DLFU62.2 3HP	63 300DLFU622 30HP
31 100DLFU63.7 5HP	64 300DLFU630 40HP
32 100DLFU65.5 7½HP	65 300DLFU637 50HP
33 100DLFU67.5 10HP	66 300DLFU645 60HP

## Standard Specifications

<b>Design</b>	Discharge Horsepower Capacity Total head Max.Liquid temp.	2, 3, 4, 6, 8, 10, 12 inch 2 to 60 13 to 4000 GPM 7 to 243 feet 104°F/40°C
<b>Speed</b>		1800 RPM
<b>Materials</b>	Casing Impeller  Shaft  Motor Frame Fastener	Cast Iron Cast Iron (2 to 60HP) Ductile Iron (150-300DLFU, 40 to 60HP) 403 Stainless Steel, 2 to 5HP 420 Stainless Steel, 7½ to 60HP Cast Iron 304 Stainless Steel
<b>Construction</b>	<b>Mechanical Seal</b> Material – Upper  Material – Lower  Impeller Type  Bearing Motor  Three Phase Service Factor Motor Protection	Double Mechanical Seal Carbon/Ceramic <i>Optional:</i> Tungsten Carbide/Tungsten/Carbide Silicon Carbide/Silicon Carbide, 2 to 60HP <i>Optional:</i> Tungsten Carbide/Tungsten/Carbide Tungsten Carbide/Tungsten Carbide, 150-300DLFU, 50 & 60 HP Semi-open, 2 to 30HP Enclosed, 40 to 60HP Prelubricated Ball Bearing 2-5hp= Class F Insulation, 7.5-60hp= Class H Insulation <i>Optional:</i> FM Explosion Proof Class 1, Division 1, Group C, D 208/230V, 460V 1.15 Built-in Thermal Detector - Klixon Mechanical Seal Leakage - Float Switch
<b>Submersible Cable</b>		2 to 5HP - 33 ft. standard cable length 7½ to 60HP - 40 ft. standard cable length Optional _____ ft. (customer specified)
<b>Accessories</b>		Optional QDC System



**Please note:** Overlap in coverage is designated by the two numbers; for example "9 / 10". Refer to the legend left for the specific model numbers.

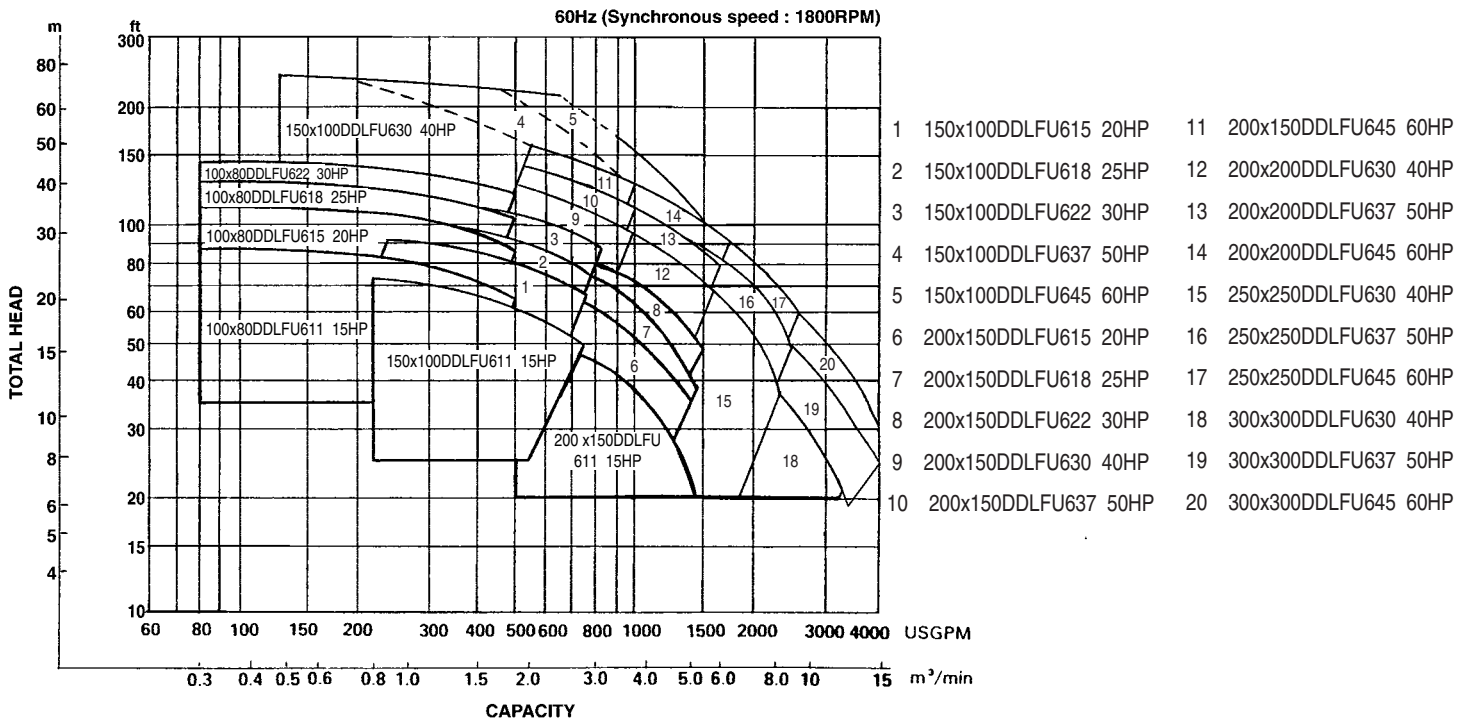
# Model DDLFU



## Standard Specifications

<b>Design</b>	Discharge	4"×3", 6"×4", 8"×6", 8"×8", 10"×10", 12"×12"
	Horsepower	15 to 60HP
	Capacity	80 to 4000 GPM
	Total head	20 to 243 feet
	Max.Liquid temp.	104°F/40°C
<b>Speed</b>		1800 RPM
<b>Materials</b>	Casing	Cast Iron
	Impeller	Cast Iron
	Shaft	420 Stainless Steel
	Motor Frame	Cast Iron
	Fastener	304 Stainless Steel
<b>Construction</b>	<b>Mechanical Seal</b>	
	Double Mechanical Seal – Tandem Arrangement	
	Material – Upper	Carbon/Ceramic
		<i>Optional:</i> Tungsten Carbide/Tungsten/Carbide
	Material – Lower	Silicon Carbide/Silicon Carbide
		<i>Optional:</i> Tungsten Carbide/Tungsten/Carbide
		Tungsten Carbide/Tungsten Carbide
		(200×150DDLFU and greater, 50 & 60 HP only)
	Impeller Type	Semi-open for 15 to 30HP
		Enclosed for 40 to 60HP
	Bearing	Prelubricated Ball Bearing
	Motor	2-5hp=Class F Insulation, 7.5-60hp=Class H Insulation
	<i>Optional:</i> FM Explosion Proof Class 1, Division 1, Group C, D	
	Three Phase	208/230V, 460V
	Service Factor	1.15
	Motor Protection	Built-in Thermal Detector - Klixon Mechanical Seal Leakage - Float Switch
<b>Submersible Cable</b>		40 ft. standard cable length, Optional 66 ft. Optional _____ ft. (customer specified)

## DDLFU selection chart



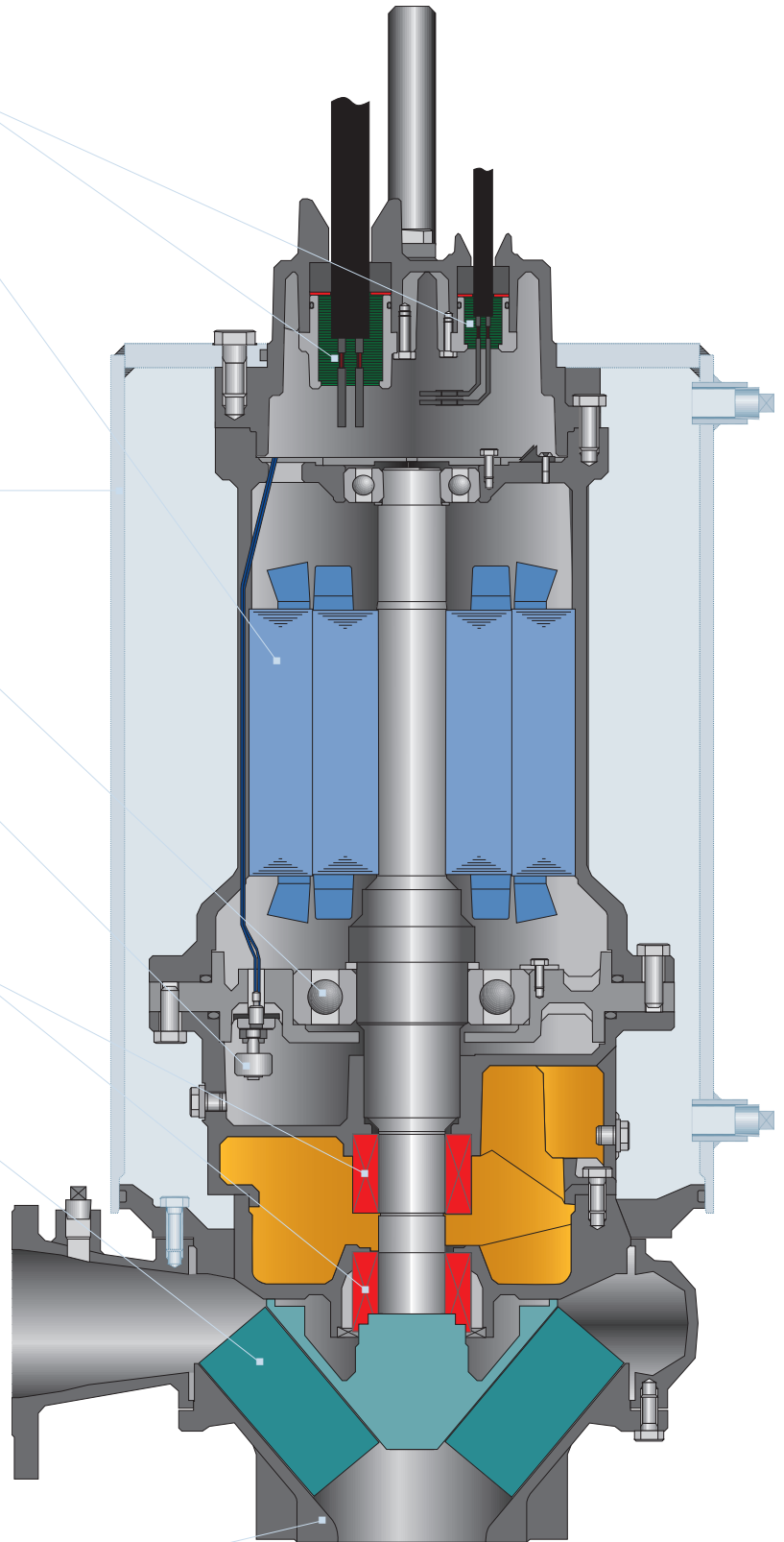
# Model DLFU, DLKFU, DDLFU

## Features

- **Watertight cable entry system** prevents capillary action and protects against moisture; reduces maintenance costs
- **Heavy duty, high efficiency, air filled** motor dissipates heat easily; thermal protection in each phase of windings protects; operates cooler with higher efficiencies; longer service life with lower operating costs
- **Self cooling jacket** (Model DDLFU) eliminates the need for external pumping devices or special heat transfer fluids; offers simplicity and high reliability by effectively dissipating heat in dry pit applications only
- **Single and double row thrust bearings** carries thrust loads with L-10 life of 60,000 hours; ensures long, dependable operation and lowers maintenance costs
- **Mechanically actuated float switch** provides early warning of mechanical seal failure; avoids costly motor repairs
- **Double mechanical seals – silicon carbide lower seals, carbon/ceramic upper –** hard faced upper and lower seals operate in an oil bath; providing longer service life and lower maintenance costs
- **High efficiency impellers** pass large solids with high outputs and reduces power consumption; impellers are optimized for hydraulic coverage; lowers operating costs

**Model DLKFU series pumps** are designed to tackle clogging challenges with enhanced passage capabilities for handling of fibrous waste. The design features address the most common reasons for clogging caused by fibrous materials: Reduces material caught on the vane tips, increases inlet pressure which keeps debris moving instead of recirculating and E-eliminators groove disrupts the accumulation of fibrous debris

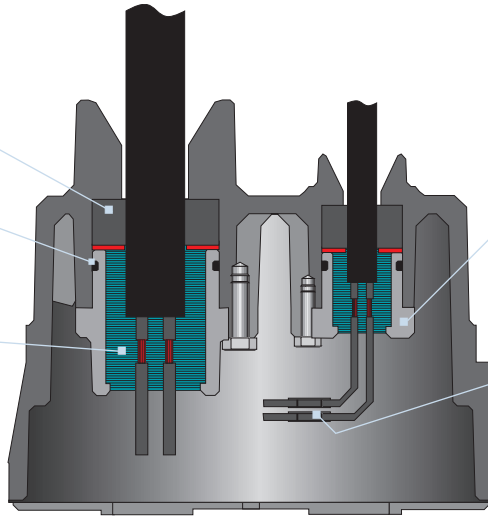
- **Replaceable wear components** maintains working clearances while reducing casing and volute costs



# Model DLFU, DLKFU, DDLFU

## Cable Entry System

- Primary seal – grommet (NBR)
- Secondary sealing – O-rings (NBR)
- Epoxy resin – prevents capillary action
- Solid joint butt connector (copper)
- Cable gland (grey cast iron)
- Solid joint butt connector (copper)

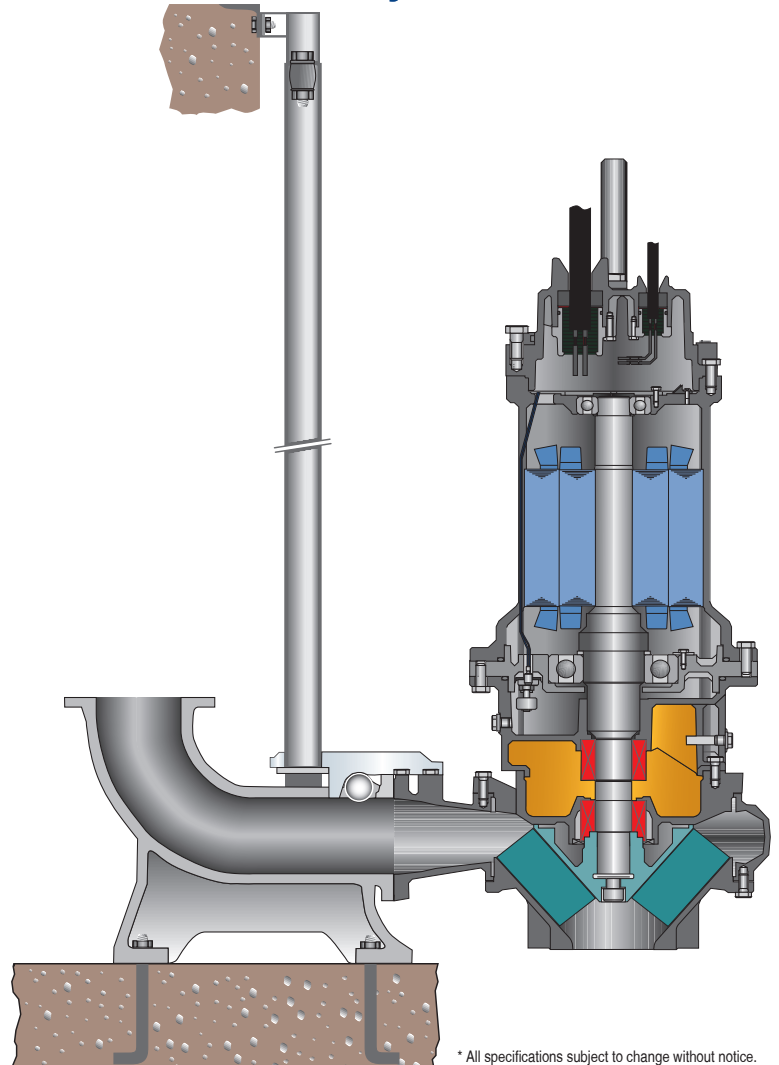
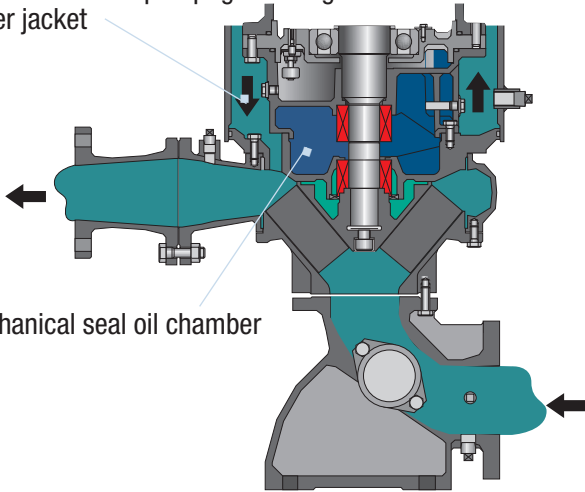


*Note:* Entry system is the same for both power and control cables.

## QDC & Slide Rail System

### DDLFU Dry Pit Design

- Motor cooling is provided by internal recirculation of pumpage through water jacket
- Mechanical seal oil chamber



\* All specifications subject to change without notice.



**EBARA** Fluid Handling

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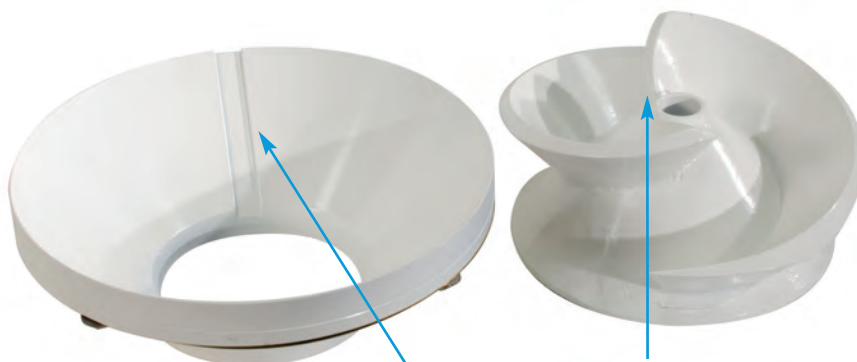
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EFHDLFU1011

# EBARA K-Series

An increased frequency of submersible wastewater pumps clogging due to an abundance of improperly disposed materials entering waste streams have plagued pump manufacturers and municipal wastewater facilities over the past decade. Efforts by municipalities to restrict occurrences of such materials entering the system are not always successful.

Ebara DLKF series pumps are designed to tackle these challenges. The Ebara K-series submersible sewage pump maintains the same quality and durability of the Ebara DLF line but with enhanced passage capabilities for handling of fibrous waste.



Adjustable wear plate with an E-eliminators groove.

Modified vane profiles.

The Ebara K-series design features address the most common reasons for clogging caused by fibrous materials. This design:

- Reduces material caught on the vane tips
- Increases inlet pressure which keeps debris moving instead of recirculating
- E-eliminators groove disrupts the accumulation of fibrous debris.

When applied as designed, Ebara submersible DLF-series pumps continue to offer superior solids handling for up to three-inch spherical solids. In most applications the standard D-series design can sufficiently handle your pumping requirements, but when the situation calls for something more, choose Ebara K-series.

K-series pumps are available for new equipment sales and as a conversion kit for installed Ebara pumps.

## Field Trials

have shown that the Ebara K-series pumps have dramatically reduced and in some cases eliminated clogging pumps.

### South Carolina Municipality:

80DLMF (3 HP), multiple clogging occurrences per week pumps converted to 80DLMKF 9/24/09 – **no clogs as of 9/2/2010**

### South Carolina Municipality:

80DLCMF (10 HP), two clogging occurrences per week pumps converted to 80DLCMKF 7/23/09 – **no clogs as of 9/2/2010**

### South Carolina Municipality:

80DLMF (7 1/2 HP) multiple clogging occurrences per week, pumps converted to 80DLMKF 11/17/09 – **no clogs as of 9/2/2010**

### Ohio Municipality:

100DLMF (15HP) , daily clogging occurrences upgraded to 100DLMKF 10/23/09 – **no clogs as of 9/2/2010**

### Iowa Municipality:

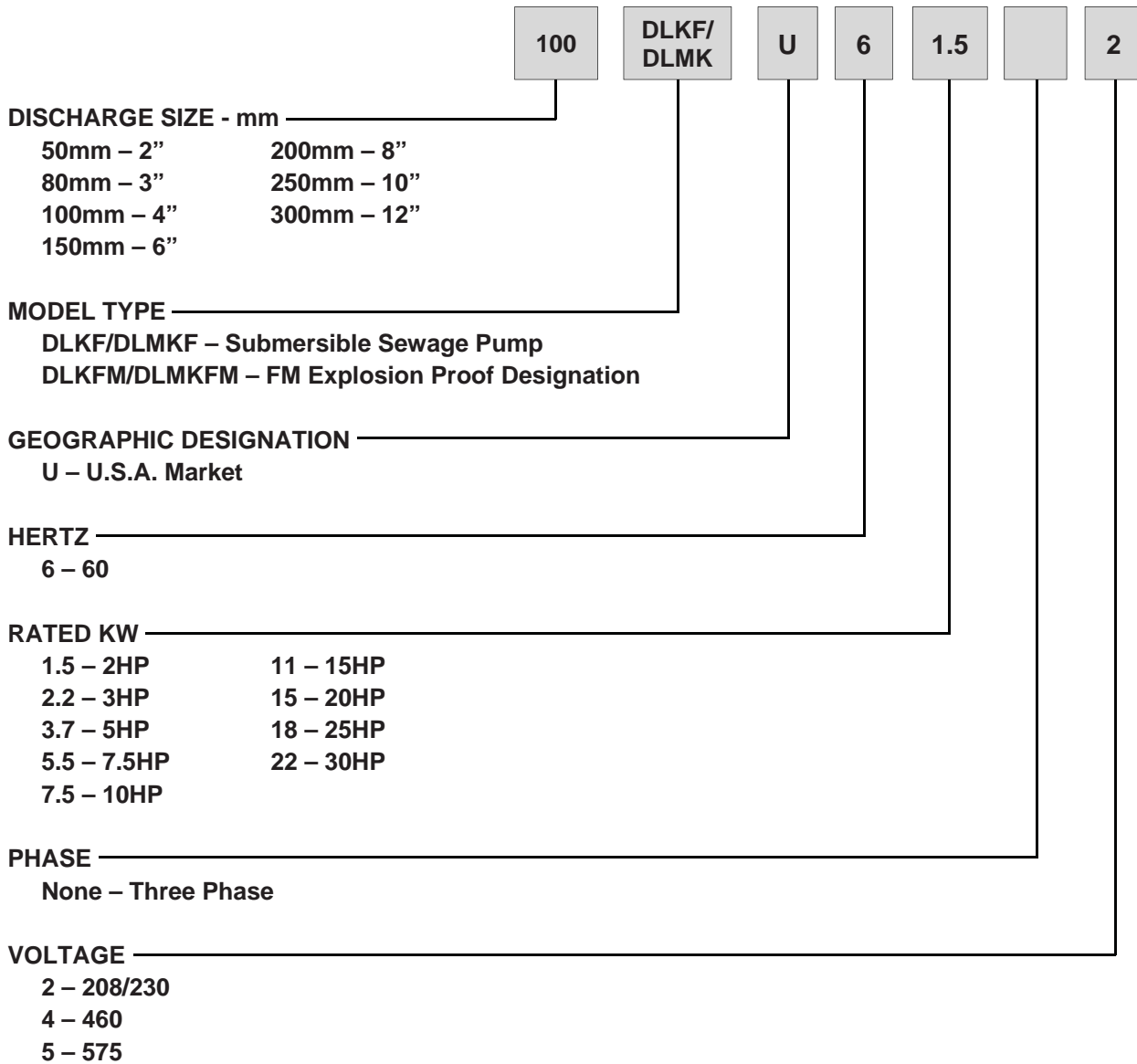
100DLMF (10HP), multiple clogging occurrences per week, upgraded to 100DLMKF 11/12/09 – **no clogs as of 9/2/2010**

### Florida Municipality:

150DLFU618 (25 HP) 11/5/09 two clogging occurrences per week, upgraded to 150DLKFU618 – **no clogs as of 9/2/2010**



**Model Designation**

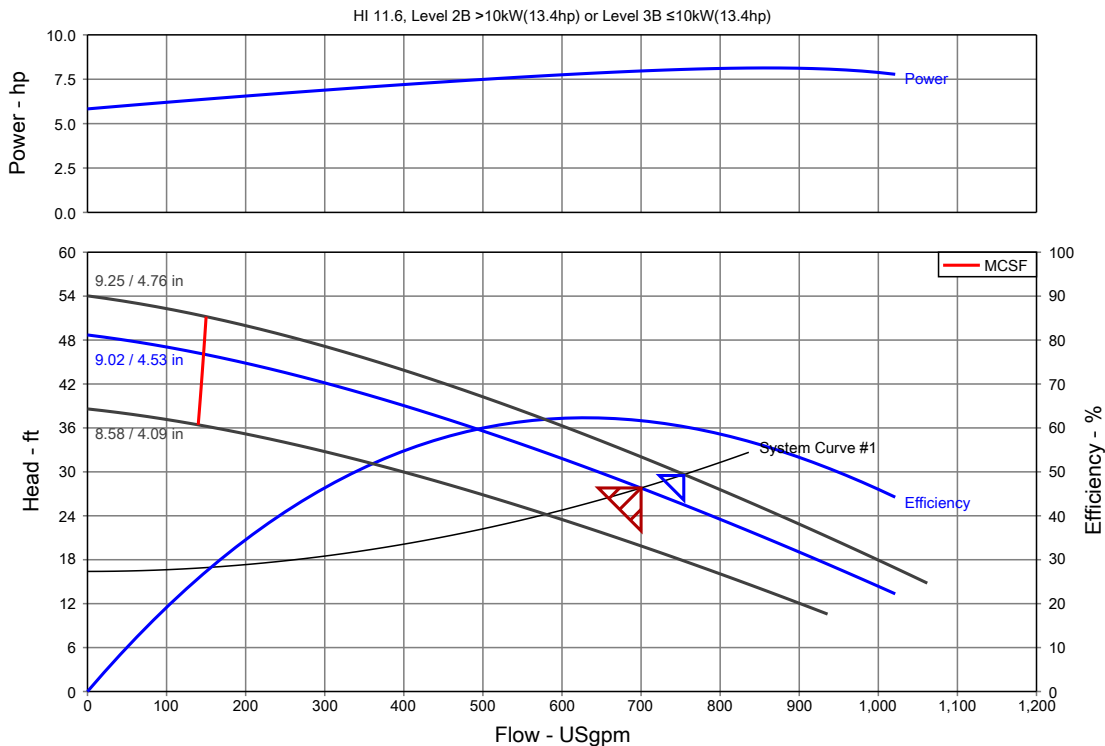




Customer :  
Reference :

Item number	: 002	Product Description	: 100DLKFU67.5
Service	:	Stages	: 1
Quantity	: 2	Based on curve number	: DLMK-C615-9203
Quote number	: 1839286	Date last saved	: 07 Mar 2023 3:02 PM

Operating Conditions		Liquid	
Flow, rated	: 700.0 USgpm	Liquid type	: Cold Water
Differential head / pressure, rated (requested)	: 27.80 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 27.46 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
<b>Performance</b>		Viscosity, rated	: 1.00 cP
Speed criteria	: Synchronous	Vapor pressure, rated	: 0.00 psi.a
Speed, rated	: 1745 rpm	<b>Material</b>	
Impeller diameter, rated	: 9.02 / 4.53 in	Material selected	: Standard
Impeller diameter, maximum	: 9.25 / 4.76 in	<b>Pressure Data</b>	
Impeller diameter, minimum	: 8.58 / 4.09 in	Maximum working pressure	: 21.08 psi.g
Efficiency	: 61.66 %	Maximum allowable working pressure	: N/A
NPSH required / margin required	: - / 0.00 ft	Maximum allowable suction pressure	: N/A
Ns (imp. eye flow) / Nss (imp. eye flow)	: 3,168 / - US Units	Hydrostatic test pressure	: N/A
MCSF	: 146.8 USgpm	<b>Driver &amp; Power Data (@Max density)</b>	
Head, maximum, rated diameter	: 48.70 ft	Driver sizing specification	: Rated power
Head rise to shutoff	: 75.27 %	Margin over specification	: 0.00 %
Flow, best eff. point	: 629.4 USgpm	Service factor	: 1.00
Flow ratio, rated / BEP	: 111.22 %	Power, hydraulic	: 4.91 hp
Diameter ratio (rated / max)	: 96.68 %	Power, rated	: 7.97 hp
Head ratio (rated dia / max dia)	: 86.68 %	Power, maximum, rated diameter	: 8.14 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Motor rating	: 10.00 hp / 7.46 kW (Fixed)
Selection status	: Acceptable		





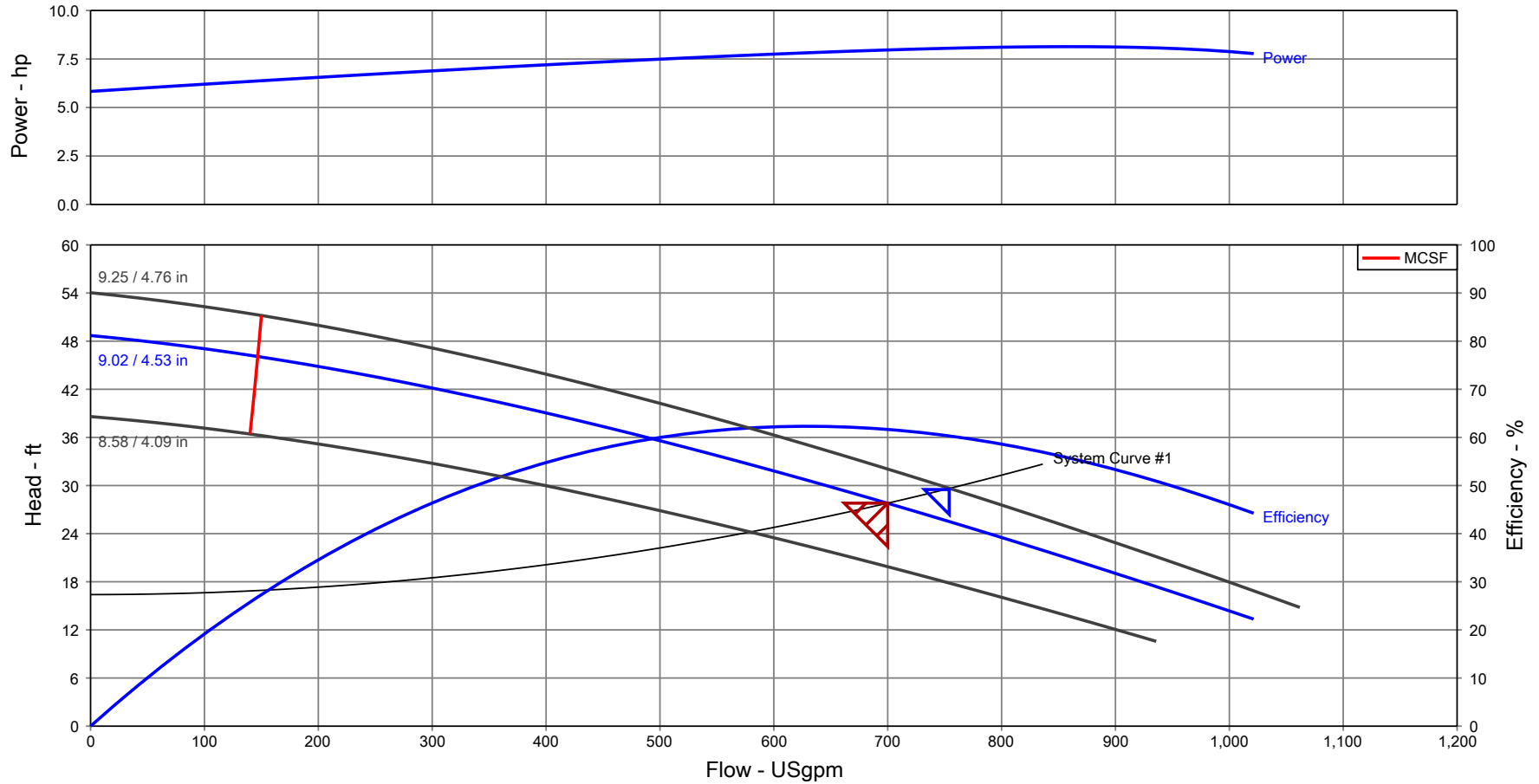


Customer :  
Reference :

# Pump Performance Curve

Ebara Quotation System 23.0.0

HI 11.6, Level 2B >10kW(13.4hp) or Level 3B ≤10kW(13.4hp)



Item number	: 002	Product Description	: 100DLKFU67.5	Flow, rated	: 700.0 USgpm
Service	:	Stages	: 1	Differential head / pressure, rated	: 27.80 ft
Quantity	: 2	Speed, rated	: 1745 rpm	NPSH required	: -
Quote number	: 1839286	Based on curve number	: DLMK-C615-9203	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 07 Mar 2023 3:02 PM	Efficiency	: 61.66 %	Viscosity	: 1.00 cP
		Power, rated	: 7.97 hp	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

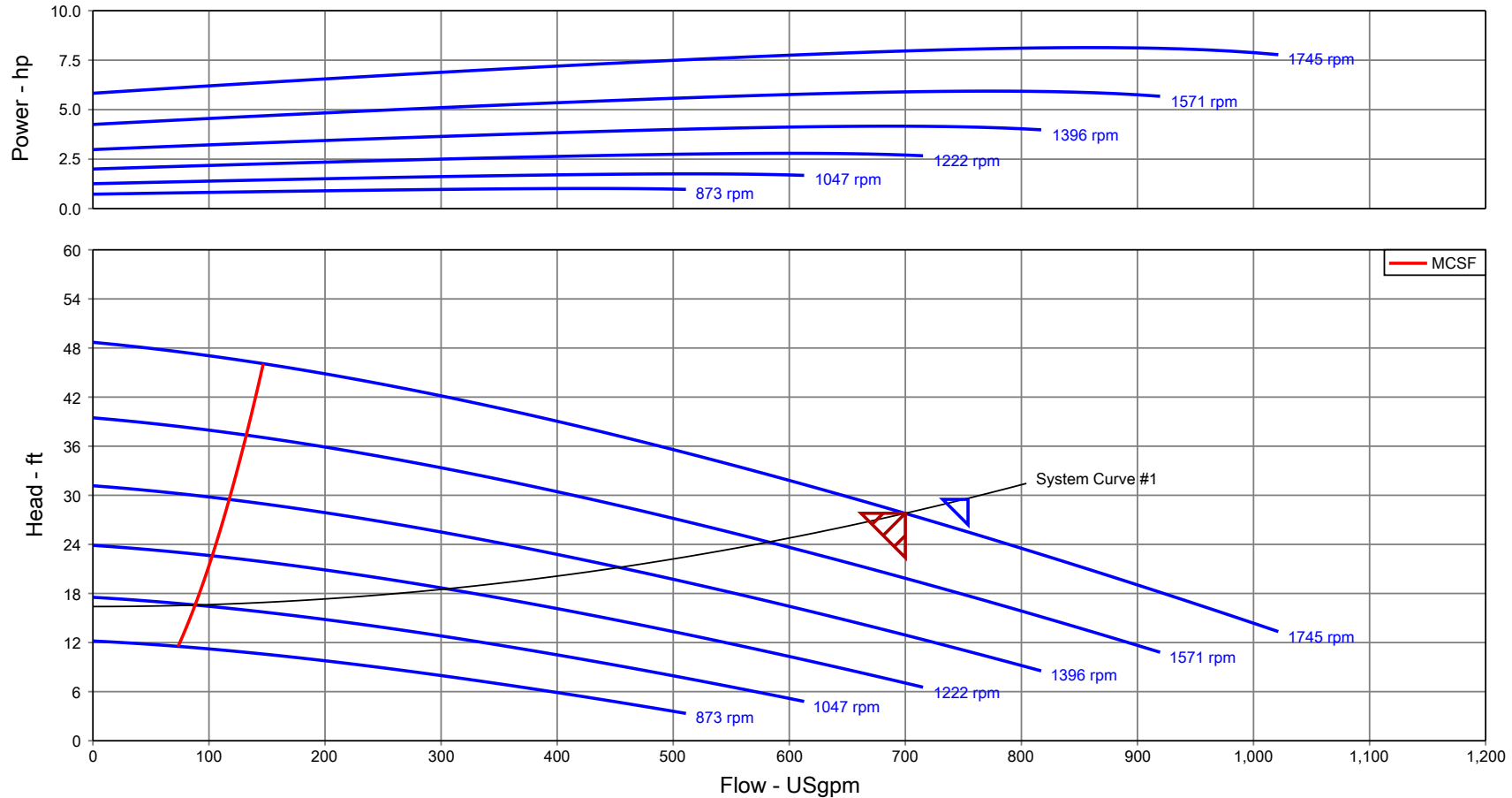


Customer :  
Reference :

# Multi-Speed Performance Curve

Ebara Quotation System 23.0.0

HI 11.6, Level 2B >10kW(13.4hp) or Level 3B ≤10kW(13.4hp)



Item number	: 002	Product Description	: 100DLKFU67.5	Flow, rated	: 700.0 USgpm
Service	:	Stages	: 1	Differential head / pressure, rated	: 27.80 ft
Quantity	: 2	Efficiency	: 61.66 %	Speed, rated	: 1745 rpm
Quote number	: 1839286	Power, rated	: 7.97 hp	Impeller diameter, rated	: 9.02 / 4.53 in
Based on curve number	: DLMK-C615-9203	NPSH required	: -	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 07 Mar 2023 3:02 PM	Site Supply Frequency	: 60 Hz	Viscosity	: 1.00 cP
		Nominal speed	: 1765 rpm	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

## Construction Datasheet

Customer :	Quote number : 1839286
Customer reference :	Pump Model : 100DLKFU67.54
Sales Order :-	Quantity :2
Job Name :-	Date last saved : 07 Mar 2023 3:02 PM

### Pump Data

FM Approved No	Insulation Class H
Discharge Size (in) 4	Service Factor 1.15
Discharge Size (mm) 100	Motor Protection
Hertz 60	Thermal Detection Klixons
Rated KW 7.5	Leakage Detection Float Switch
Horsepower 10	Cable Length (ft) 50.00 ft
Phase Three	Max Submergence 65
Voltage 460	Impeller Type Semi-Open
Max Water Temperature °F 104	Impeller Design Mixed Flow
Max Water Temperature °C 40	Number of Vanes 2
Max Solid Diameter 3.00 in	Back P.O. Vanes Yes
Synchronous Speed (RPM) 1800	

### Pump Materials of Construction

Casing Cast Iron	Shaft 420 SS
Impeller Cast Iron	Key 420 SS
Intermediate Casing Cast Iron	Motor Frame Cast Iron
Suction Cover Cast Iron	O-Rings NBR
Wear Ring -	Fastener 304 SS

### Mechanical Seal and Ball Bearing Data

Mechanical Seal Size (mm) -	Lubricating Oil
Mechanical Seal Material	Capacity (oz) 90
Upper Side Carbon Ceramic	Capacity (cc) 2500
Lower Side Silicon Carbide/Silicon Carbide	Name Turbine Oil #32
Ball Bearing	
Upper 6309ZZ	
Lower 6306ZZ	

### QDC and Accessories

QDC Model LL125	Lifting Chain LCLS-9
Discharge Elbow (in) 5 x 6	Material Stainless Steel
Upper Guide Bracket UGBE2-316	Size (mm) 9
Intermediate Guide Bracket IGBLL1256-316	Standard Length (ft) 20

### Estimated Weights (lbs)

Pump 341.0 lb	Intermediate Guide Bracket 12.00 lb
QDC 147.0 lb	Lifting Chain 24.00 lb
Upper Guide Bracket 4.00 lb	Total Weight 528.0 lb

**THE ESHELMAN COMPANY, INC**

## Motor Datasheet

Customer :	Quote number : 1839286
Customer reference :	Pump Model : 100DLKFU67.54
Sales Order : -	Quantity : 2
Job Name : -	Date last saved : 07 Mar 2023 3:02 PM

### Motor Data

Nameplate Rating	100% Load
Horsepower 10	Full Load (A) 14.6
Rated KW 7.5	Efficiency (%) 76.9
Phase Three	Power Factor (%) 83.7
Voltage 460	Speed (min1) 1746
Poles 4	Resistance at 20Â°C (OHMS) 1.36
Current (A) 14.6	Locked Rotor Torque (%) 229
Speed (min1) 1745	Locked Rotor Current (A) 88.5
Insulation Class H	Vibraton (Micron) 15
No Load Test	Noise Phon (50cm) 65
Amperes 6.3	Number Starts Per Hour 20
Watts 502	Design Standard NEMA MG1 Part 31.4.4.2
	Voltage Tolerance (%) ± 10
	Frequency Tolerance (%) ± 5
	Symbols EM

### Power Cable Data

Gauge (AWG) SOW-A #8	Nominal Insulator Thickness 1.14
Number of Conductors 4	Sheath Thickness (mm) 3.4
Detail of Conductor -	Cable O.D. (mm) 20.83
Qty/Dia of Wire (PCS/mm) 119/0.29	Resistance at 20Â°C 2.41
Diameter (mm) 4.4	Max Cable Length (ft) 1465

### Control Cable Data

Gauge (AWG) #18	Nominal Insulator Thickness 0.76
Number of Conductors 5	Sheath Thickness (mm) 2.2
Detail of Conductor -	Cable O.D. (mm) 12.32
Qty/Dia of Wire (PCS/mm) 16/0.25	Resistance at 20Â°C 24.23
Diameter (mm) 1.2	Max Cable Length (ft) -

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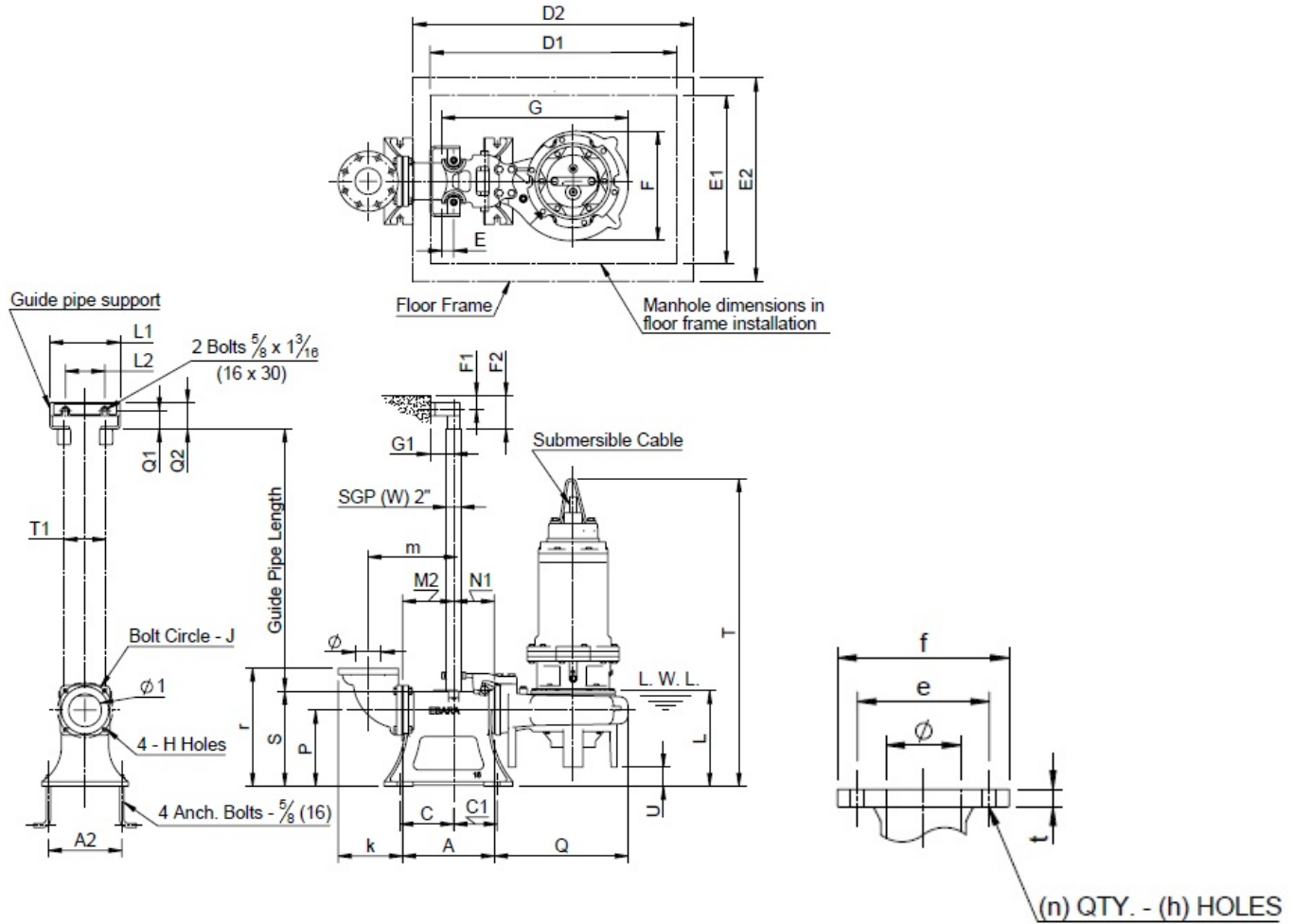
# General Arrangement

## EBARA Pumps

### Dimensions

Model: 100DLKFU67.54 460V - Weight 341.0 lb

QDC Model: Standard LL125 5" Base - Weight 147.0 lb



PUMP & MOTOR					
F	G	L	Q	T	U
15.67	26.97	14.06	18.90	40.16	2.72

Discharge Flange (ANSI 125 PSI FF)								
ø (mm/in)	e	f	t	n	h	r	m	k
150 / 6	9.49	10.98	0.98	0.31	0.87	18.31	13.58	11.42

QDC															
A	A1	A2	B1	B2	C	C1	H	J	M2	N	N1	N2	P	S	ø1
13.78	-	11.02	-	-	8.07	6.50	0.75	8.27	7.68	C/F	6.10	-	11.42	14.25	4.92

UGB								
E	F1	F2	G1	L1	L2	Q1	Q2	T1
2.17	1.57	3.54	3.54	10.55	5.91	2.76	3.94	6.30

ACCESS HOLE			
D1	D2	E1	E2
31.50	36.61	27.56	32.68

**NOTES:**

1. Dimensions are in inches

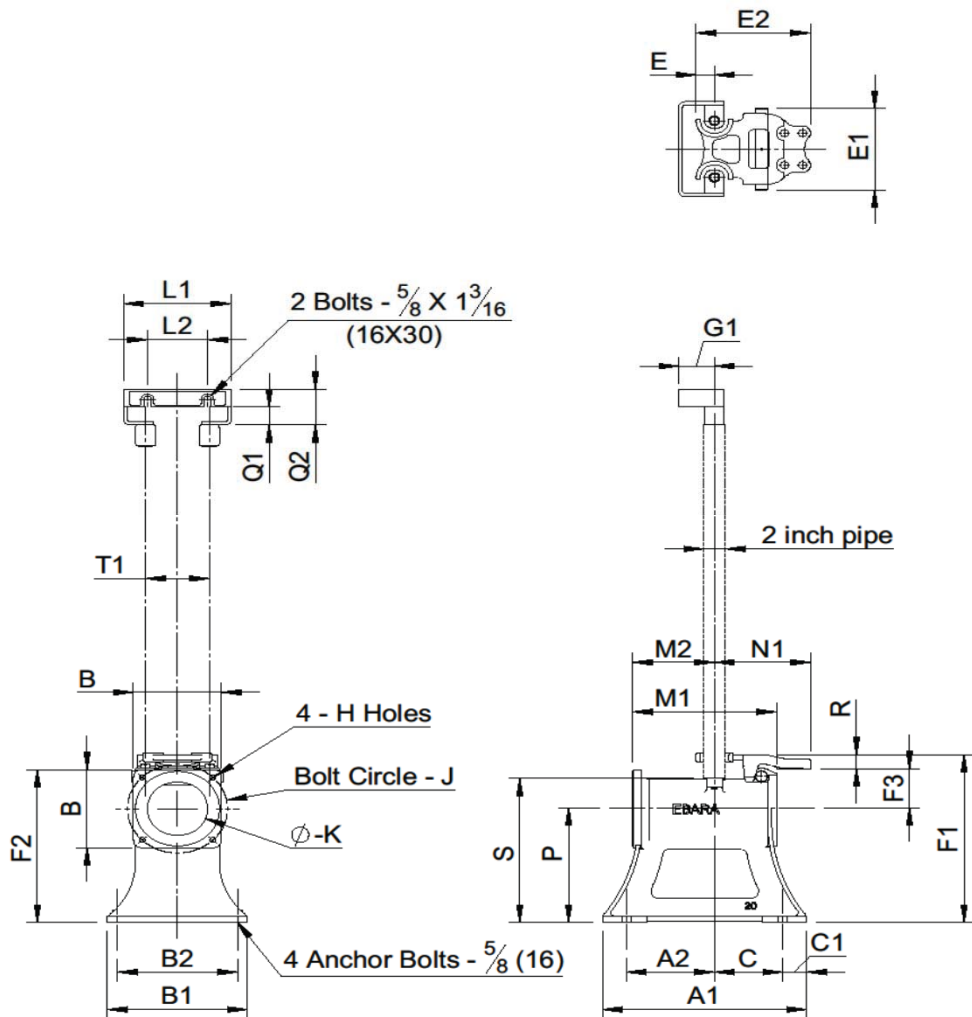
# EBARA Quick Discharge Connector

## Dimensions

Project: \_\_\_\_\_ Model: \_\_\_\_\_ Chk'd: \_\_\_\_\_ Date: \_\_\_\_\_

### Model LL125

Weight: 143 Lb (65 kg)



### Dimensions: inch

A1	A2	B	B1	B2	C	C1	E	E1	E2	F1
19.31	8.06	7.50	13	11	6.50	2.38	1.81	7.88	11.25	16.94
F2	F3	G1	H	J	K	L1	L2	M1	M2	N1
15.19	3.94	3.56	0.75	8.25	5	10.56	5.88	13.75	7.69	2.75
P	Q1	Q2	R	S	T1					
11.44	2.75	3.94	1.56	14.25	6.31					

### Dimensions: mm

A1	A2	B	B1	B2	C	C1	E	E1	E2	F1
490	205	190	330	280	165	60	46	200	286	430
F2	F3	G1	H	J	K	L1	L2	M1	M2	N1
385	100	90	19	210	125	268	150	350	195	70
P	Q1	Q2	R	S	T1					
290	70	100	40	362	160					



# EBARA Submersible Pumps

## Technical Information

Project: \_\_\_\_\_ Model: \_\_\_\_\_ Chk'd: \_\_\_\_\_ Date: \_\_\_\_\_

### Thermal Protection

The motor shall be equipped with a protector such as automatic cut-off device and thermal protector. The motors described below shall incorporate Miniature Thermal Protectors (MTP) which are embedded in the windings.

When temperature of the winding raises and reaches the MTP acting point, the motor protection circuit is activated to protect motor from over heat.

**1. Applicable model**

Model: DGFU, DLFU, DLKFU, DVFU, DDLFU

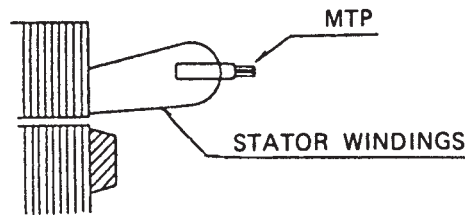
**2. MTP Specifications:**

Model	KLIXON 9700K-66-215
Type of Contact	b (Normally-Closed contact Acting-open)
Acting Temperature	140±5°C (284±9°F)
Re-setting Temperature	85±10°C (185±18°F)
Capacity of Contact	

Voltage (V)	DC 24	AC 115	AC 230	AC 460
Amperage (A)	18	18	13	5.5

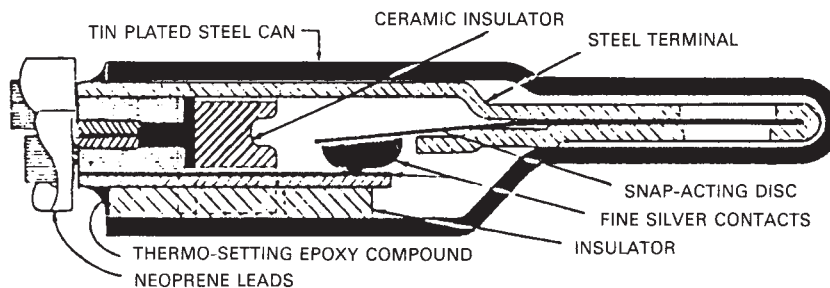
**3. Installation:**

MTP shall be embedded in the stator windings as shown at right—



**4. Construction:**

Construction of the MTP is as shown below:



# EBARA Submersible Pumps

## Technical Information

Project:

Model:

Chk'd:

Date:

### Details of Leakage Detector

#### 1. Applicable model

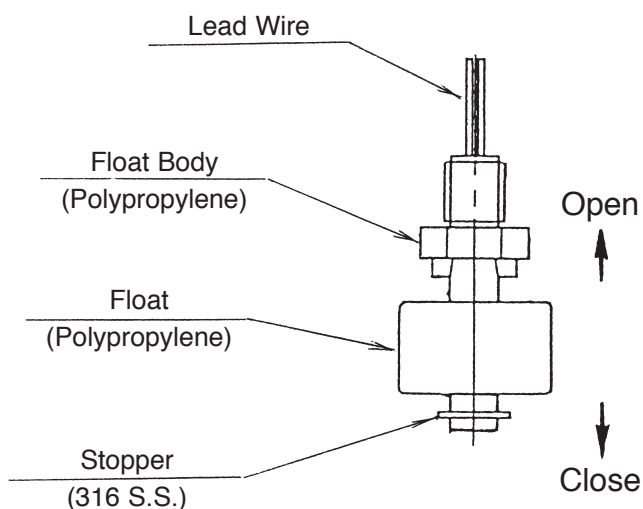
Model: DGFU, DLFU, DLKFU, DVFU, DDLFU

#### 2. Construction:

Each switch has a magnet-containing float which senses the liquid level and magnetically actuates a dry reed switch encapsulated within a stem. The switch opens on rise of liquid.

#### 3. Specifications

- Apply to 2 to 30HP



Breaking Capacity : AC50VA, DC50W

Max. Breaking Current : AC0.5A, DC0.5A

Max. Operating Voltage : AC300V, DC300V



# EBARA Submersible Pumps

## Technical Information

Project:

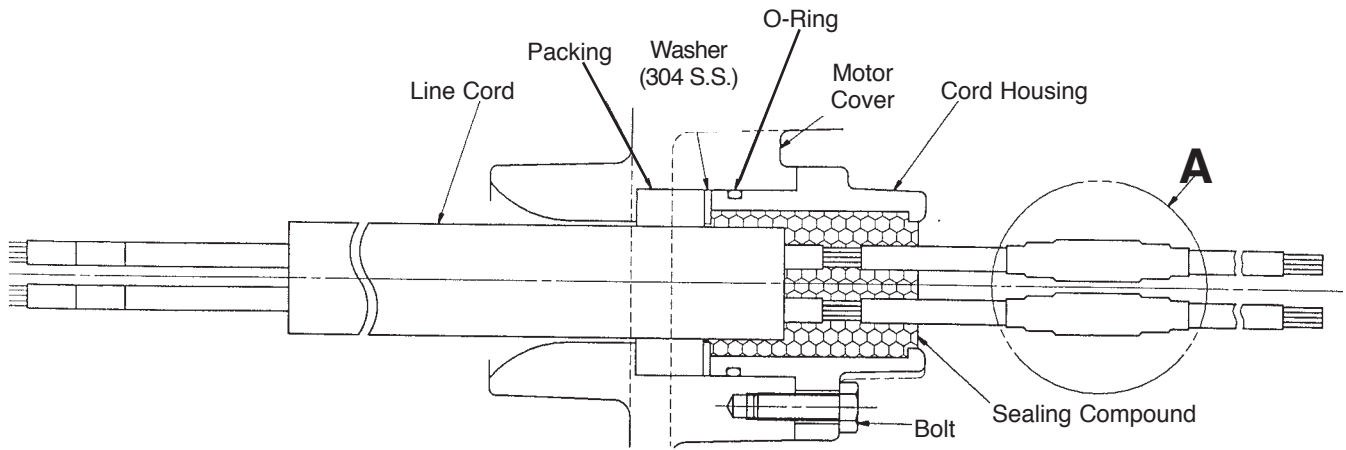
Model:

Chk'd:

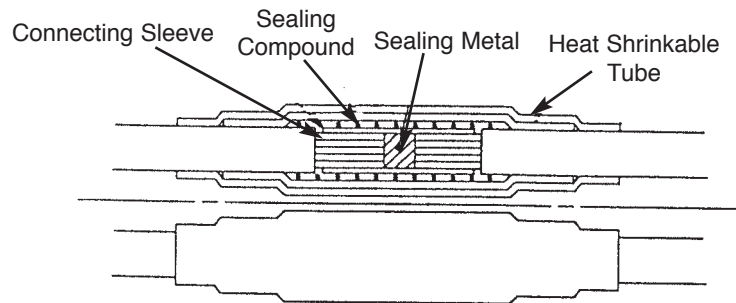
Date:

### Details of Cable Entry

Based on their first years of experience, EBARA now provides the most dependable cable entry construction of any submersible pump. Its features are as follows:



DETAIL "A"



**Motor Wiring Diagram**

Project:

Model:

Chk'd:

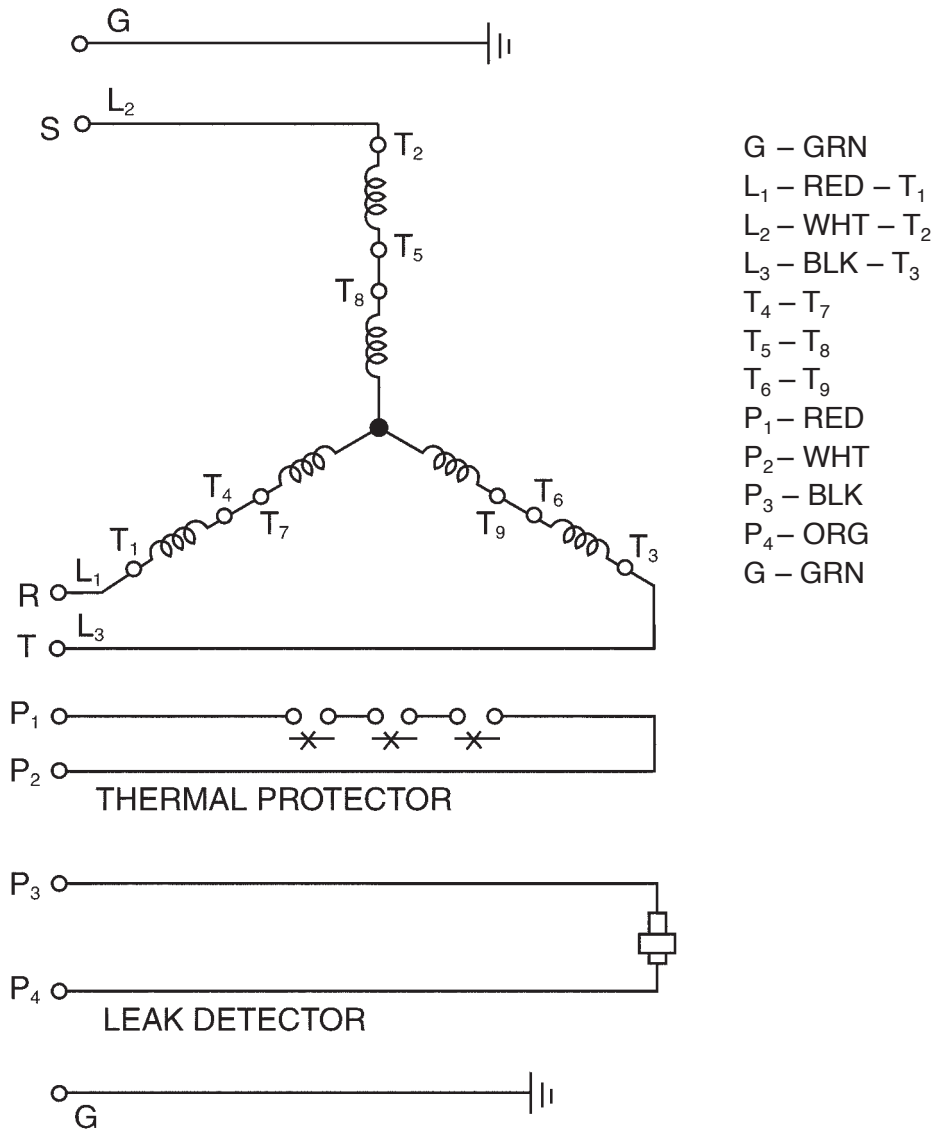
Date:

**Manual Operation Type – Three Phase**

Model DLKFU

Output 7.5 to 10HP

460V



**Technical Information**

Project: \_\_\_\_\_ Model: \_\_\_\_\_ Chk'd: \_\_\_\_\_ Date: \_\_\_\_\_

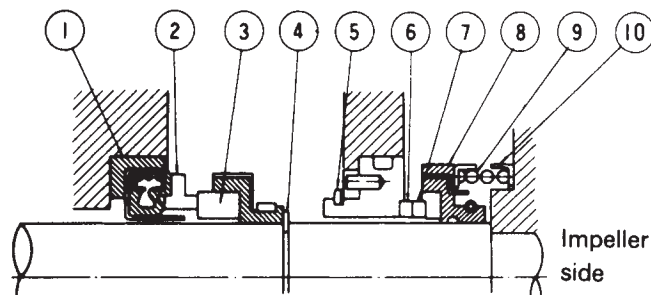
**Mechanical Seal Sectional View**

DOUBLE MECHANICAL SEALS in a tandem arrangement with HARD seal face materials are provided on all EBARA "D-Series" submersible pumps.

The double mechanical seal in oil chamber provides long life and friction-free sealing of the motor shaft.

Typical construction and materials are as follows:

- **TYPE A-40**  
DLKFU, 7.5 to 15HP



NO.	PART NAME	MATERIALS	NO. FOR 1 SET
1	Packing	N.B.R.	1
2	Seal Ring	Carbon Graphite	1
3	Floating Ring	Ceramic	1
4	Snap Ring	Spring Steel	1
5	Snap Ring	Spring Steel	1
6	Floating Ring	Silicon Carbide	1
7	Seal Ring	Silicon Carbide	1
8	Shock Absorbing Rubber	Fluorine Rubber	1
9	Spring	304SS	1
10	Spring Retainer	304SS	1

# EBARA Submersible Pumps

## Lifting chain

Project:

Model:

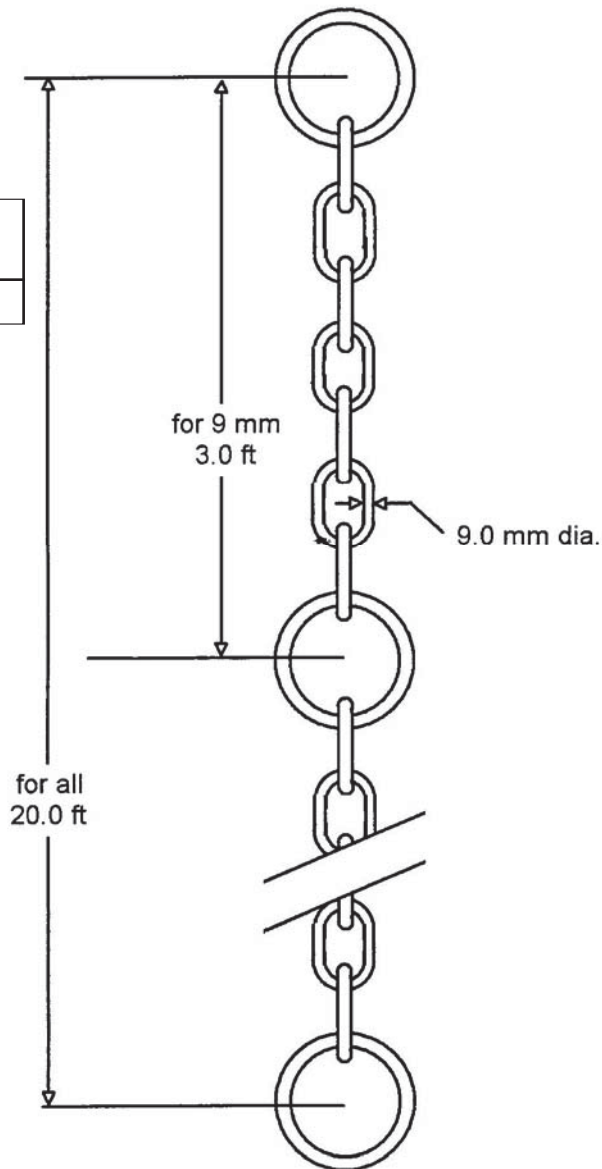
Chk'd:

Date:

### Lifting Chain

The Ebara lifting chain is high tensile strength galvanized steel or stainless steel.

Model	Size (mm)	Material	Max. Load (lbs.)	Wt. (lbs.)
LCLS-9	9	stainless	2400	24

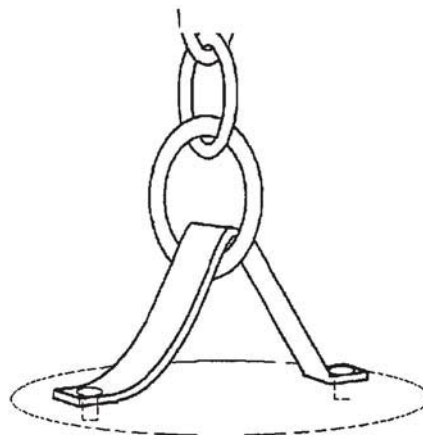


### To Attach Chain:

1. Unbolt Pump bail
2. Slide open end ring over bail
3. Re-bolt bail to pump top.

### For chain lengths longer than 20 ft.:

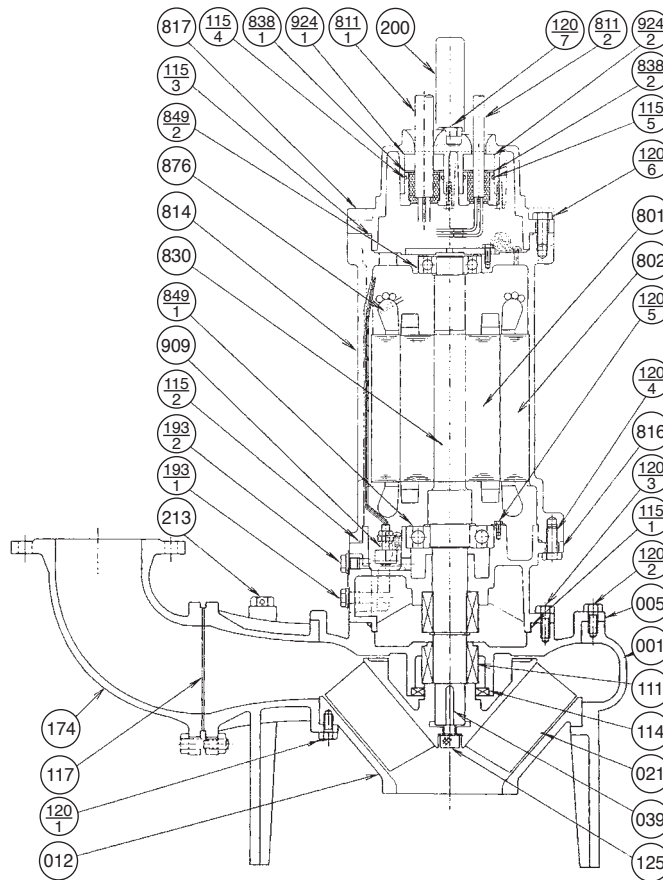
- use "quick links" or shackles to join 20 ft. lengths.



**Sectional View**

Project: \_\_\_\_\_ Model: \_\_\_\_\_ Chk'd: \_\_\_\_\_ Date: \_\_\_\_\_

**7½ to 10HP**



PART NO.	PART NAME	MATERIAL	ASTM, AISI CODE	NO. FOR 1 UNIT	PART NO.	PART NAME	MATERIAL	ASTM, AISI CODE	NO. FOR 1 UNIT
001	CASING	CAST IRON	A48 Class 30	1	174	DISCHARGE ELBOW	CAST IRON	A48 Class 30	1
005	INTERMEDIATE CASING	CAST IRON	A48 Class 30	1	193-1	PLUG	304 STAINLESS	AISI304	1
†012	SUCTION COVER	CAST IRON	A48 Class 30	1	193-2	PLUG	304 STAINLESS	AISI304	1
†021	IMPELLER	CAST IRON	A48 Class 30	1	200	LIFTING HANGER	STEEL	A283 Grade D	1
039	KEY	420 STAINLESS	AISI420	1	213	AIR VENT VALVE	BRASS	B36 No. 272	1
†111	MECHANICAL SEAL	—		1 SET	801	ROTOR	—		1
†114	OIL SEAL	RUBBER (NBR)		1	802	STATOR	—		1
†115-1	O-RING	RUBBER (NBR)		1	811-1	POWER CABLE	—		1
†115-2	O-RING	RUBBER (NBR)		1	811-2	CONTROL CABLE	—		1
†115-3	O-RING	RUBBER (NBR)		1	814	MOTOR COVER	CAST IRON	A48 Class 30	1
†115-4	O-RING	RUBBER (NBR)		1	816	BRACKET	CAST IRON	A48 Class 30	1
†115-5	O-RING	RUBBER (NBR)		1	817	BRACKET	CAST IRON	A48 Class 30	1
†117	GASKET			1	830	SHAFT	420J2 STAINLESS	AISI420	1
120-1	BOLT	304 STAINLESS	AISI304	4	838-1	WASHER	304 STAINLESS	AISI304	1
120-2	BOLT	304 STAINLESS	AISI304	8	838-2	WASHER	304 STAINLESS	AISI304	1
120-3	BOLT	304 STAINLESS	AISI304	4	†849-1	BALL BEARING	—		1
120-4	BOLT	304 STAINLESS	AISI304	6	†849-2	BALL BEARING	—		1
120-5	BOLT	304 STAINLESS	AISI304	3	876	MOTOR PROTECTOR	—		3
120-6	BOLT	304 STAINLESS	AISI304	4	909	LEAKAGE DETECTOR	—		1
120-7	BOLT	304 STAINLESS	AISI304	2	924-1	PACKING	RUBBER (NBR)		1
125	BOLT	304 STAINLESS	AISI304	1	924-2	PACKING	RUBBER (NBR)		1

Motors are purchased as a complete unit  
 †: Recommended spare parts



# EBARA Quick Discharge Connector

## Sectional View

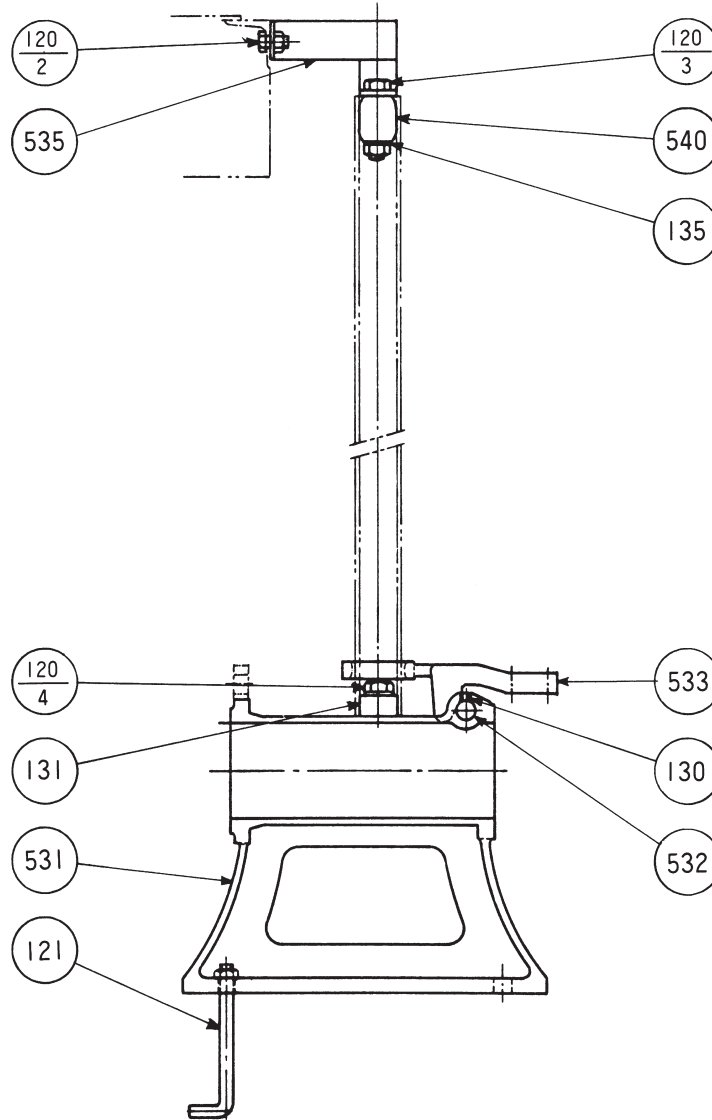
Project:

Model:

Chk'd:

Date:

### Model LL125



Part No.	Part Name	Material	ASTM, AISI, CODE	No. for 1 Unit
		Model LL	Model LL	
120-2	Bolt & Nut	Steel	A283 Grade D	2
120-3	Bolt & Nut	Steel	A283 Grade D	2
120-4	Bolt	316 Stainless	AISI316	2
121	Anchor Bolt	Steel	A283 Grade D	4
130	Set Screw	304 Stainless	AISI304	1
131	Guide Pin	Steel	A283 Grade D	2
135	Washer	Steel	A283 Grade D	2
531	Body	Cast Iron	A48 Class 30	1
532	Support Bar	420 Stainless	AISI420	1
533	Sliding Guide	Cast Iron	A48 Class 30	1
535	Guide Support Plate	Steel	A283 Grade D	1
540	Rubber Ring	Rubber (NR)		1

# EBARA Submersible Pumps

## Technical Information

Project:

Model:

Chk'd:

Date:

### Clogging Phenomena and Prevention

From abundant experience, EBARA placed the following design concepts on sump and sewage pumps in order to prevent clogging.

#### CLOGGING PHENOMENA AT:

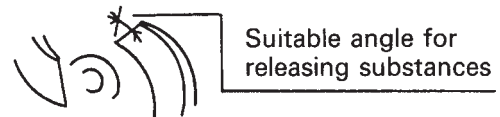
#### PREVENTION

1. Strainer Inlet

Choose a pump with a large strainer opening or pump without strainer.

2. Impeller Inlet

Shape inlet portion of the impeller blade as described below. The inlet edge of the impeller vanes are angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump.



3. Clearance between Impeller and Suction Cover

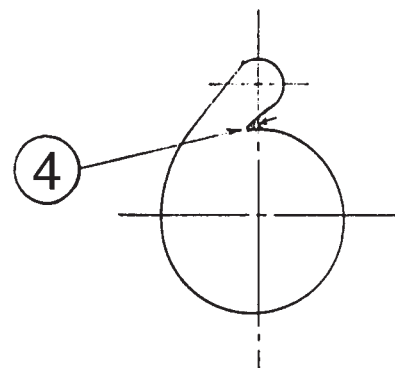
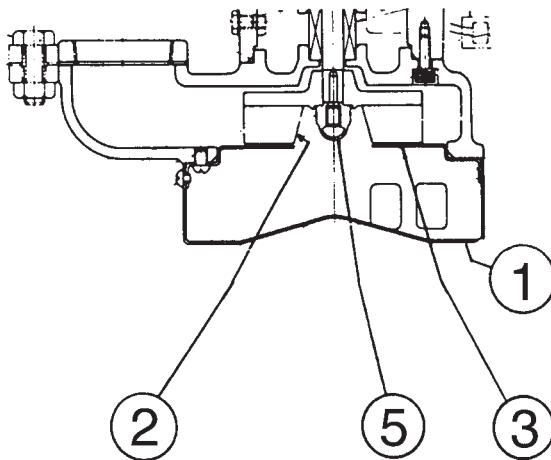
Increase clearance – Model DVU, DVFU.

4. Casing Tongue

Provide large radius on tongue, or cut water.

5. Shaft End

Eliminate sharp points on impeller and impeller nut (use rounded impeller nut).



## EBARA Submersible Pumps

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### Technical Information

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Project:

Model:

Chk'd:

Date:

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### Understanding Unbalance (1 of 5)

**Three phase motors can be damaged by sustained application of unbalanced voltages. This problem can easily be more severe than application of balanced voltages above or below normal data plate ratings.**

#### UNBALANCED PHASES

Unbalanced voltages applied to a 3 phase motor will adversely affect the motor operating characteristics. Motors will operate successfully where the variation in the supply voltage does not exceed plus or minus 10% of the name plate rating, but the voltages of a given 3 phase circuit should be evenly balanced as closely as can be read on the usually available commercial voltmeter. A relatively small unbalance in voltage will cause a considerable increase in temperature rise. For example, a 3.5% voltage unbalance will cause approximately 25% increase in temperature rise. The full load speed is reduced slightly when the motor operates on unbalanced voltages.

An unbalanced voltage will cause unequal currents to flow in the windings. If the motor is moderately or heavily loaded, currents in certain coils will exceed rating and overheat. Thermal cut-outs buried in the windings may detect this overheating and shut down the motor. If not, winding failure will result due to insulation damage.

A second type of damage is caused by rotor heating. This can occur without excessive coil current on a lightly loaded motor. Damaging currents at these frequencies will flow as a result of voltage unbalance. Rotors are not designed for such currents, especially those of recent design optimized by computer techniques. Rotor overheating is most likely to cause bearing or seal failure, again perhaps, after a long period of time. Thermal cut-outs in the stator seldom will detect this problem and starter failures have been charged to mechanical failure while the cause was actually voltage unbalance.

#### UNBALANCED CURRENTS

Questions relative to how much unbalance a motor can tolerate have been raised from time to time. This condition is generally due to voltage unbalance in the supply and can usually be corrected by working with the power company involved.

The effect of unbalanced phase currents is to increase the heating of the motor, thus reducing its efficiency. It might be said that unbalanced currents, as far as motor temperature rise is concerned, acts like additional load on the motor. For this reason the permissible loading decreases with increasing unbalance of phase currents.

Before a problem of this nature can be corrected, it is necessary to determine whether the source is with the **submersible motor** or with the **electrical supply furnished for its operation**. The following facts will assist in locating the source of the problem and will govern the steps to be taken in its correction.

Unbalanced amperage is generally caused by problems in either of the following areas:

- A. External power supply, including the pump control box.
- B. Internal problem with motor windings or stator leads to drop cable connection.

The following diagrams and explanation will present you with a method by which you can localize the problem as being caused by "A" or by "B". In other words, we are trying to find out whether the trouble lies in the area from the control back through the supply or whether it is a result of malfunction beyond the control down to and including the pump motor.



# EBARA Submersible Pumps

## Technical Information

Project:

Model:

Chk'd:

Date:

### Understanding Unbalance (2 of 5)

Assuming that the unit is connected to the supply so that the 3 phase motor is running in the **correct direction of rotation**, there are two other combinations of connection that will change phase connections but not change the rotation. This is accomplished by changing the position of **all three** drop cable leads at their termination in the control. It is important that all three leads be interchanged each time as the interchanging of only two leads will result in reversing the motor.

If any two pump cable power leads are interchanged in the control it will change the rotation of the motor.

If all three leads are interchanged in the control, the pump will continue to operate in the original rotation.

Once the three power leads in the pump cable are connected to the terminals in the control so that the pump is operating in the correct direction of rotation, there are two other possible combinations that will also operate the pump in the correct direction.

#### • EXAMPLE

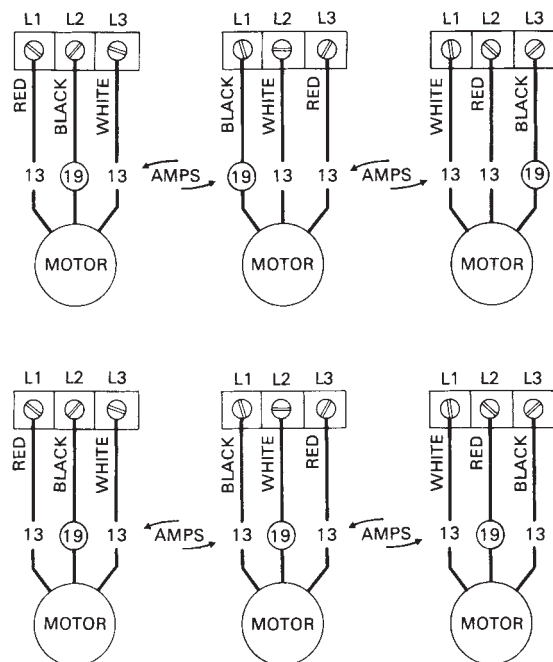
Assuming that combination #1 is operating in correct rotation the 2nd and 3rd combination will also operate in the correct rotation.

*If combination #1 shows unbalanced amperage readings, it is sometimes possible that one of the other two combinations above will operate at a lesser degree of unbalance.*

Combination	T1	T2	T3
1st →	Red	Black	White
2nd →	Black	White	Red
3rd →	White	Red	Black

If the unbalanced leg follows the same wire in the drop cable from the pump, regardless of which position it is connected to on the control terminals the fault would most likely be found in the stator windings or in the stator leads to drop cable connections.

If the unbalanced leg remains related to the same terminal in the control box regardless of which wire is connected to it, the fault would most likely be found in the power supply or possibly poor connection in the control.



# EBARA Submersible Pumps

## Technical Information

Project: \_\_\_\_\_ Model: \_\_\_\_\_ Chk'd: \_\_\_\_\_ Date: \_\_\_\_\_

### Understanding Unbalance (3 of 5)

#### GENERAL CAUSES OF UNBALANCE

1. Extreme case as in Single Phasing of a 3 phase supply. The source may be in the control. Either a blown fuse, defective or poor contact point in contactor or any interruption in wiring or terminals.
2. Pulling single phase loads from the 3 phase supply in an unbalanced sequence. This can be especially true in a job shop where electrical load is unpredictable at any given time.

As we are speaking of Voltage and Amperage in terms of percentage of Unbalance, the question arises as to how to figure the % of unbalance in a three phase system. The formula reads as follows:

$$\frac{\text{Maximum Deviation from average}}{\text{Average of the 3 readings}} \times 100 = \text{Percentage of Unbalance}$$

#### • EXAMPLE

L1—L2 = 234V	Average of the 3 readings: 229V
L1—L3 = 230V	Maximum deviation from the average: 229—223=6V
L2—L3 = 223V	Voltage unbalance : $6/229 \times 100 = 2.62\%$
L1 = 63.3 amps	Average of the 3 readings: 61.1 amps
L2 = 65.6 amps	Maximum deviation from the average: 61.1—54.4=6.7 amps
L3 = 54.4 amps	Amperage unbalance: $6.7/61.1 \times 100 = 10.97\%$

Maximum permissible % of amperage unbalance allowed at motor full load is 5%. Permissible % of unbalance increases as motor load decreases. However, unless under specific conditions, the motor should, for safety, be considered to be operating at full load.

Maximum permissible % of Voltage unbalance allowed is 1%. Keep in mind that, especially with Delta wound motors, the true amperage unbalance is in the neighborhood of 6 to 10 times the voltage unbalance. The true amperage unbalance is not readily determined by the amperage readings taken in the supply lines. Excess circulating currents within the stator not recorded on your amp meter contribute to overheating of winding insulation.

The “maximum” percentages mentioned above are based on motors working at full load. Slightly higher maximums may be allowed at less than full load conditions but “good practice” and full warranty must necessarily be based on full load conditions especially with squirrel cage induction motors assigned to such variable conditions as is found in the pumping of liquids, etc.



## EBARA Submersible Pumps

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### Technical Information

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Project:

Model:

Chk'd:

Date:

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### Understanding Unbalance (4 of 5)

#### EXPLANATION OF NEMA STANDARD MGI-1973-SECTION 14.34

This standard presents guidelines on Voltage Unbalance.

While the voltages should be evenly balanced as closely as can be read on the usually available commercial voltmeter, it is recommended that any voltage unbalance at the Motor Terminals not exceed 1%.

Unbalanced Voltage can be broken into two opposing components, a positive sequence voltage and negative sequence voltage component. The positive sequence, operating the motor in its correct rotation, is opposed by the negative sequence, causing a build up of heat.

Unbalance causes extra motor losses and in turn heating of the Rotor and Windings. Increased motor losses increase power costs.

Line currents, as a result of unbalanced voltage, will be greatly unbalanced in the order of 6 to 10 times the voltage unbalance. This true value of the current unbalance will not be apparent on a normal reading, as part of the unbalance is in the form of circulating currents in the motor and does not show up in the line. It is recommended that any amperage unbalance at the motor terminals not exceed 5%.

In the phase with the highest current, the percentage increase in temperature rise will be approximately two times the square of the percentage of voltage unbalance.

#### • EXAMPLE

If voltage unbalance was 3%, percentage increase in temperature rise would be:

$$2 \ (3\%)^2 = 2 \ 9\% = 18\%$$

# EBARA Submersible Pumps

## Technical Information

Project:

Model:

Chk'd:

Date:

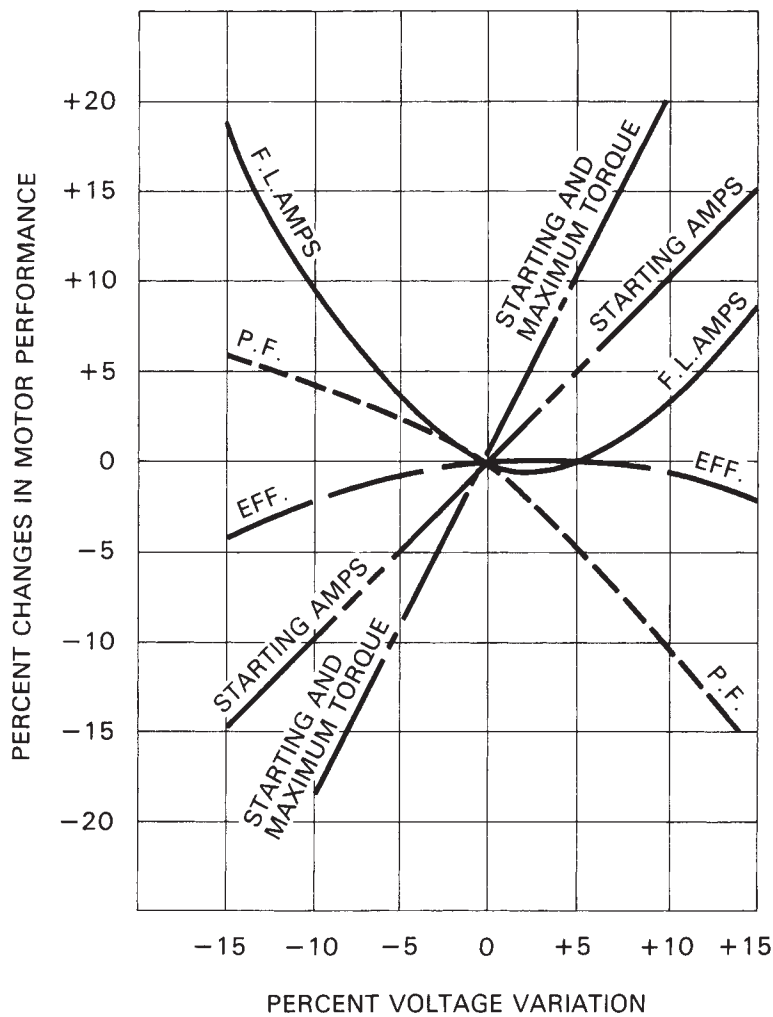
### Understanding Unbalance (5 of 5)

Any significant voltage unbalance notably reduces the margins that motors have at usual service conditions, i.e. Service Factor. Voltage Unbalance can be more harmful than short time overloading or moderate low voltage conditions.

• **NOTE**

If the unbalance condition cannot be corrected, it would then be advisable to reduce the motor load or oversize the motor.

### EFFECT OF VOLTAGE VARIATION ON INDUCTION MOTOR CHARACTERISTICS



# EBARA Submersible Pumps **DLU, DVU, DGUII, DGFU, DLFU, DVFU, DDLFU**

## Technical Information

Project: \_\_\_\_\_ Model: \_\_\_\_\_ Chk'd: \_\_\_\_\_ Date: \_\_\_\_\_

### Shop Painting Standards

#### 1. Scope

This specification covers the methods for painting the following EBARA PUMPS in the shop.

EBARA Models: **DGUII, DLU, DVU, DGFU, DLFU, DVFU, DDLFU**

#### 2. Surface Preparation

All surfaces to be painted shall be cleaned of oil, grease or other similar materials with solvent, and then shall be brushed and air blasted to remove rust or scale.

Prior to above preparation, mill scale, rust scale, chips and other foreign materials shall be removed in accordance with painting schedule.

#### 3. Coating Procedure

Detailed coating procedures are as shown in each paint schedule.

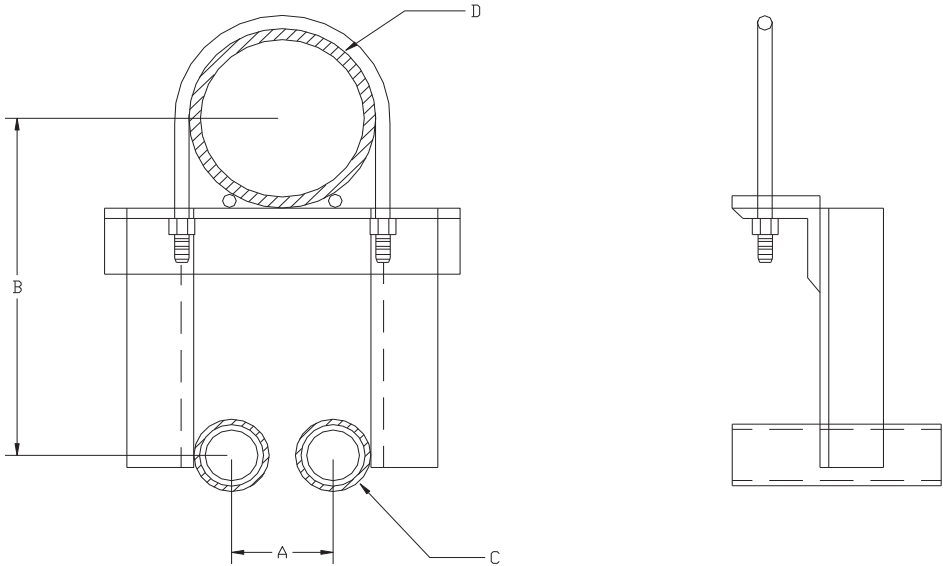
Service	Painting Schedule			
	Surface Preparation		SSPC-VIS1-3-63	
External Surface	Coats	Type of Coating	Brand Name	Maker
	1st	Zinc Rich Epoxy Primer	Zinc Rich 3x1	New Volcano Paints and Varnishes S/A
	2nd	Coal Tar Epoxy	Hi-Build Tneme-Tar 46-413	Tnemec Co., Inc.

Final color: Black

Service	Painting Schedule			
	Surface Preparation		SSPC-VIS1-3-63	
Internal Surface	Coats	Type of Coating	Brand Name	Maker
	1st	Zinc Rich Epoxy Primer	Zinc Rich 3x1	New Volcano Paints and Varnishes S/A



**INTERMEDIATE GUIDE BRACKETS**

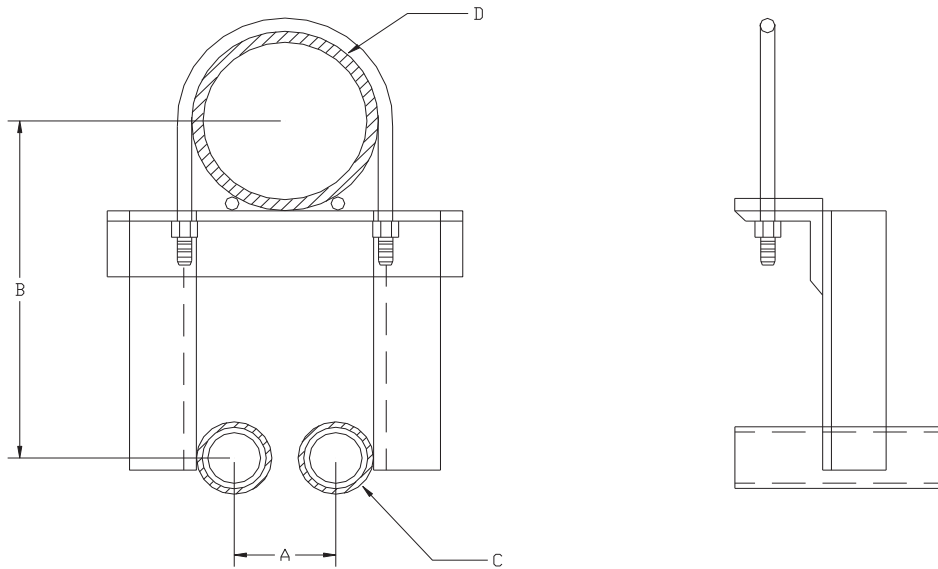


**304 Stainless Steel**

Part No.	A	B	C	D	App. Wt.
IGBLM502	2 3/4	5 5/16	1	2	5
* IGBLM503	2 3/4	5 13/16	1	3	5
IGBLM803	2 3/4	6 1/2	1	3	5
IGBLM804	2 3/4	7 11/16	1	4	5
IGBLL803	6 5/16	7 11/16	1 1/2	3	6
IGBLL804	6 5/16	8 7/8	1 1/2	4	7
IGBLL1003	6 5/16	8 1/4	1 1/2	3	7
IGBLL1004	6 5/16	8 1/4	1 1/2	4	7
IGBLL1006	6 5/16	9 1/4	1 1/2	6	8
IGBLL1254	6 5/16	12 3/4	2	4	12
IGBLL1256	6 5/16	13 9/16	2	6	12
IGBLL150Y6	6 5/16	12 13/16	2	6	12
IGBLL1506	6 5/16	14	2	6	12
IGBLL150/200Y8	6 5/16	14	2	8	12
* IGBLL150Y8	6 5/16	13 13/16	2	8	11
IGBLL250Y10	9 7/16	17 1/8	3	10	16
IGBLL300Y12	9 7/16	18 5/16	3	12	20

\* An eccentric reducer is required ( by others) to match the "D" dimension.

### INTERMEDIATE GUIDE BRACKETS

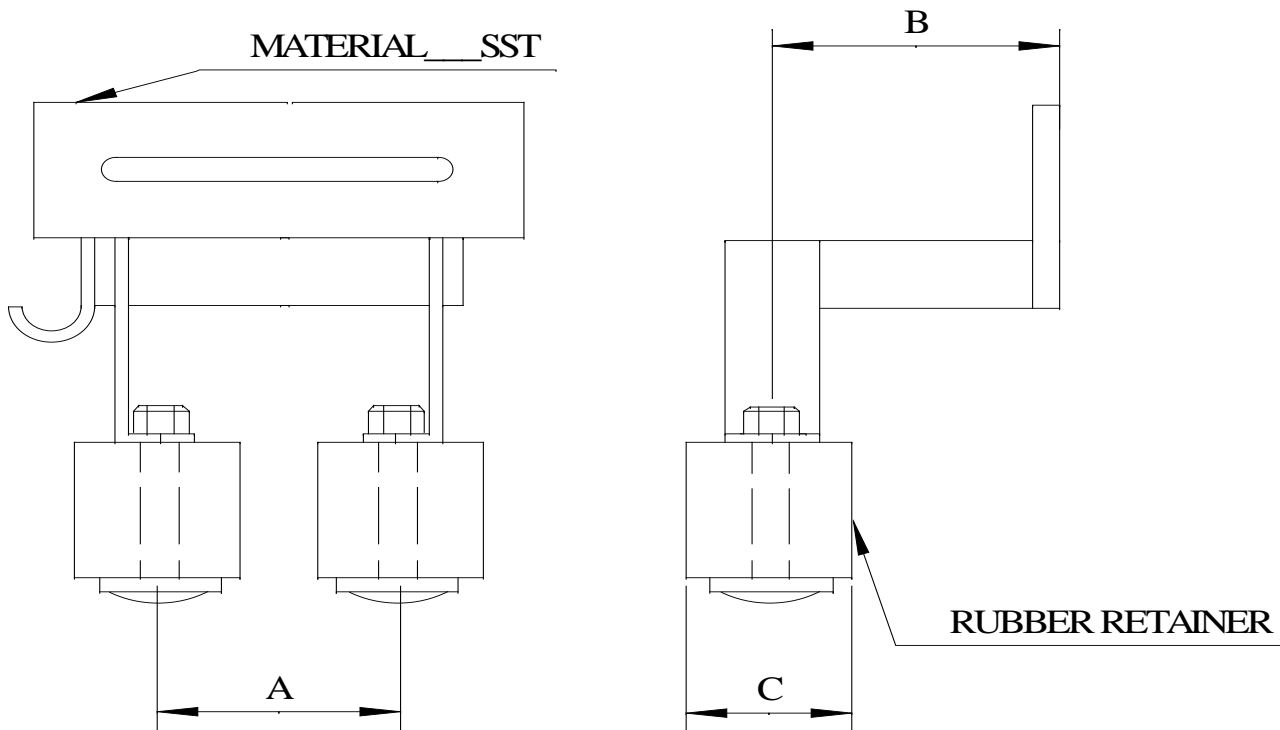


#### 316 Stainless Steel

Part No.	A	B	C	D	App. Wt.
IGBLM502-316	2 3/4	5 5/16	1	2	5
* IGBLM503-316	2 3/4	5 13/16	1	3	5
IGBLM803-316	2 3/4	6 1/2	1	3	5
IGBLM804-316	2 3/4	7 11/16	1	4	5
IGBLL803-316	6 5/16	7 11/16	1 1/2	3	6
IGBLL804-316	6 5/16	8 7/8	1 1/2	4	7
IGBLL1003-316	6 5/16	8 1/4	1 1/2	3	7
IGBLL1004-316	6 5/16	8 1/4	1 1/2	4	7
IGBLL1006-316	6 5/16	9 1/4	1 1/2	6	8
IGBLL1254-316	6 5/16	12 3/4	2	4	12
IGBLL1256-316	6 5/16	13 9/16	2	6	12
IGBLL150Y6-316	6 5/16	12 13/16	2	6	12
IGBLL1506-316	6 5/16	14	2	6	12
IGBLL150/200Y8-316	6 5/16	14	2	8	12
* IGBLL150Y8-316	6 5/16	13 13/16	2	8	11
IGBLL250Y10-316	9 7/16	17 1/8	3	10	16
IGBLL300Y12-316	9 7/16	18 5/16	3	12	20

\* An eccentric reducer is required ( by others) to match the "D" dimension.

## UPPER GUIDE BRACKETS



### 304 Stainless Steel

Part No.	A	B	C	App. Wt.	
UGBE1	2 3/4	2 3/16	1	2	LM50, LM65, LM80
UGBE1.5	6 5/16	3 3/8	1 1/2	3	LL100, LL80
UGBE2	6 5/16	3 9/16	2	4	LL125, LL150, LL200Y
UGBE3	9 7/16	4 3/4	3	7	LL250, LL300

### 316 Stainless Steel

Part No.	A	B	C	App. Wt.	
UGBE1-316	2 3/4	2 3/16	1	2	LM50, LM65, LM80
UGBE1.5-316	6 5/16	3 3/8	1 1/2	3	LL100, LL80
UGBE2-316	6 5/16	3 9/16	2	4	LL125, LL150, LL200Y
UGBE3-316	9 7/16	4 3/4	3	7	LL250, LL300





# Pump Monitor Relay PMR4A

MADE IN  
THE U.S.A.



UL FILE #E101681



## OPERATION

The Pump Monitor Relay provides Motor Over Temperature and Seal Leakage alarms for Submersible Pumps.

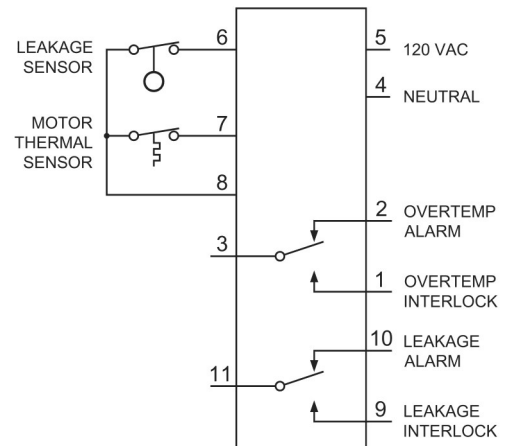
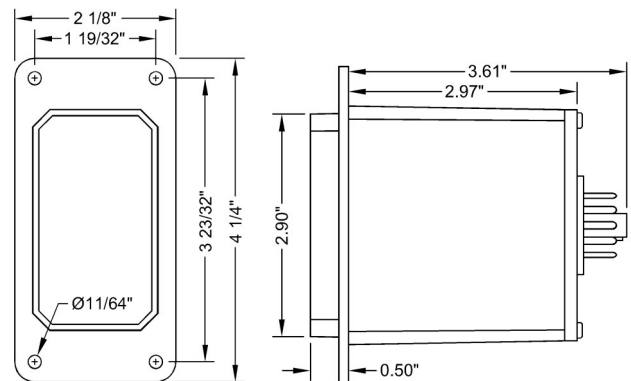
**Motor Over Temperature Alarm** - The unit applies a low voltage DC signal to the Motor Thermal Sensor to check its status. If the unit detects that the Motor Thermal Sensor contacts are closed (normal condition), the Overtemp indication remains off, and the Overtemp Relay is energized closing the contacts between terminals 3 and 1.

If the Motor Thermal Sensor contacts open (Over Temperature condition), the Overtemp Indication is turned on and the Overtemp Alarm Relay is de-energized opening the contacts between terminals 3 and 1 and closing the contacts between terminals 3 and 2.

When the High Motor Temperature condition has cleared, the unit will reset based on the position of Alarm Reset Mode Select Switch (Auto or Manual). When in the Auto position, the Overtemp Alarm resets automatically. If the switch is in the Manual position, the Overtemp Reset Push-button must be pushed for approximately 1.5 seconds to clear the alarm.

**Seal Leakage Alarm** - The unit applies a low voltage DC signal to the Leakage Sensor to check its status. If the unit detects that the Leakage Sensor contacts are closed (normal condition), the Seal Leakage indication remains off, and the Leakage Relay is energized closing the contacts between terminals 11 and 9.

If the Leakage Sensor contacts open (Seal Leakage condition), the Seal Leakage Indication is turned on and the Leakage Alarm Relay is de-energized opening the contacts between terminals 11 and 9 and closing the contacts between terminals 11 and 10.



## SPECIFICATIONS

Input Power:	120 VAC ±10%, 7.0 VA max
Output Rating:	8A Resistive @ 120VAC
Operating Temp:	-20°C to +65 °C
Storage Temp:	-45°C to +85 °C
Temp Sensor Voltage:	6.6 VDC ±10%
Leak Sensor Voltage:	6.6 VDC ±10%
Enclosure:	White Lexan
Base:	Phenolic

## ORDERING INFORMATION

Part Number: PMR4A



Customer :  
Reference :

**Multiple Conditions Datasheet**

Ebara Quotation System 23.0.0

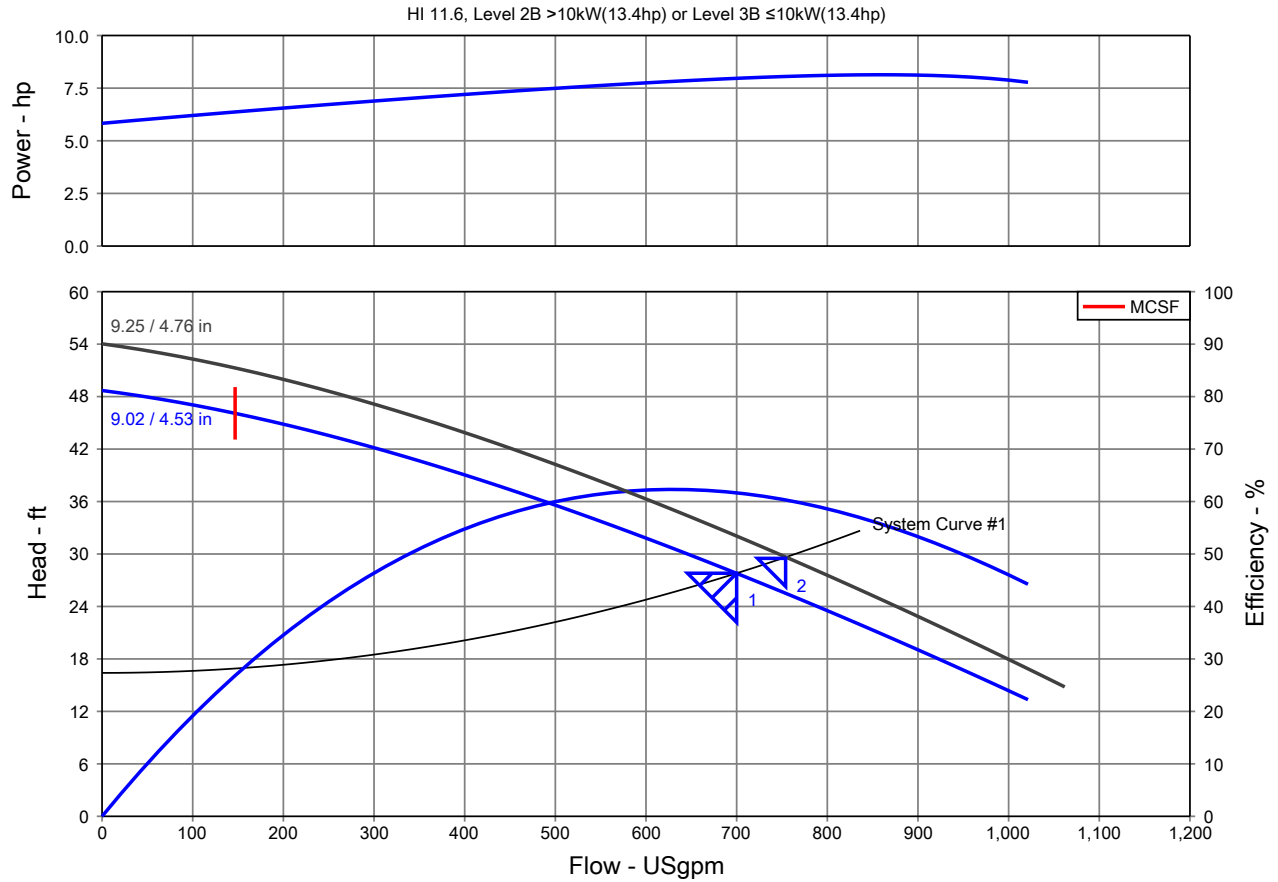
Item number : 002	Quantity : 2	Product Description : 100DLKFU67.5
Service :	Quote number : 1839286	Stages : 1
	Date last saved : 07 Mar 2023 3:02 PM	Speed, rated : 1745

Condition #		1	2
Description		-	-
Temperature, max	deg F	68.00	68.00
Fluid density, rated / max	SG	1.000 / 1.000	1.000 / 1.000
Viscosity, rated	cP	1.00	1.00
Primary condition		☉	○
Product Description		100DLKFU67.5	
Stages		1	
Impeller diameter, rated	in	9.02 / 4.53	
Flow, rated	USgpm	700.0	754.0
Head, rated (requested)	ft	27.80	29.50
Head, rated (actual)	ft	27.46	25.19
Suction pressure, rated / max	psi.g	0.00 / 0.00	0.00 / 0.00
NPSH available, rated	ft	Ample	Ample
Speed, rated	rpm	1745	1745
Selection status		Acceptable	<b>Near miss</b>
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]		1.00 / 1.00 / 1.00 / 1.00	1.00 / 1.00 / 1.00 / 1.00
Efficiency	%	61.66	60.31
NPSH required	ft	-	-
Power, rated	hp	7.97	8.05



Customer :  
Reference :

**Multiple Conditions Curve**  
Ebara Quotation System 23.0.0



Item number	: 002	Product Description	: 100DLKFU67.5
Service	:	Stages	: 1
Quantity	: 2	Speed, rated	: 1745 rpm
Quote number	: 1839286	Based on curve number	: DLMK-C615-9203
Date last saved	: 07 Mar 2023 3:02 PM	Efficiency	: 61.66 %
Flow, rated	: 700.0 USgpm	Power, rated	: 7.97 hp
Differential head / pressure, rated	: 27.80 ft	NPSH required	: -
Fluid density, rated / max	: 1.000 / 1.000 SG	Viscosity	: 1.00 cP
		Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00



# Five Star Filtration LLC

13639 Poplar Circle, Suite 102 • Conroe, Texas 77304 - 1315 USA • 936.588.5033  
e-mail: jay@5starfiltration.com www.5starfiltration.com

[REDACTED]

Gentlemen,

We appreciate the opportunity to provide this proposal for the project referenced above.

The Five Star Disk Filter is a CA Department of Health Services Certified Title 22 product utilizing the latest developments in the continuous cloth media filtration market. The benefits from this design are numerous and easily realized. The proposed filter equipment is designed with space provided that will double the flow capacity for future growth. Only the additional disks will be required and the installation of them and the controls adjustment will take approximately 1 hour.

Five Star Filtration is pleased to offer one (1) Five Star Disk Filter Model FSDF-6D54D-SS unit placed in a stainless steel tank mounted on a concrete slab constructed by others. The equipment will be furnished assembled ready to be mounted on a concrete slab. No field welding will be required.

### **Description of Operation**

The Five Star Disk Filter Model FSDF-6D54D-SS utilizes an outside-in flow pattern, and a stationary disk to minimize mechanical requirements of the system. The disk modules are designed for easy removal without the need to dewater the tank or take the system offline. All components of the system are constructed from corrosion resistant materials that have been designed for continuous operation.

The flow enters the tank through the influent nozzle and distribution trough. As the water passes through the cloth material, it enters into the core of each disk module. The water exits each disk through one filtrate line located on the top of the disk. This line passes the filtrate to the filtrate collection trough. During the normal filtration process, the entire filter is in a static mode. As the filter cloth collects solids on the outer surface, headloss across the media gradually increases to a set point elevation in the tank. At this point, the backwash cleaning system energizes in a set sequence of cleaning operations. Influent will continue to be processed during the backwash cleaning cycle, allowing for continuous filtration, 24 hours per day.

The units backwash cleaning system is controlled by a Allen-Bradley PLC based operation system furnished with the filter equipment. The cleaning mechanism will have minimal contact with the filter cloth. This reduces the possibility of solids being forced into and through the cloth or unnecessary wear to the cloth. Each 10 $\mu$  filter cloth is removable from the tank and replaceable in the field while the filter remains in operation.

Based on the requirements, the filter system will be designed to handle the flows as follows:

	<b><u>Current Flow</u></b>
Average Design Daily Flow:	174 USgpm (0.25 MGD)
Peak Design Daily Flow:	695 USgpm (1 MGD)
Total filter area available:	180 ft <sup>2</sup>
Filter Area flow rate (ADDF):	0.97gpm/ ft <sup>2</sup>
Filter Area flow rate (PDDF) one disk removed:	4.63 gpm/ ft <sup>2</sup>
Influent to Filters      TSS Average	< 30 mg/L
Effluent from Filters    TSS Average	≤ 10 mg/L

Filtration will be accomplished within one (1) unit mounted in a stainless steel tank with six (6) disks installed for. Footprint of filter tank is 109.75 W x 144" L x 101.50" H.

#### **Items Furnished by Five Star Filtration**

The proposed Five Star Disk Filter System will be complete and will include the following:

- (1) filter tank (304 stainless steel)
- (6) filter disk modules (304 stainless steel) with filter grid and 10 $\mu$  cloth media
- (1) center vacuum tube assembly complete with twelve (12) vacuum shoes
- (1) 0.33 HP drive unit with 480 volt, 60 Hz, 3 phase motor, polyethylene drive sprocket, nylon chain with stainless steel link pins and guards
- (6) disk isolation valves
- (1) vacuum pumps for backwash system consisting of and externally mounted centrifugal pump on base plate with a 3 HP 480 volt, 60 Hz., 3 phase motor; (2) electric actuated butterfly valves for backwash and one (1) electric actuated butterfly valves for sludge withdrawal
- (1) UL Listed PLC control panel with Allen Bradley MicroLogix 1400 and a NEMA 4X 304 SS enclosure to include but not limited to main disconnect circuit breaker, GFI receptacle, terminal blocks, motor starters for pumps and drives, pilot lights. Submersible level transmitter with support brackets and an air conditioner
- (1) aluminum platform with ladder access

#### **Items Furnished by Others**

Equipment unloading and installation, including plumbing and electrical from components to control panel enclosure

### **Purchase Price**

The TOTAL PRICE for one (1) Model FSD-6D54D-SS with six (6) disks installed and as described herein is: \$ \_\_\_\_\_

This price includes freight and service to the jobsite.

### **Startup Supervision and Operator Training**

The price of this proposal INCLUDES installation inspection, filter startup supervision and operator training consisting of one (1) trip and two (2) days onsite. These and additional services may be provided in accordance with the attached form labeled "SERVICE TERMS".

### **Equipment Delivery**

Submittal of drawings for customer approval can be forwarded two (2) weeks after receipt of a notice of selection. Shipment of equipment is estimated at 10-12 weeks after receipt of approved drawings and a release to manufacture.

### **Terms of Payment**

25% with purchase order  
25% with submittal approval  
45% upon shipment to jobsite  
5% retainage, not to exceed 90 days from shipment

ALL payments shall be direct to Five Star Filtration by wire transfer.

### **General Information**

Five Star Filtration Service Terms, and Warranty Statements are attached and apply.

Five Star Filtration prices do not include sales, use, excise, or other similar taxes, and all such taxes will be paid by the purchaser at the commencement of the contract, if applicable.

**Time of Acceptance**

This proposal is valid for a period of ninety (90) days from the date of this proposal unless extended in writing by Five Star Filtration, LLC.

Sincerely,

FIVE STAR FILTRATION, LLC

Jay S. Stevens  
President

Attachments: Service Terms, Warranty Statement  
6D54D-SS General Arrangement Drawing

Cc: Jason Stevens - FSF  
Brad Kocian- FSF  
file

STANDARD TERMS AND CONDITIONS

Standard Terms and Conditions shall apply and form part of the within quotation except as expressly otherwise agreed by an officer of FIVE STAR FILTRATION, LLC (“Five Star”).

**ACCEPTANCE:** Unless otherwise expressly stated herein, this quotation shall expire thirty (30) days after its date.

**DELIVERY:** Except as otherwise specified in this quotation, delivery will be Ex-Works, Conroe, Texas. Time of Delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The company shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, and acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond the company’s control.

**WARRANTIES:** The equipment offered is warranted in accordance with the terms of Five Star's standard warranty which is hereby made part of this proposal.

**PRICES:** All prices exclude sales, use, occupation, license, excise and other taxes in respect to manufacture, sale or delivery, all of which shall be paid by the buyer unless a proper exemption certificate is furnished.

**TERMS:** If not otherwise specified in the quotation, the terms of payment shall be balance net within **thirty (30)** days after invoice date. In all cases payment, other than initial payments, shall be made pro rata as principal items are shipped. In the event delay in making shipment is caused by buyer, payment for such shipment shall be due thirty (30) days from date Five Star notifies buyer that Five Star is prepared to make such shipment. If buyer delays completion of manufacture, Five Star may elect to require payment according to percentage of completion. Machinery held for buyer shall be at buyer’s risk and expense.

**CANCELLATION CHARGES:** In the event the buyer elects to cancel the order or if any proceeding be instituted by or against buyer under any bankruptcy or insolvency law, or if in Five Star 's judgment, buyer’s financial situation justifies such action, Five Star may, at its election exercisable at any time prior to delivery require payment in advance or cancel the order as to any unshipped items and require payment of its reasonable cancellation charges.

Schedule of Cancellation Charges

<u>Attained Milestone</u>	<u>% of P.O Contract Value</u>
Prior to Submittal	5%
Subsequent to Submittal Approval	15%
Subsequent to Release to Production	50%
Subsequent to Initiation of Equipment Assembly	100%

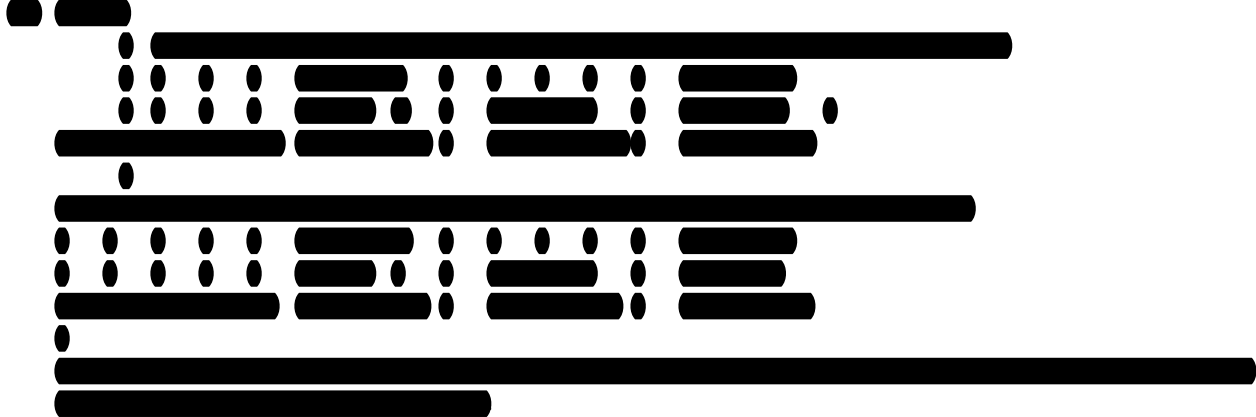
**BACKCHARGE(S)/CHANGE ORDER(S):** Five Star shall not accept any backcharges unless written approval has been furnished by an authorized Five Star employee prior to work/task commencement. An authorized Five Star employee prior to commencement must execute all change orders.

**TITLE AND LIEN RIGHTS:** The equipment shall remain personal property, regardless of how affixed to any realty or structure until the price (including any notes given therefore) of the equipment has been fully paid in cash. The company shall, in the event of customer’s default, have the right to repossess such equipment.

**THIS QUOTATION MAY BE CHANGED OR BE REVOKED AND WITHDRAWN BY THE COMPANY AT ANY TIME UPON WRITTEN NOTICE TO THE BUYER.**



## SERVICE TERMS



### **2. Minimum Billing**

A minimum charge of 1/2 day's time will be made. Billing will be made in 1/2 day increments for time each day at job and/or traveling during normal working hours. Thus, five hours spent on job and/or traveling is billed as one full day.

### **3. Normal Working Time**

Eight hours per day with one hour for lunch, Monday - Friday, except observed holidays.

### **4. Travel**

Travel arrangements are made with 14-day advance purchase. Should the agreed travel dates change due to no fault of Five Star and additional costs be levied, such costs shall be chargeable.

#### These Include:

- Plane, Train and/or Automobile rental cost from Five Star, Conroe, Texas, to the customer's plant or construction site and return.
- Private Automobile travel at the current IRS published rate.
- Expenses also include all local travel.
- Living expenses for lodging, meals and incidental costs.
- Telephone calls and wires, as required in connection with the details of the job.
- When our service representative goes from job to job rather than returning to his headquarters, an equitable distribution or travel charge will be made.

A 20% charge will be added to cover administration costs on all travel and living expenses.

### **5. Parts**

All parts supplied will be billed at selling prices. Service work by others under our authorization will be billed at our cost plus 20% overhead.

### **6. Limits of Liability**

As our representatives are authorized to work on Five Star equipment, all responsibility for operation rests with the customer. Five Star shall not be liable for any claims, losses, labor, expenses, or damages, direct or consequential, resulting directly or indirectly from the service performed hereunder or for other consequential loss or damage of any nature arising from any cause.

### **7. Authorization**

Five Star will not commence any service work until an official Purchase Order for the work has been received.

## **WARRANTY**

**FIVE STAR FILTRATION, LLC** warrants for a period of twelve (12) months from acceptance, (equipment startup not to exceed 3 months after delivery; date of acceptance not to exceed 3 months after equipment startup), the new equipment of its own manufacture to be free from defects in material and workmanship under normal use and service when used and maintained in accordance with Operation and Maintenance Instruction Manual supplied by Five Star. Five Star's obligation under this warranty being limited to repairing or replacing, at its option, any part found to its satisfaction to be defective, providing that such part is, upon request, returned to Five Star's factory, freight prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect or from improper operation, maintenance, installation, modification, or adjustment. This warranty also excludes the coating when the equipment is constructed from carbon steel. Five Star will warrant the coating for one year and will not cover any corrosion repair due to damaged coating or misuse during the warranty period.

Filter cloth bags are warranted for 3 years from initial startup of the equipment. Five Star offers the 3-year prorated warranty on the filter cloths based on a pre-determined number of backwash cycles per year (4,000 backwash cycles per year for this project as recorded by the PLC control system). The warranty on the filter cloths covers materials ONLY and does not cover the labor to physically change the filter cloth.

Backwash pumps are provided with a 5 year warranty. O&M procedures **MUST** be performed and documented per the original manufacturers instructions for warranty to be valid. The drive motors/gearboxes are warranted by the original manufacturer for one year.

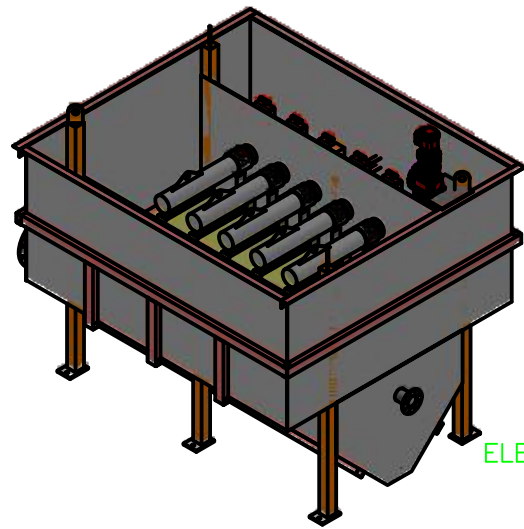
Five Star shall not be liable for indirect or consequential damages, whether or not caused by seller's neglect. Consequential damages for the purposes of this agreement shall include, but not be limited to, loss of use, income or profit, or loss of or damage to property occasioned by or arising out of the operation, use, installation, repair or replacement of the equipment or otherwise.

"Start up" for the purpose of this agreement shall be the date when the equipment is first placed into operation regardless of the status of other items, i.e. chemical feed systems, and polymer feed systems, piping, etc., at that time.

All parts repaired or replaced under this warranty will continue coverage on a prorated basis of the original warranty.

The company shall in no event be liable for damage caused by acts of force majeure, including but not limited to acts of war, fires, acts of God, strikes, and labor difficulties, acts of governmental or military authorities, civil unrest, or causes of any kind beyond the company's control.

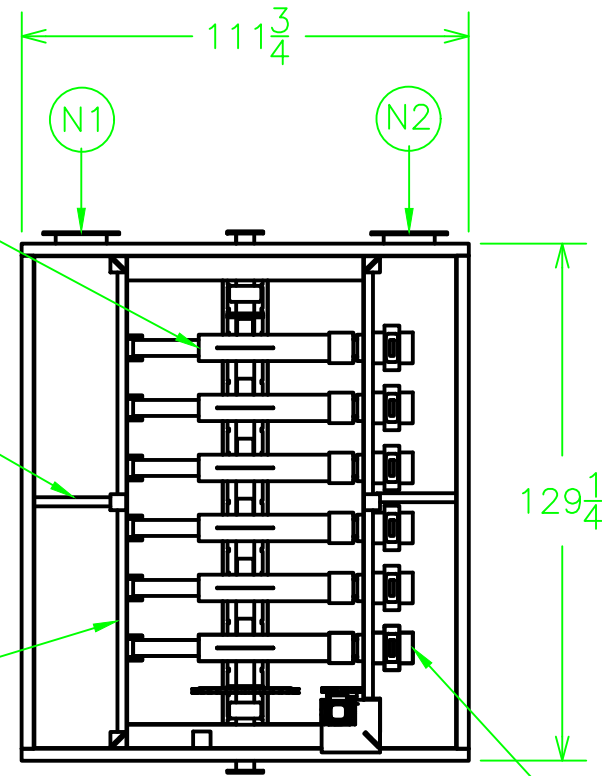
Service may be refused to any area designated as High Risk by the company. This refusal will take precedence over any other agreed terms.



FILTER DISK WELDMENT  
6-REQ.

TYPE 3 SHAPE BRACE  
ELEVATION TO MATCH PERIMETER CHANNEL  
2-REQ.

TYPE 3 SHAPE AT  
INFLUENT & OVERFLOW WEIRS  
SEE SHT.3



PLAN

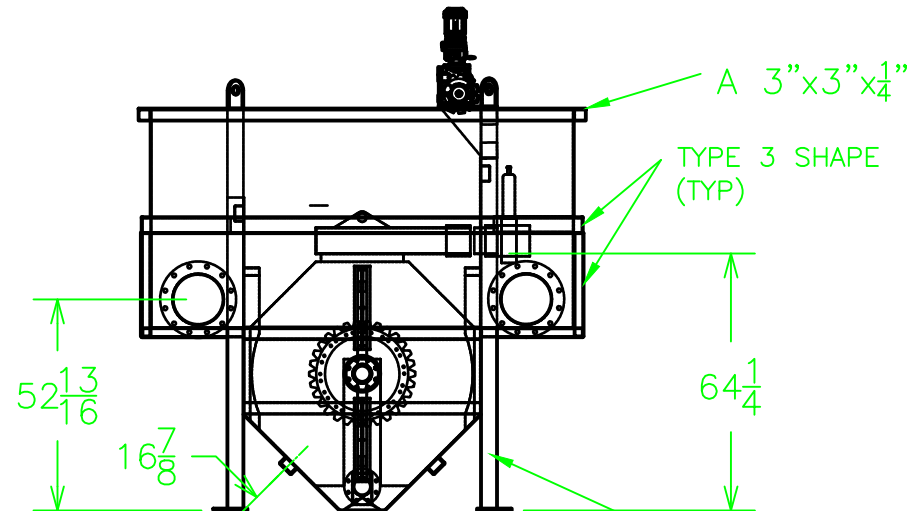
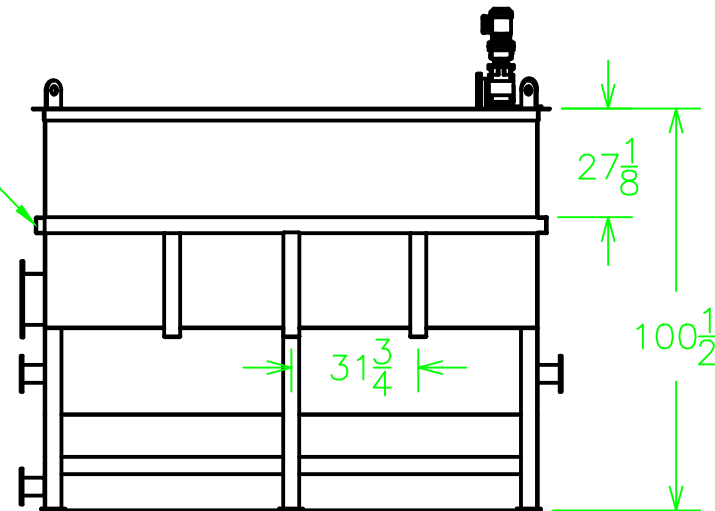
KNIFE GATE VALVE  
6-REQ

NOZZLE SCHEDULE				
ITEM	QTY.	SIZE / TYPE	DESCRIPTION	NOTE
N1	1	12"FF	INFLUENT	
N2	1	12"FF	EFFLUENT/FILTRATE	
N3/N4	2	4" FF	BACKWASH	
N5	1	4" FF	UNDERDRAIN	
N6	0		OVERFLOW	

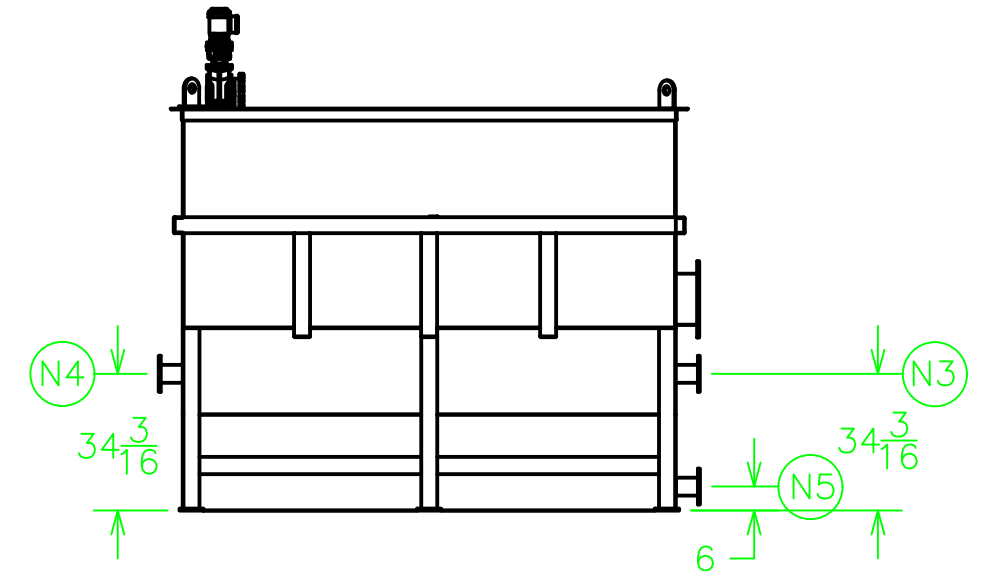
NOTES:

1. ALL MAT'L  $\frac{3}{16}$ "THK. 304SS U.N.
2. ASSEMBLY INCLUDES -6EA. FILTER DISK WELDMENTS. (DWG. 54D FILTER DISK WELDMENT)
3. ALL FLANGES  $\frac{1}{2}$ "THK. FF. BOLT PATTERN CORRESPONDS TO 150# FLANGES.
4. NOZZLE PROJECTION 6"U.N.
5. ASSEMBLY INCLUDES ONE CHAIN GUARD. (DWG. CHAIN GUARD K57 & K77)

PERIMETER CHANNEL  
TYPE 3 SHAPE



ELEVATION



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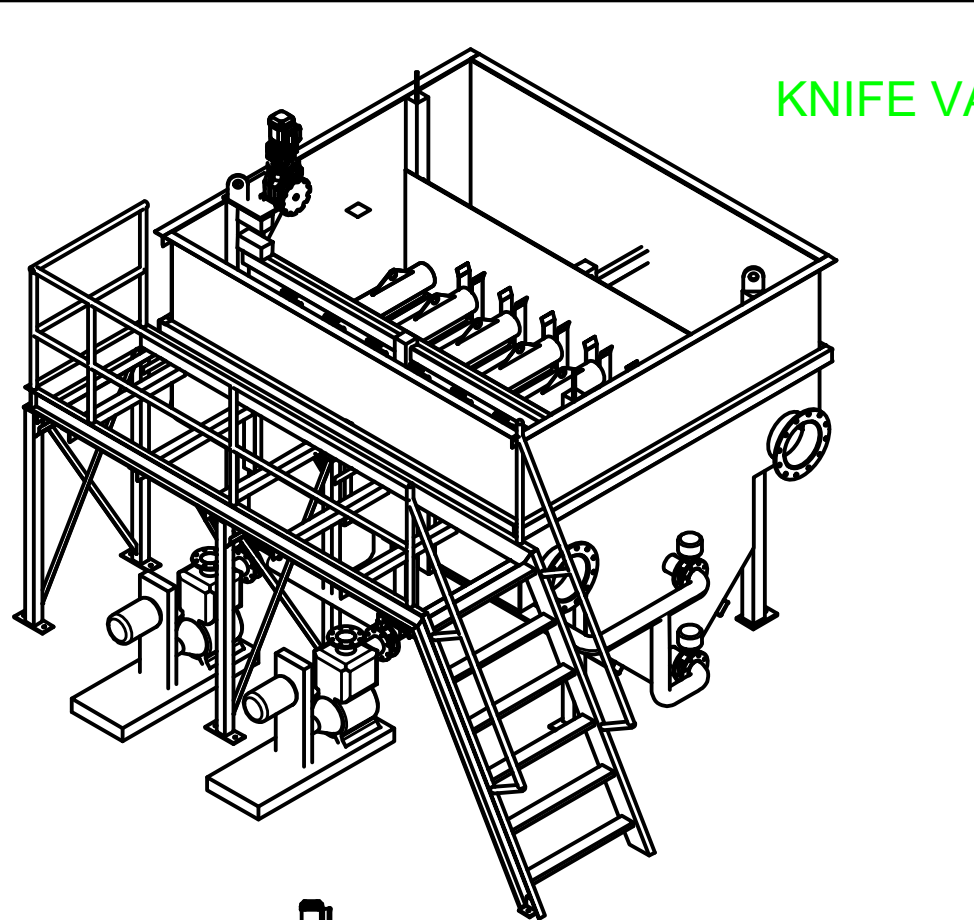
REV	DATE	BY	APPV'D	DESCRIPTION
1	-			
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Five Star Filtration, LLC

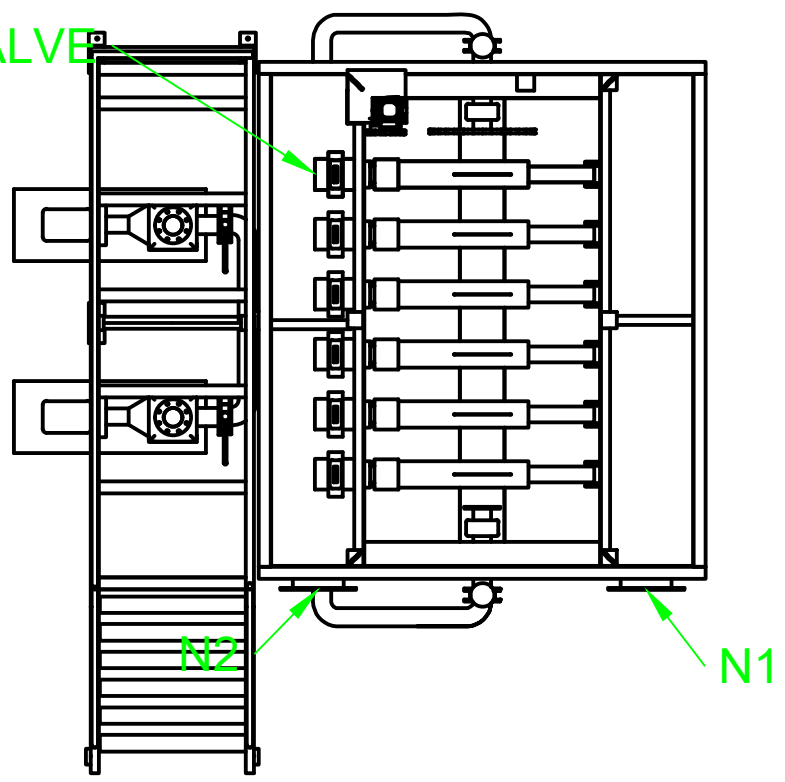
13639 Poplar Circle, Ste.102  
Conroe, Texas 77304

FILTER ASSEMBLY

DRAWN BY: BRM	DATE: 3/9/2020	DWG. NO.: FSF-6D54D-1039
CHK'D BY: JSS	SCALE: *"=1'-0"	SHT 1 OF 6 REV: 0

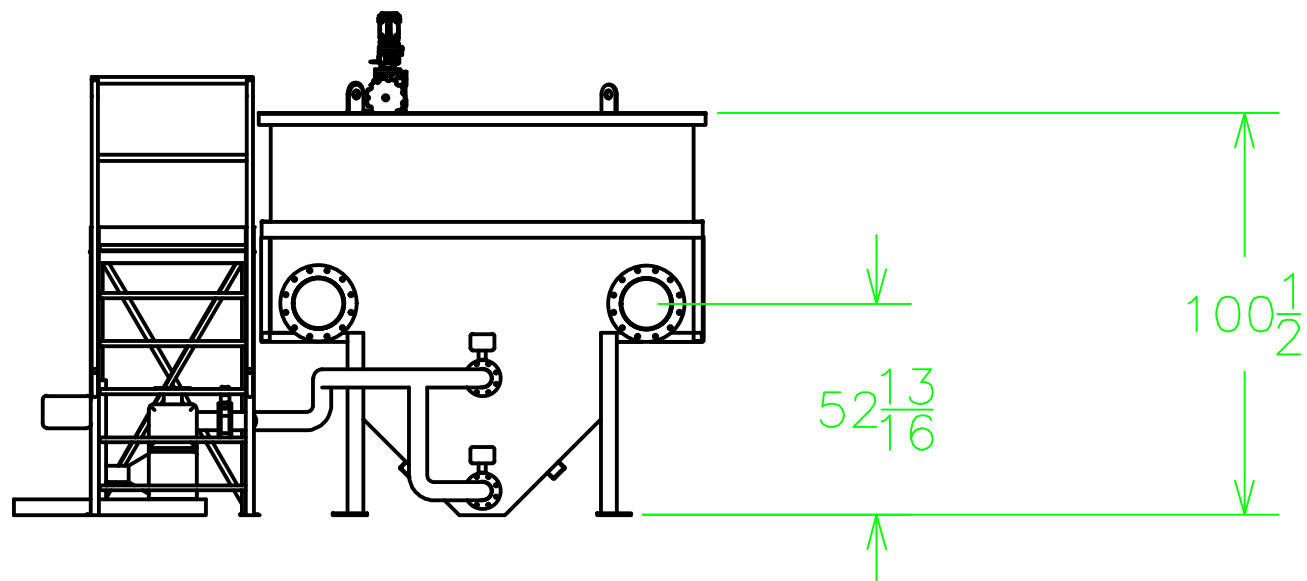
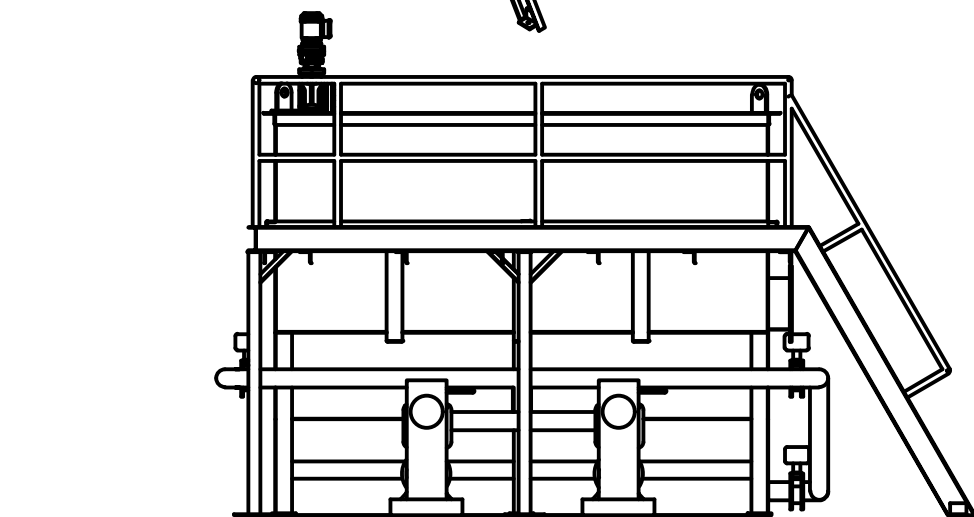


KNIFE VALVE



NOZZLE SCHEDULE				
ITEM	QTY.	SIZE / TYPE	DESCRIPTION	NOTE
N1	1	12"FF	INFLUENT	
N2	1	12"FF	EFFLUENT/FILTRATE	
N3/N4	2	4" FF	BACKWASH	
N5	1	4" FF	UNDERDRAIN	
N6	0		OVERFLOW	

- NOTES:
1. ALL MAT'L  $\frac{3}{16}$ "THK. 304SS U.N.
  2. ALL FLANGES  $\frac{1}{2}$ "THK. FF. BOLT PATTERN CORRESPONDS TO 150# FLANGES.
  3. NOZZLE PROJECTION 6"U.N.



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REV	DATE	BY	APPV'D	DESCRIPTION
1	-			
2				
3				
4				
5				

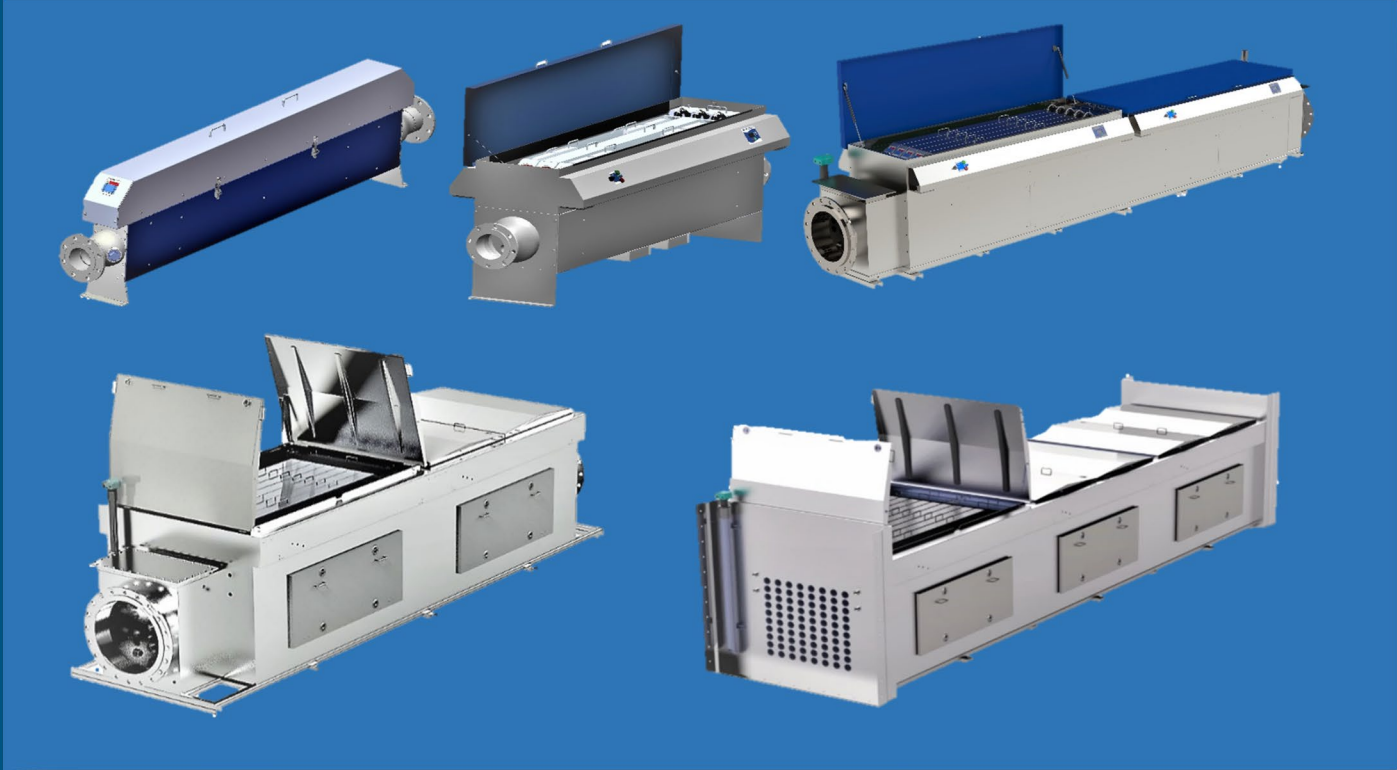
Five Star Filtration, LLC

13639 Poplar Circle, Ste.102  
Conroe, Texas 77304

FILTER ASSEMBLY

DRAWN BY: BRM	DATE: 10/4/2020	DWG. NO.: FSF-6D54D-P135
CHK'D BY: JSS	SCALE: *"=1'-0"	SHT 1 OF 1 REV: 0

**NON-CONTACT UV DISINFECTION SYSTEM  
CONCEPT LEVEL PROPOSAL**



**Wedowee, AL WWTP- UV Replacement.**

Prepared For:  
Edward Smith  
**THE ESHELMAN COMPANY, Inc.**

**DOCUMENT REVISION HISTORY**

Name	Ref #	Date	Reason For Change	Revision #
Concept Level Proposal	FCME_B22USAL07	12/16/2022	N/A	0



**ENAQUA**  
1350 Specialty Drive, Suite F  
Vista, CA 92081  
Phone: (+1)760 599 2644  
Fax: (+1)760 599 2642  
www.enaqua.com

Name: Rick McIntyre  
Direct: 760 477 0880  
Email: rmcintyre@enaqua.com  
Date: December 16, 2022



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Dear Edward,

Enaqua is pleased to provide the following concept level proposal for Non-Contact UV Disinfection Systems for the above referenced project. The proposed UV system is an "In-Pipe" UV system that may be installed slab on grade or in a vault.



Enaqua Non-Contact UV Disinfection Systems have been proven to provide superior performance, resistance to fouling and scaling, combined with electrical efficiency and minimum maintenance. The lack of quartz sleeves and seals completely eliminate the need for automated cleaning systems, acid baths, hoists, and the replacement cost of the quartz sleeves housing the lamps.

Please do not hesitate to contact us with any questions you may have regarding this proposal, or the Enaqua Non-Contact UV Disinfection system operation. Thank you for your interest in in Enaqua and the opportunity to provide you with this proposal.

Regards,

Frederick McIntyre  
Director of Sales

---

Your local sales representative:

Edward A. Smith, PE  
The Eshelman Company, Inc.  
Cell: 334-559-1182  
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Your Enaqua Sales Contact:

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**SUMMARY:**

The details of the UV design criteria, process configuration, UV reactor(s), scope of supply, reactor drawings, summarized O & M information, and other pertinent information are provided in the following sections.

**1. UV DESIGN CRITERIA:**

The flow rates and water quality parameters used for reactor sizing are listed in the Table 1 below:

**Table 1: UV Design criteria**

Average Flow Rate	.25/ 173.6	MGD/GPM
Peak Hydraulic Flow Rate (Peak Disinfection Flow Rate)	1.0/ 694	MGD/GPM
UV Transmittance	60.0	% UVT (Minimum)
Total Suspended Solids*	<30.0	mg/l (30-day average)
BOD*	<25.0	mg/l (30-day average)
Target Indicator Organism	E. Coli/ Fecal Coliform.	
Permit Criteria	125/200	(CFU/100 ml) monthly geomean / single sample max
UV Dose (manufacturer calculated)	30.0	Minimum UV dose of 30.0 mJ/cm <sup>2</sup> . After applying certified Lamp End of Lamp Life (EOLL) of .87, Fouling Factor of .89.
Plant Process	Lagoon> Filtration> UV Disinfection.	
Particle Size*	30.0	Microns
Total Iron*	0.3	mg/l
Turbidity*	5	NTU
Process Redundancy	One UV reactor with two UV banks in U configuration, with the system capable of disinfecting 50.0% of the peak flow with the one UV bank out of service.	

\*Note: Industry standard parameters used for this proposal.

**2. SCOPE OF SUPPLY:**

Summary details of the proposed reactor selected to meet the effluent permit criteria (based on the water quality parameters listed in Table 1) are provided in the tables below:

**Table 2: Scope of Supply – UV Reactor(s)**

Reactor model number	C2t.06041U
Reactor type	In-Pipe
Installation notes	Indoor/ Outdoor – Covered Installation
Process connection	8.00” ø CL 150 Flange
Reactor configuration	Standard
UV Lamps - Enaqua part #: 001.0617045 XUV60L	145-Watt LPHO Non-Amalgam Smart Lamps
UV Lamp output at 253.7 nm (Nominal Watts)	55.00 Watts
Ballasts - Enaqua part #: 502.5V2427M	145-Watt Enlight High Efficiency Ballast
Non-Contact Reactor Material	C-Series AFP840 Tube
Material of Construction	304 SS

UV REACTOR(S)	
# of proposed UV reactors	1
# of banks per reactor	2
# of AFP tubes per reactor	24
# of lamp racks per bank	5
# of lamps per lamp rack	8
Total # of lamps per bank	40
Total # of ballasts per bank	40
Total #of lamps per reactor	40
Total # of lamps in system	40
REACTOR THERMAL CONTROL MECHANISM	
Air to Air heat exchanger assemblies with Thermostats and air circulation fans	1
EFFLUENT LEVEL CONTROL MECHANISM	
Weir plate (rectangular contracted or V-Notch weir) installed in effluent tank of UV reactor. Weir plate, frame, and installation hardware 304 SS.	1

**Table 3: Scope of Supply – Controls**

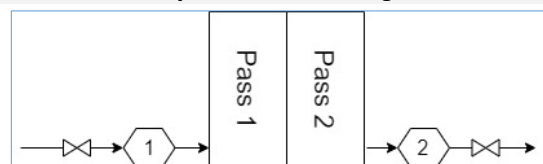
Phase	Current
<b>CONTROLS &amp; ELECTRICAL</b>	
ADR GEN 2. Enaqua part number: 062.01003500	1
EDC GEN 2 (Ensure Dosing Controller). Supervisory Microcontroller and SCADA integration using MODBUS TCP	1
Power Disconnect Panel in NEMA 4X SS Enclosure	1
<b>UV Control Panel - HMI Panel:</b> 19.00" Touch Screen Color HMI (Panel PC)- Enaqua part Number 064.01000542 installed in NEMA 4 X SS- RITTAL Model WM363012N4. 36.00" x 30.00" x 12.00" Enclosure.	1
<b>SENSORS</b>	
Radar level sensor	1
UV intensity sensor - Enaqua part number: 560.601902	1

**3. PROPOSED PROCESS FLOW & DESIGN REDUNDANCY:**

The proposed UV configuration consists of one “In-Pipe” UV reactor with two banks in series in a U configuration. With both banks active, the system is sized to disinfect 100% % of the peak disinfection flow rate, given the water quality parameters listed in Table 1.

The proposed process flow diagram is shown in Figure 1 below, and the flow ranges of the UV reactor banks presented in the Table 4 below.

**Figure 1: Preliminary Process Flow Diagram**





**Table 4: Process Flow**

Tag	Description	Bank 1-2 Disinfection Peak Flow Rate MGD
1	Influent to UV Reactor 1	0.5
2	Effluent from UV Reactor 1	0.5

**4. OPERATING CONDITIONS:**

The reactor head loss at peak flow rate and the total connected load of the reactors are provided in Table 5 and Table 6 below:

**Table 5: Head Loss Calculations**

Calculated Head loss (inches)-Flange to Flange	
Peak flow rate (1.0 MGD)	< 28.6 Inches*

+Note: Flange to flange head loss at flow listed.

**Table 6: Electrical Details**

Total Connected Load Per Reactor @ 480V 3Ø	
Total connected Load (kW)	7.1
Total connected Load (kVA) (w/ PF of .95)	7.87
Total connected Load (Amps)*	9.5

\*Note: Total connected load for the entire UV reactor including cooling and control components

**5. OPERATIONS & MAINTENANCE INFORMATION:**

The estimated power usage at daily average flow (kW), and the projected lamp replacement costs based on 24/7 operations at average flow are provided in Table 7 and Table 8 below:

**Table 7: Power Usage at Daily Average Flow**

Power Usage (kW)	
Average flow of 0.25 MGD	4.1 kW*

\*Note: Assumed both banks operating using level pacing. 3 vertical rows of AFP tubes (6 AFP tubes) and associated UV lamps active to disinfect average flow rate of 0.25 MGD.

**Table 8: Lamp Replacement Cost Evaluation**

Lamp Replacement Costs (\$)	
Number of lamps per year	14+

+ Note: Based on 25 UV Lamps in 2 UV Banks at average flow of 0.25 MGD, and an annual lamp replacement factor of .55 ((24 hrs. /day x 365 days a year)/ (16,000 Hr. lamp Life))

**GENERAL MAINTENANCE:**

The AFP840™ Tube reactors are the only UV transmitting reactor component that is in contact with wastewater, and the AFP840™ tubes have been demonstrated to have high resistance to fouling. No cleaning chemicals are required/ necessary for cleaning of the AFP840™ tubes. The cleaning procedure is very simple and cleaning instructions are provided in the O&M manual and the brush attachment for manual cleaning is supplied with the reactors.

**6. ELECTRICAL REQUIREMENTS:**

The electrical requirements for the proposed reactor(s) are provided in Table 9 below:

**Table 9: Electrical Requirements – Per UV Reactor**

1.	Each reactor requires an electrical supply of one (1) 480V/3P 4 wire (plus ground) – 10.0 A, one per bank
2.	Each reactor cooling system & control requires an electrical supply of Two (2) 120V/ 1P/ 2 wire (plus ground) – 10.0 A, one per bank

3.	UV Control Panel requires an electrical supply of one (1) 120V/ 1P/ 2 wire – 20 A
----	-----------------------------------------------------------------------------------

Note: Based on 60Hz power

**7. STANDARD EQUIPMENT WARRANTIES:**

The equipment furnished (excluding lamps, ballasts) shall be warranted to be free of defects in material and workmanship, including damages that may be incurred during shipping for the lessor of a period of 12 months from substantial completion of the installed UV system or 18 months from receipt of all equipment supplied by the contractor and received in good condition by owner.

**UV LAMPS:** UV lamps shall be warranted for a minimum of 16,000 hours operating time under the conditions specified herein prorated after 12,000 hours. In the event of premature UV lamp failure, the UV system supplier shall offer the following:

1. Lamp failure before 9,000 hours – send a replacement lamp free of charge
2. Lamp failure after 9,000 hours – issue a credit proportional to the hours not used.

**BALLASTS:** Electronic ballasts are fully warranted for 3 years, extended to five years with first purchase of (1:1) replacement lamps from ENAGUA lamps within three years of installation.

**8. BUDGETARY PRICING:**

Budgetary pricing for the proposed UV reactor(s) is provided in Table 10 below:

**Table 10: Budgetary Pricing in US \$**

DESCRIPTION	QTY
UV Reactor – C2t.06041U	1
UV Power Panels	1
UV Control Panel	1
Level control weir plate	1
Spare Parts	Per Table 11
Start-up and Commissioning	Per Table 12
Shipping and handling	1
Net sales price	
<b>*TOTAL</b>	

**Note: Shipping is FOB Jobsite Wedowee, AL**

\*Note: The prices as quoted are firm for acceptance within 90 days from proposal date. This quote is based on current raw material prices. If raw material prices change substantially, we reserve the right to requote. Prices are based on receiving entire order, adjustments to quantities may alter pricing.

**Table 11: Spare Parts included in scope of supply**

ITEM	QTY
Spare lamp rack. Fully populated with 8 lamps and 8 ballasts.	1
Additional Spare UV Lamps	6
Additional Spare UV Ballasts	4
Operator's safety kit	2
Cleaning Kit	1

**Table 12: Startup services included in scope of supply**

ITEM	QTY (hr.)
TRIP 1- One trip, and two eight-hour work days included for Start-up, testing, training, and commissioning	16

**Table 13: Terms of Payment: Net 30 upon completion of the milestones listed below:**

Order acceptance (prior to shipping)	30	%
Upon approval of shop drawings	30	%
Upon delivery of all goods, or six weeks after declaration of "ready to ship"	30	%
After start up and commissioning of UV system	10	%

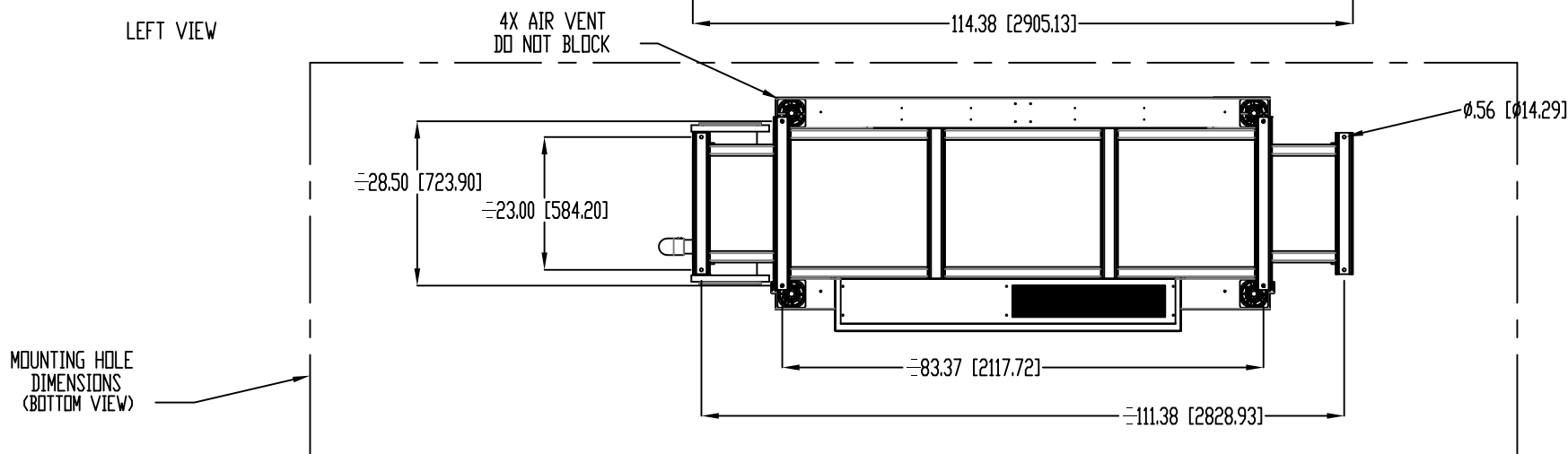
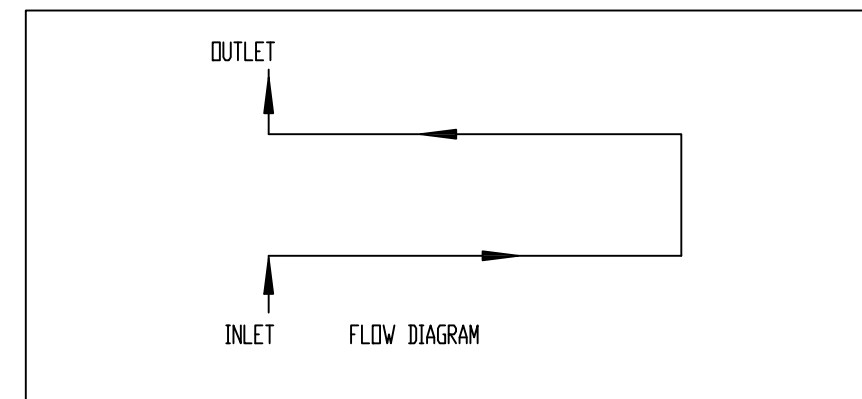
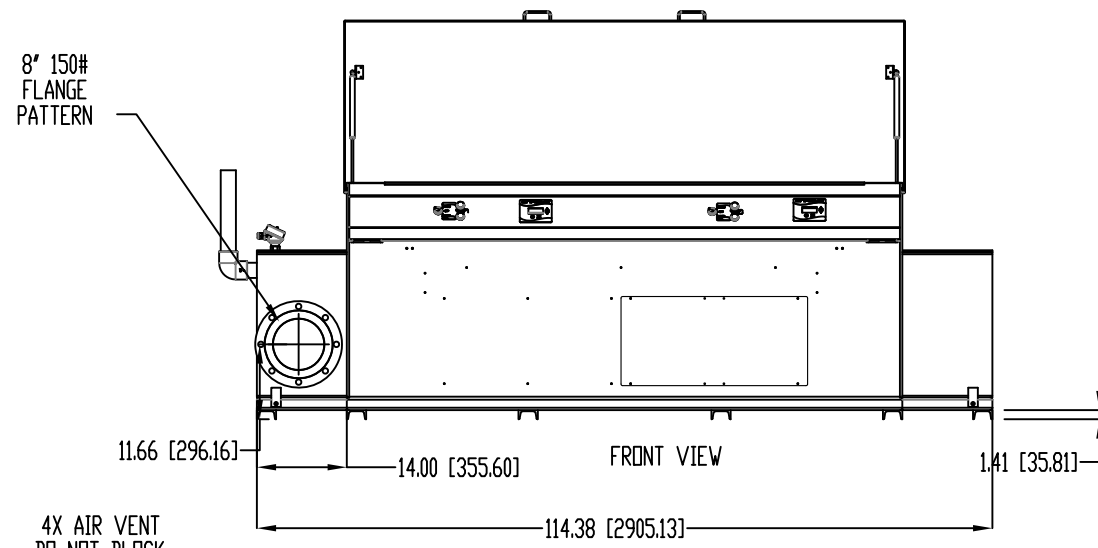
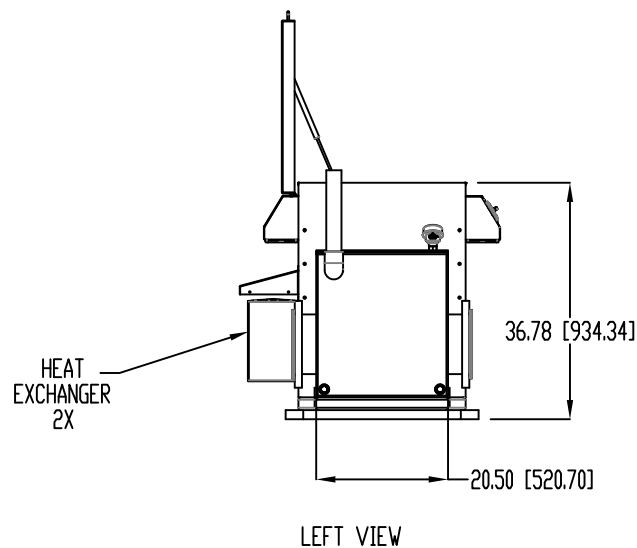
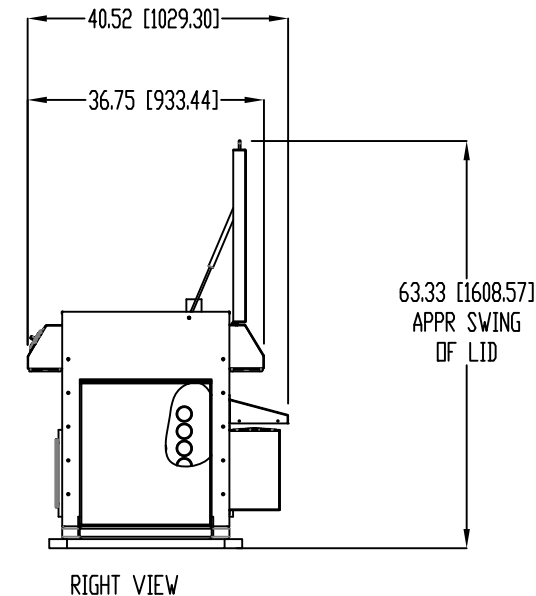
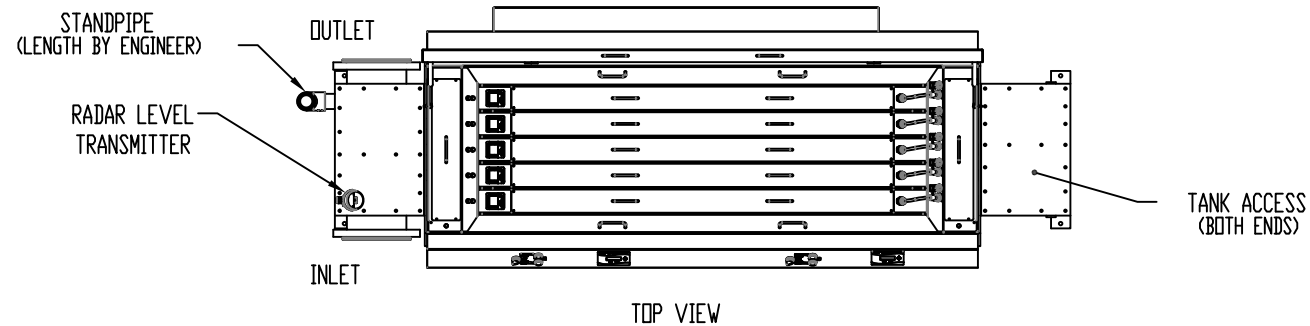
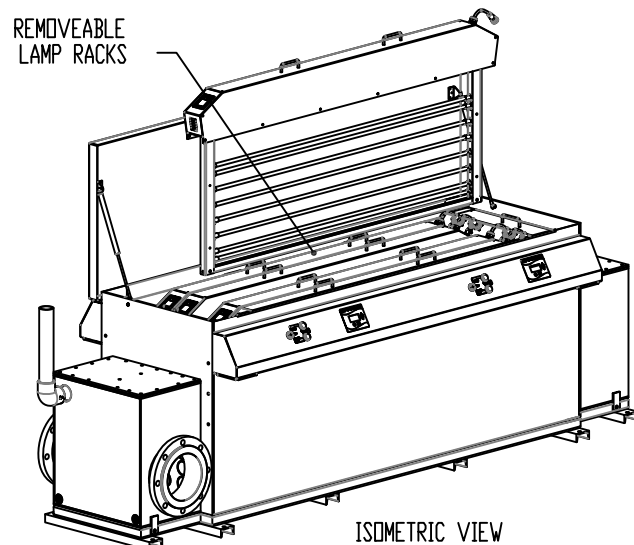
**9. MECHANICAL DRAWINGS:**

Sales Engineering drawings of the proposed UV reactor are provided in Figure 2 below; the drawings are for dimensional reference only.

**Figure 2: UV Reactor Drawings**

REVISIONS					
REV.	ZONE	ECM#	DESCRIPTION	DATE	APPROVED
A	ALL	-	INITIAL RELEASE	6/5/2020	WILL M.

SALES ENGINEERING DRAWING  
NOT FOR INSTALLATION



NOTES (UNLESS OTHERWISE SPECIFIED):

- DRAWING IS IN ACCORDANCE WITH ASME Y14.5-2009.
- ALL DIMENSIONS ARE IN INCHES AND/OR [MILLIMETERS].
- ALL WETTED COMPONENTS OF STAINLESS STEEL, AFP, OR NON-CORROSIVE MATERIALS.

MOUNTING HOLE DIMENSIONS (BOTTOM VIEW)

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES[mm] TOLERANCES: X.X ± .1[2.54] X ± 1*[25.4] X.XX ± .03[.76] .X ± .5*[12.7] X.XXX ± .01[.25] .XX ± .25*[6.4] FRACTIONS: X/X ± 1/16[1.59]	ERP NO: N/A	APPROVALS			 A GRUNDFOS COMPANY	1350 SPECIALTY DRIVE, STE. F, VISTA, CA 92081	
	SERIES: C-SERIES	TITLE	NAME	DATE		TITLE: SALES ENG. DWG., MODEL: C2t.06041U - 8 in TF	
MATERIAL: N/A	FINISH: N/A	CHECKED			PROJECT:		
		ENG. APPR.			SIZE	DWG. NO.	REV
		MFG. APPR.			B	C2t.06041U-SED	A
DO NOT SCALE DRAWING	WEIGHT (LBS.): N/A	SCALE: 1:30		SHEET 1 OF 1			

# APPENDIX C

## SUBMITTAL IDENTIFICATION & CONTRACTOR'S APPROVAL STATEMENT

SUBMITTAL No. \_\_\_\_\_

SECTION \_\_\_\_\_

Do not combine multiple sections together unless required by specifications.

(Contractor's Letterhead)

## SUBMITTAL IDENTIFICATION & CONTRACTOR'S APPROVAL STATEMENT

DATE: \_\_\_\_\_ COPIES \_\_\_\_\_ DRAWING SHEET NO. \_\_\_\_\_

Description submittal contents: \_\_\_\_\_

Location: \_\_\_\_\_

Manufacturer \_\_\_\_\_

Subcontractor or Supplier (Optional) \_\_\_\_\_

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### **CONTRACTOR'S APPROVAL**

( \_\_\_\_\_ Construction Company ) has reviewed and coordinated the submitted documentation and verifies that the equipment and material meet the requirements of the Work and the Contract Documents. We accept sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data contained in the submittal as required by the Contract Documents.

**Deviations:**  None  Yes (Noted in the submittal and itemized on the following page)

Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

This approval does not release subcontractor / vendor from the contractual responsibilities.



# APPENDIX D

## NPDES PERMIT





**Alabama Department of Environmental Management**  
[adem.alabama.gov](http://adem.alabama.gov)

1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463  
Montgomery, Alabama 36130-1463  
(334) 271-7700 ■ FAX (334) 271-7950

October 29, 2020

Ms. Kimberle J. Elmore  
641 Sweetwater Point Drive  
Wedowee, Alabama 36278

Re: Response to Comments  
NPDES Permit No. AL0024171  
Wedowee Lagoon  
Randolph County, Alabama

Dear Ms. Elmore:

The proposed draft reissuance of National Pollutant Discharge Elimination System (NPDES) Permit AL0024171 was placed on public notice on September 16, 2020. This document addresses comments received during the public notice period. The Department reviewed the comment and provides a summary of the comment, as well as the Department's response, below.

**Comment:** "A review of ADEM eFile documentation reveals that the Town of Wedowee has been chronically out of compliance regarding CBOD and Ammonia/Total Nitrogen discharge limits. Wedowee is under Consent Decree with ADEM and as a result improvements must be made to the Wedowee lagoon, including a sludge cleanout of the lagoon itself. A work plan has been created for these improvements and has been filed with ADEM, but to my knowledge no work has started on remediation."

"Given the chronic nature of the issue, as well as the fact that discharge is occurring into Wedowee Creek, which is classified as a Fish & Wildlife waterway, I recommend the addition of testing points immediately below and immediately above the lagoon's point of discharge into Wedowee Creek. This would establish a baseline for current impact of the lagoon on the creek's ecosystem as well as to monitor the impact of future improvements to the lagoon on the creek's ecosystem."

**Response:** The limitations in the permit were developed to be protective of Wedowee Creek's Fish & Wildlife classification. The Department has collected and analyzed samples up and downstream of the Wedowee Lagoon discharge. The Department provides access to its data through the ADEM website and also shares its data with EPA, who then makes it available through various EPA websites. State and federal water quality monitoring data can be accessed from the Water Quality Portal via the ADEM website. Outlined below are links to websites that may be of assistance in your data search.

<http://www.adem.state.al.us/programs/water/waterquality.cnt>

<https://www.waterqualitydata.us/>

<http://www.epa.gov/enviro/facts/pcs-icis/search.html>

A review of the permit indicates that the proposed limitations will be protective of water quality and instream monitoring by the Permittee is not deemed necessary at this time.

The Department filed a Complaint in the Circuit Court of Randolph County on August 6, 2019, regarding permit noncompliance. The Department is actively working towards a Settlement Agreement that will require corrective actions to return the facility to compliance. The Department expects that any Settlement Agreement issued would

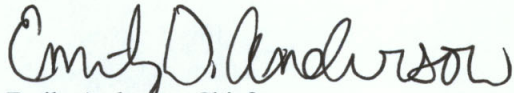


include updates of progress towards completion of necessary corrective actions to achieve compliance. This information would be available on the Department's eFile system.

No changes were made to the permit as a result of your comments.

The Department appreciates your careful review of the permit and the comments submitted. A copy of the final permit can be located in the Department's eFile system. If you have any further questions regarding the permit, please either email or call the area's engineer Ms. Shanda Torbert at [storbert@adem.alabama.gov](mailto:storbert@adem.alabama.gov) or 334-271-7800.

Sincerely,



Emily Anderson, Chief  
Municipal Section  
Industrial/Municipal Branch  
Water Division

cc: Water, Sewer, & Gas Board of the Town of Wedowee  
Ms. Shanda Torbert/ADEM

LANCE R. LEFLEUR  
DIRECTOR



KAY IVEY  
GOVERNOR

Alabama Department of Environmental Management  
adem.alabama.gov

1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463  
Montgomery, Alabama 36130-1463  
(334) 271-7700 ■ FAX (334) 271-7950

October 29, 2020

Mayor Tim Coe, Mayor  
Water, Sewer, & Gas Board of the Town of Wedowee  
Post Office Box 935  
Wedowee, AL 36278

RE: Final Permit  
NPDES Permit No. AL0024171  
Wedowee Lagoon  
Randolph County, Alabama

Dear Mayor Coe:

Attached is the issued copy of the above referenced permit. Please note the permit limitations and conditions with which the permittee must comply. The Department has prepared a Response to Comments that addresses the comments received during the public notice period for the draft permit.

Future monitoring data should be submitted in accordance with the conditions of your permit. Please see PART I.C for your reporting requirements. To reduce the paperwork burden for both the Department and the Permittee, when submitting the required Discharge Monitoring Reports (DMRs), please **do not submit** lab worksheets, logs, reports or other paperwork not specifically required by the permit unless requested by ADEM staff.

Please be aware that Part I.C.1.c of your permit requires participation in the Department's web-based Electronic Environmental (E2) Reporting System Program for submittal of DMRs upon issuance of this permit unless valid justification as to why you cannot participate is submitted in writing. Please also be aware that Part I.C.2.e of your permit requires participation in the Department's web-based electronic environmental (E2) reporting system for submittal of SSOs unless valid justification as to why you cannot participate is submitted in writing. SSO hotline notifications and hard copy Form 415 SSO reports may be used only with the written approval from the Department. The E2 Program allows ADEM to electronically validate, acknowledge receipt, and upload data to the state's central wastewater database. This improves the accuracy of reported compliance data and reduces costs to both the regulated community and ADEM. The Permittee Participation Package may be downloaded online at <https://e2.adem.alabama.gov/npdes> or you may obtain a hard copy by submitting a written request or by emailing [e2admin@adem.alabama.gov](mailto:e2admin@adem.alabama.gov).

Please also be aware that Part IV. of your permit requires that you develop, implement, and maintain a Sanitary Sewer Overflow Response Plan.

If you have questions regarding this permit or monitoring requirements, please contact Shanda Torbert by email at [storbort@adem.alabama.gov](mailto:storbort@adem.alabama.gov) or by phone at (334) 271-7800.

Sincerely,

Emily Anderson, Chief  
Municipal Section  
Water Division

EDA/mfc

Enclosure: Final Permit

cc: Environmental Protection Agency Email  
Ms. Elaine Snyder/U.S. Fish and Wildlife Services

**Birmingham Branch**  
110 Vulcan Road  
Birmingham, AL 35209-4702  
(205) 942-6168  
(205) 941-1603 (FAX)

**Decatur Branch**  
2715 Sandlin Road, S.W.  
Decatur, AL 35603-1333  
(256) 353-1713  
(256) 340-9359 (FAX)



**Mobile Branch**  
2204 Perimeter Road  
Mobile, AL 36615-1131  
(251) 450-3400  
(251) 479-2593 (FAX)

**Mobile-Coastal**  
3664 Dauphin Street, Suite B  
Mobile, AL 36608  
(251) 304-1176  
(251) 304-1189 (FAX)



# NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

PERMITTEE: WATER, SEWER, & GAS BOARD OF THE TOWN OF WEDOWEE  
POST OFFICE BOX 935  
WEDOWEE, ALABAMA 36278

FACILITY LOCATION: WEDOWEE LAGOON (0.25) MGD  
WOODLAND LANE, OFF OF ALABAMA HIGHWAY 48  
WEDOWEE, ALABAMA  
RANDOLPH COUNTY

PERMIT NUMBER: AL0024171

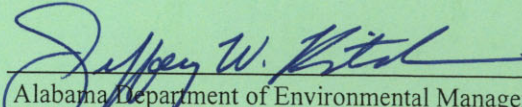
RECEIVING WATERS: WEDOWEE CREEK

*In accordance with and subject to the provisions of the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§1251-1388 (the "FWPCA"), the Alabama Water Pollution Control Act, as amended, Code of Alabama 1975, §§ 22-22-1 to 22-22-14 (the "AWPCA"), the Alabama Environmental Management Act, as amended, Code of Alabama 1975, §§22-22A-1 to 22-22A-17, and rules and regulations adopted thereunder, and subject further to the terms and conditions set forth in this permit, the Permittee is hereby authorized to discharge into the above-named receiving waters.*

ISSUANCE DATE: OCTOBER 29, 2020

EFFECTIVE DATE: NOVEMBER 1, 2020

EXPIRATION DATE: OCTOBER 31, 2025

  
Alabama Department of Environmental Management

**MUNICIPAL SECTION  
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
PERMIT**

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**PART I**

**DISCHARGE LIMITATIONS, CONDITIONS, AND REQUIREMENTS**

**A. DISCHARGE LIMITATIONS AND MONITORING REQUIREMENTS**

1. Outfall 0021 Discharge Limits

During the period beginning on the effective date of this permit and lasting through the expiration date of this permit, the Permittee is authorized to discharge from Outfall 0021, which is described more fully in the Permittee’s application. Such discharge shall be limited and monitored by the Permittee as specified below:

Parameter	Discharge Limitations*							Monitoring Requirements**			
	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Daily Minimum	Daily Maximum	Percent Removal	(1) Sample Location	(2) Sample Type	(3) (5) Measurement Frequency	(4) Seasonal
Oxygen, Dissolved (DO) 00300 1 0 0	*****	*****	*****	*****	6.0 mg/l	*****	*****	E	GRAB	G	*****
pH 00400 1 0 0	*****	*****	*****	*****	6.0 S.U.	9.0 S.U.	*****	E	GRAB	G	*****
Solids, Total Suspended 00530 1 0 0	187 lbs/day	281 lbs/day	90.0 mg/l	135 mg/l	*****	*****	*****	E	GRAB	G	*****
Solids, Total Suspended 00530 G 0 0	REPORT lbs/day	REPORT lbs/day	REPORT mg/l	REPORT mg/l	*****	*****	*****	I	GRAB	G	*****
Nitrogen, Ammonia Total (As N) 00610 1 0 0	9.4 lbs/day	14.0 lbs/day	4.5 mg/l	6.7 mg/l	*****	*****	*****	E	GRAB	G	S
Nitrogen, Ammonia Total (As N) 00610 1 0 0	41.7 lbs/day	62.5 lbs/day	20.0 mg/l	30.0 mg/l	*****	*****	*****	E	GRAB	G	W
Nitrogen, Kjeldahl Total (As N) 00625 1 0 0	REPORT lbs/day	REPORT lbs/day	REPORT mg/l	REPORT mg/l	*****	*****	*****	E	GRAB	G	S
Nitrite Plus Nitrate Total 1 Det. (As N) 00630 1 0 0	REPORT lbs/day	REPORT lbs/day	REPORT mg/l	REPORT mg/l	*****	*****	*****	E	GRAB	G	S
Phosphorus, Total (As P) 00665 1 0 0	REPORT lbs/day	REPORT lbs/day	REPORT mg/l	REPORT mg/l	*****	*****	*****	E	GRAB	G	S
Flow, In Conduit or Thru Treatment Plant 50050 1 0 0	REPORT MGD	*****	*****	*****	*****	REPORT MGD	*****	E	CONTIN	A	*****

\* See Part II.C.1. (Bypass); Part II.C.2. (Upset)

\*\* Monitoring Requirements

(1) Sample Location

- I – Influent
- E – Effluent
- X – End Chlorine Contact Chamber
- K - Percent Removal of the Monthly Avg. Influent Concentration from the Monthly Avg. Effluent Concentration.
- RS - Receiving Stream

(2) Sample Type:

- CONTIN - Continuous
- INSTAN - Instantaneous
- COMP-8 - 8-Hour Composite
- COMP24 - 24-Hour Composite
- GRAB – Grab
- CALCTD - Calculated

(3) Measurement Frequency: See also Part I.B.2.

- A - 7 days per week
- B - 5 days per week
- C - 3 days per week
- D - 2 days per week
- E - 1 day per week
- F - 2 days per month
- G - 1 day per month
- H - 1 day per quarter
- J - Annual
- Q - For Effluent Toxicity Testing, see Provision IV.B.

(4) Seasonal Limits:

- S = Summer (April – October)
- W = Winter (November – March)
- ECS = E. coli Summer (May – October)
- ECW = E. coli Winter (November – April)

(5) If only one sampling event occurs during a month, the sample result shall be reported on the DMR as both the monthly average, weekly average, and/or the daily maximum.

Limits for Outfall 0021 continued on the next page.

## 2. Outfall 0021 Discharge Limits (continued)

During the period beginning on the effective date of this permit and lasting through the expiration date of this permit, the Permittee is authorized to discharge from Outfall 0021, which is described more fully in the Permittee's application. Such discharge shall be limited and monitored by the Permittee as specified below:

Parameter	Discharge Limitations*							Monitoring Requirements**			
	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Daily Minimum	Daily Maximum	Percent Removal	(1) Sample Location	(2) Sample Type	(3) (5) Measurement Frequency	(4) Seasonal
Chlorine, Total Residual 50060 1 0 0	*****	*****	0.053 mg/l	*****	*****	0.091 mg/l	*****	E	GRAB	G See Note 6 & 7	*****
E. Coli 51040 1 0 0	*****	*****	126 col/100mL	*****	*****	298 col/100mL	*****	E	GRAB	G	ECS
E. Coli 51040 1 0 0	*****	*****	548 col/100mL	*****	*****	2507 col/100mL	*****	E	GRAB	G	ECW
BOD, Carbonaceous 05 Day, 20C 80082 1 0 0	14.5 lbs/day	21.8 lbs/day	7.0 mg/l	10.5 mg/l	*****	*****	*****	E	GRAB	G	S
BOD, Carbonaceous 05 Day, 20C 80082 1 0 0	52.1 lbs/day	78.1 lbs/day	25.0 mg/l	37.5 mg/l	*****	*****	*****	E	GRAB	G	W
BOD, Carbonaceous 05 Day, 20C 80082 G 0 0	REPORT lbs/day	REPORT lbs/day	REPORT mg/l	REPORT mg/l	*****	*****	*****	I	GRAB	G	*****
BOD, Carb-5 Day, 20 Deg C, Percent Remvl 80091 K 0 0	*****	*****	*****	*****	*****	*****	85.0%	K	CALCTD	G	*****
Solids, Suspended Percent Removal 81011 K 0 0	*****	*****	*****	*****	*****	*****	65.0%	K	CALCTD	G	*****

\* See Part II.C.1. (Bypass); Part II.C.2. (Upset)

\*\* Monitoring Requirements

(1) Sample Location

I – Influent  
E – Effluent  
X – End Chlorine Contact Chamber  
K - Percent Removal of the Monthly Avg. Influent Concentration from the Monthly Avg. Effluent Concentration.  
RS - Receiving Stream

(2) Sample Type:

CONTIN - Continuous  
INSTAN - Instantaneous  
COMP-8 - 8-Hour Composite  
COMP24 - 24-Hour Composite  
GRAB – Grab  
CALCTD - Calculated

(3) Measurement Frequency: See also Part I.B.2.

A - 7 days per week  
B - 5 days per week  
C - 3 days per week  
D - 2 days per week  
E - 1 day per week  
F - 2 days per month  
G - 1 day per month  
H - 1 day per quarter  
J - Annual  
Q - For Effluent Toxicity Testing, see Provision IV.B.

(4) Seasonal Limits:

S = Summer (April – October)  
W = Winter (November – March)  
ECS = E. coli Summer (May – October)  
ECW = E. coli Winter (November – April)

(5) If only one sampling event occurs during a month, the sample result shall be reported on the DMR as both the monthly average, weekly average, and/or the daily maximum.

(6) See Part IV.C. for Total Residual Chlorine (TRC). Monitoring for TRC is applicable if chlorine is utilized for disinfection purposes. If monitoring is not applicable during the monitoring period, enter “\*9” or “NODI=9” (if hard copy) on the monthly DMR.

(7) A measurement of Total Residual Chlorine below 0.05 mg/L shall be considered in compliance with the permit limitations above and should be reported as NODI=B or \*B on the discharge monitoring reports.



**B. DISCHARGE MONITORING AND RECORD KEEPING REQUIREMENTS**

## 1. Representative Sampling

Sample collection and measurement actions shall be representative of the volume and nature of the monitored discharge and shall be in accordance with the provisions of this permit. The effluent sampling point shall be at the nearest accessible location just prior to discharge and after final treatment, unless otherwise specified in the permit.

## 2. Measurement Frequency

Measurement frequency requirements found in Provision I.A. shall mean:

- a. Seven days per week shall mean daily.
- b. Five days per week shall mean any five days of discharge during a calendar weekly period of Sunday through Saturday.
- c. Three days per week shall mean any three days of discharge during a calendar week.
- d. Two days per week shall mean any two days of discharge during a calendar week.
- e. One day per week shall mean any day of discharge during a calendar week.
- f. Two days per month shall mean any two days of discharge during the month that are no less than seven days apart. However, if discharges occur only during one seven-day period in a month, then two days per month shall mean any two days of discharge during that seven day period.
- g. One day per month shall mean any day of discharge during the calendar month.
- h. Quarterly shall mean any day of discharge during each calendar quarter.
- i. The Permittee may increase the frequency of sampling, listed in Provisions I.B.2.a through I.B.2.h; however, all sampling results are to be reported to the Department.

## 3. Test Procedures

For the purpose of reporting and compliance, Permittees shall use one of the following procedures:

- a. For parameters with an EPA established Minimum Level (ML), report the measured value if the analytical result is at or above the ML and report "0" for values below the ML. Test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and guidelines published pursuant to Section 304(h) of the FWPCA, 33 U.S.C. Section 1314(h). If more than one method for analysis of a substance is approved for use, a method having a minimum level lower than the permit limit shall be used. If the minimum level of all methods is higher than the permit limit, the method having the lowest minimum level shall be used and a report of less than the minimum level shall be reported as zero and will constitute compliance, however should EPA approve a method with a lower minimum level during the term of this permit the Permittee shall use the newly approved method.

- b. For pollutants parameters without an established ML, an interim ML may be utilized. The interim ML shall be calculated as 3.18 times the Method Detection Level (MDL) calculated pursuant to 40 CFR Part 136, Appendix B.

Permittees may develop an effluent matrix-specific ML, where an effluent matrix prevents attainment of the established ML. However, a matrix specific ML shall be based upon proper laboratory method and technique. Matrix-specific MLs must be approved by the Department, and may be developed by the Permittee during permit issuance, reissuance, modification, or during compliance schedule.

In either case the measured value should be reported if the analytical result is at or above the ML and "0" reported for values below the ML.

- c. For parameters without an EPA established ML, interim ML, or matrix-specific ML, a report of less than the detection limit shall constitute compliance if the detection limit of all analytical methods is higher than the permit limit. For the purpose of calculating a monthly average, "0" shall be used for values reported less than the detection limit.

The Minimum Level utilized for procedures a and b above shall be reported on the Permittee's DMR. When an EPA approved test procedure for analysis of a pollutant does not exist, the Director shall approve the procedure to be used.

## 4. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the Permittee shall record the following information:

- a. The facility name and location, point source number, date, time and exact place of sampling;

- b. The name(s) of person(s) who obtained the samples or measurements;
  - c. The dates and times the analyses were performed;
  - d. The name(s) of the person(s) who performed the analyses;
  - e. The analytical techniques or methods used, including source of method and method number; and
  - f. The results of all required analyses.
5. Records Retention and Production
- a. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the above reports or the application for this permit, for a period of at least three years from the date of the sample measurement, report or application. This period may be extended by request of the Director at any time. If litigation or other enforcement action, under the AWPCA and/or the FWPCA, is ongoing which involves any of the above records, the records shall be kept until the litigation is resolved. Upon the written request of the Director or his designee, the Permittee shall provide the Director with a copy of any record required to be retained by this paragraph. Copies of these records should not be submitted unless requested.
  - b. All records required to be kept for a period of three years shall be kept at the permitted facility or an alternate location approved by the Department in writing and shall be available for inspection.
6. Reduction, Suspension or Termination of Monitoring and/or Reporting
- a. The Director may, with respect to any point source identified in Provision I.A. of this permit, authorize the Permittee to reduce, suspend or terminate the monitoring and/or reporting required by this permit upon the submission of a written request for such reduction, suspension or termination by the Permittee, supported by sufficient data which demonstrates to the satisfaction of the Director that the discharge from such point source will continuously meet the discharge limitations specified in Provision I.A. of this permit.
  - b. It remains the responsibility of the Permittee to comply with the monitoring and reporting requirements of this permit until written authorization to reduce, suspend or terminate such monitoring and/or reporting is received by the Permittee from the Director.
7. Monitoring Equipment and Instrumentation
- All equipment and instrumentation used to determine compliance with the requirements of this permit shall be installed, maintained, and calibrated in accordance with the manufacturer's instructions or, in the absence of manufacturer's instructions, in accordance with accepted practices. At a minimum, flow measurement devices shall be calibrated at least once every 12 months.

### C. DISCHARGE REPORTING REQUIREMENTS

1. Reporting of Monitoring Requirements
  - a. The Permittee shall conduct the required monitoring in accordance with the following schedule:
    - (1) **MONITORING REQUIRED MORE FREQUENTLY THAN MONTHLY AND MONTHLY** shall be conducted during the first full month following the effective date of coverage under this permit and every month thereafter.
    - (2) **QUARTERLY MONITORING** shall be conducted at least once during each calendar quarter. Calendar quarters are the periods of January through March, April through June, July through September, and October through December. The Permittee shall conduct the quarterly monitoring during the first complete calendar quarter following the effective date of this permit and is then required to monitor once during each quarter thereafter. Quarterly monitoring should be reported on the last DMR due for the quarter (i.e., March, June, September and December DMRs).
    - (3) **SEMIANNUAL MONITORING** shall be conducted at least once during the period of January through June and at least once during the period of July through December. The Permittee shall conduct the semiannual monitoring during the first complete calendar semiannual period following the effective date of this permit and is then required to monitor once during each semiannual period thereafter. Semiannual monitoring may be done anytime during the semiannual period, unless restricted elsewhere in this permit, but it should be reported on the last DMR due for the month of the semiannual period (i.e., June and December DMRs).
    - (4) **ANNUAL MONITORING** shall be conducted at least once during the period of January through December. The Permittee shall conduct the annual monitoring during the first complete calendar annual period following the effective date of this permit and is then required to monitor once during each annual period thereafter.

Annual monitoring may be done anytime during the year, unless restricted elsewhere in this permit, but it should be reported on the December DMR.

- b. The Permittee shall submit discharge monitoring reports (DMRs) on the forms approved by the Department and in accordance with the following schedule:
- (1) **REPORTS OF MORE FREQUENTLY THAN MONTHLY AND MONTHLY TESTING** shall be submitted on a monthly basis. The first report is due on the 28th day of the month following the month the permit becomes effective. The reports shall be submitted so that they are received by the Department no later than the 28th day of the month following the reporting period, unless otherwise directed by the Department.
  - (2) **REPORTS OF QUARTERLY TESTING** shall be submitted on a quarterly basis. The first report is due on the 28th day of the month following the first complete calendar quarter the permit becomes effective. The reports shall be submitted so that they are received by the Department no later than the 28th day of the month following the reporting period, unless otherwise directed by the Department.
  - (3) **REPORTS OF SEMIANNUAL TESTING** shall be submitted on a semiannual basis. The reports are due on the 28th day of JANUARY and the 28th day of JULY. The reports shall be submitted so that they are received by the Department no later than the 28th day of the month following the reporting period, unless otherwise directed by the Department.
  - (4) **REPORTS OF ANNUAL TESTING** shall be submitted on an annual basis. Unless specified elsewhere in the permit, the first report is due on the 28th day of JANUARY. The reports shall be submitted so that they are received by the Department no later than the 28th day of the month following the reporting period, unless otherwise directed by the Department.
- c. Except as allowed by Provision I.C.1.c.(1) or (2), the permittee shall submit all Discharge Monitoring Reports (DMRs) required by Provision I.C.1.b. by utilizing the Department's web-based Electronic Environmental (E2) Reporting System.
- (1) If the permittee is unable to complete the electronic submittal of DMR data due to technical problems originating with the Department's E2 Reporting System (this could include entry/submittal issues with an entire set of DMRs or individual parameters), the permittee is not relieved of their obligation to submit DMR data to the Department by the date specified in Provision I.C.1.b., unless otherwise directed by the Department.  

If the E2 Reporting System is down on the 28<sup>th</sup> day of the month in which the DMR is due or is down for an extended period of time, as determined by the Department, when a DMR is required to be submitted, the permittee may submit the data in an alternate manner and format acceptable to the Department. Preapproved alternate acceptable methods include faxing, e-mailing, mailing, or hand-delivery of data such that they are received by the required reporting date. Within five calendar days of the E2 Reporting System resuming operation, the permittee shall enter the data into the E2 Reporting System, unless an alternate timeframe is approved by the Department. An attachment should be included with the E2 DMR submittal verifying the original submittal date (date of the fax, copy of dated e-mail, or hand-delivery stamped date), if applicable.
  - (2) The permittee may submit a request to the Department for a temporary electronic reporting waiver for DMR submittals. The waiver request should include the permit number; permittee name; facility/site name; facility address; name, address, and contact information for the responsible official or duly authorized representative; a detailed statement regarding the basis for requesting such a waiver; and the duration for which the waiver is requested. Approved electronic reporting waivers are not transferrable.  

A permittee with an approved electronic reporting waiver for DMRs may submit hard copy DMRs for the period that the approved electronic reporting waiver request is effective. The permittee shall submit the Department-approved DMR forms to the address listed in Provision I.C.1.e.
  - (3) If a permittee is allowed to submit a hard copy DMR, the DMR must be legible and bear an original signature. Photo and electronic copies of the signature are not acceptable and shall not satisfy the reporting requirements of this permit.
  - (4) If the permittee, using approved analytical methods as specified in Provision I.B.2, monitors any discharge from a point source for a limited substance identified in Provision I.A. of this permit more frequently than required by this permit, the results of such monitoring shall be included in the calculation and reporting of values on the DMR and the increased frequency shall be indicated on the DMR.
  - (5) In the event no discharge from a point source identified in Provision I.A. of this permit and described more fully in the permittee's application occurs during a monitoring period, the permittee shall report "No Discharge" for such period on the appropriate DMR.
- d. All reports and forms required to be submitted by this permit, the AWPCA and the Department's Rules and Regulations, shall be electronically signed (or, if allowed by the Department, traditionally signed) by a "responsible

official" of the permittee as defined in ADEM Administrative Code Rule 335-6-6-.09 or a "duly authorized representative" of such official as defined in ADEM Administrative Code Rule 335-6-6-.09 and shall bear the following certification:

**"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."**

- e. Discharge Monitoring Reports required by this permit, the AWPCA, and the Department's Rules that are being submitted in hard copy shall be addressed to:

**Alabama Department of Environmental Management  
Environmental Data Section, Permits & Services Division  
Post Office Box 301463  
Montgomery, Alabama 36130-1463**

Certified and Registered Mail containing Discharge Monitoring Reports shall be addressed to:

**Alabama Department of Environmental Management  
Environmental Data Section, Permits & Services Division  
1400 Coliseum Boulevard  
Montgomery, Alabama 36110-2400**

- f. All other correspondence and reports required to be submitted by this permit, the AWPCA, and the Department's Rules shall be addressed to:

**Alabama Department of Environmental Management  
Municipal Section, Water Division  
Post Office Box 301463  
Montgomery, Alabama 36130-1463**

Certified and Registered Mail shall be addressed to:

**Alabama Department of Environmental Management  
Municipal Section, Water Division  
1400 Coliseum Boulevard  
Montgomery, Alabama 36110-2400**

- g. If this permit is a reissuance, then the permittee shall continue to submit DMRs in accordance with the requirements of their previous permit until such time as DMRs are due as discussed in Part I.C.1.b. above.

## 2. Noncompliance Notifications and Reports

- a. The Permittee shall notify the Department if, for any reason, the Permittee's discharge:

- (1) Does not comply with any daily minimum or maximum discharge limitation for an effluent characteristic specified in Provision I.A. of this permit which is denoted by an "(X)";
- (2) Potentially threatens human health or welfare;
- (3) Threatens fish or aquatic life;
- (4) Causes an in-stream water quality criterion to be exceeded;
- (5) Does not comply with an applicable toxic pollutant effluent standard or prohibition established under Section 307(a) of the FWPCA, 33 U.S.C. Section 1317(a);
- (6) Contains a quantity of a hazardous substance that may be harmful to public health or welfare under Section 311(b)(4) of the FWPCA, 33 U.S.C. Section 1321(b)(4);
- (7) Exceeds any discharge limitation for an effluent parameter listed in Part I.A. as a result of an unanticipated bypass or upset; or
- (8) Is an unpermitted direct or indirect discharge of a pollutant to a water of the state. (Note that unpermitted discharges properly reported to the Department under any other requirement are not required to be reported under this provision.)

The Permittee shall orally or electronically provide notification of any of the above occurrences, describing the circumstances and potential effects, to the Director or Designee within 24-hours after the Permittee becomes aware of the occurrence of such discharge. In addition to the oral or electronic notification, the Permittee shall submit a report to the Director or Designee, as provided in Provision I.C.2.c. or I.C.2.e., no later than five days after becoming aware of the occurrence of such discharge or occurrence.

- b. If, for any reason, the Permittee's discharge does not comply with any limitation of this permit, then the Permittee shall submit a written report to the Director or Designee, as provided in Provision I.C.2.c below. This report must be submitted with the next Discharge Monitoring Report required to be submitted by Provision I.C.1 of this permit after becoming aware of the occurrence of such noncompliance.
- c. Except for notifications and reports of notifiable SSOs which shall be submitted in accordance with the applicable Provisions of this permit, the Permittee shall submit the reports required under Provisions I.C.2.a. and b. to the Director or Designee on ADEM Form 421, available on the Department's website (<http://www.adem.state.al.us/DeptForms/Form421.pdf>). The completed Form must document the following information:
  - (1) A description of the discharge and cause of noncompliance;
  - (2) The period of noncompliance, including exact dates, times, and duration of the noncompliance. If the noncompliance is not corrected by the due date of the written report, then the Permittee shall provide an estimated date by which the noncompliance will be corrected; and
  - (3) A description of the steps taken by the Permittee and the steps planned to be taken by the Permittee to reduce or eliminate the noncompliant discharge and to prevent its recurrence.
- d. Immediate notification

The Permittee shall provide notification to the Director, the public, the county health department, and any other affected entity such as public water systems, as soon as possible upon becoming aware of any notifiable sanitary sewer overflow. Notification to the Director shall be completed utilizing the Department's web-based electronic environmental SSO reporting system in accordance with Provision I.C.2.e.

- e. The Department is utilizing a web-based electronic environmental (E2) reporting system for notification and submittal of SSO reports. **If the Permittee is not already participating in the E2 Reporting System for SSO reports, the Permittee must apply for participation in the system within 30 days of coverage under this permit unless the Permittee submits in writing valid justification as to why it cannot participate and the Department approves in writing utilization of verbal notifications and hard copy SSO report submittals.** Once the Permittee is enrolled in the E2 Reporting System for SSO reports, the Permittee must utilize the system for notification and submittal of all SSO reports unless otherwise allowed by this permit. The Permittee shall include in the SSO reports the information requested by ADEM Form 415. In addition, the Permittee shall include the latitude and longitude of the SSO in the report except when the SSO is a result of an extreme weather event (e.g., hurricane). To participate in the E2 Reporting System for SSO reports, the Permittee Participation Package may be downloaded online at <https://e2.adem.alabama.gov/npdes>. If the E2 Reporting System is down (i.e., electronic submittal of SSO data cannot be completed due to technical problems originating with the Department's system), the Permittee is not relieved of its obligation to notify the Department or submit SSO reports to the Department by the required submittal date, and the Permittee shall submit the data in an alternate manner and format acceptable to the Department. Preapproved alternate acceptable methods include verbal reports, reports submitted via the SSO hotline, or reports submitted via fax, e-mail, mail, or hand-delivery such that they are received by the required reporting date. Within five calendar days of the E2 Reporting System resuming operation, the Permittee shall enter the data into the E2 Reporting System, unless an alternate timeframe is approved by the Department. For any alternate notification, records of the date, time, notification method, and person submitting the notification should be maintained by the Permittee. If a Permittee is allowed to submit SSO reports via an alternate method, the SSO report must be in a format approved by the Department and must be legible.
- f. The Permittee shall maintain a record of all known wastewater discharge points that are not authorized as permitted outfalls, including but not limited to SSOs. The Permittee shall include this record in its Municipal Water Pollution Prevention (MWPP) Annual Reports, which shall be submitted to the Department each year by May 31st for the prior calendar year period beginning January 1st and ending December 31st. The MWPP Annual Reports shall contain a list of all known wastewater discharge points that are not authorized as permitted outfalls and any discharges that occur prior to the headworks of the wastewater treatment plant covered by this permit. The Permittee shall also provide in the MWPP Annual Reports a list of any discharges reported during the applicable time period in accordance with Provision I.C.2.a. The Permittee shall include in its MWPP Annual Reports the following information for each known unpermitted discharge that occurred:
  - (1) The cause of the discharge;

- (2) Date, duration and volume of discharge (estimate if unknown);
- (3) Description of the source (e.g., manhole, lift station);
- (4) Location of the discharge, by latitude and longitude (or other appropriate method as approved by the Department);
- (5) The ultimate destination of the flow (e.g., surface waterbody, municipal separate storm sewer to surface waterbody). Location should be shown on a USGS quad sheet or copy thereof; and
- (6) Corrective actions taken and/or planned to eliminate future discharges.

#### **D. OTHER REPORTING AND NOTIFICATION REQUIREMENTS**

##### 1. Anticipated Noncompliance

The Permittee shall give the Director written advance notice of any planned changes or other circumstances regarding a facility which may result in noncompliance with permit requirements.

##### 2. Termination of Discharge

The Permittee shall notify the Director, in writing, when all discharges from any point source(s) identified in Provision I. A. of this permit have permanently ceased. This notification shall serve as sufficient cause for instituting procedures for modification or termination of the permit.

##### 3. Updating Information

- a. The Permittee shall inform the Director of any change in the Permittee's mailing address or telephone number or in the Permittee's designation of a facility contact or office having the authority and responsibility to prevent and abate violations of the AWPCA, the Department's Rules and the terms and conditions of this permit, in writing, no later than ten (10) days after such change. Upon request of the Director or his designee, the Permittee shall furnish the Director with an update of any information provided in the permit application.
- b. If the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information with a written explanation for the mistake and/or omission.

##### 4. Duty to Provide Information

The Permittee shall furnish to the Director, within a reasonable time, any information which the Director or his designee may request to determine whether cause exists for modifying, revoking and re-issuing, suspending, or terminating this permit, in whole or in part, or to determine compliance with this permit.

#### **E. SCHEDULE OF COMPLIANCE**

##### 1. Compliance with discharge limits

The Permittee shall achieve compliance with the discharge limitations specified in Provision I. A. in accordance with the following schedule:

**COMPLIANCE SHALL BE ATTAINED ON THE EFFECTIVE DATE OF THIS PERMIT**

##### 2. Schedule

No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

## **PART II OTHER REQUIREMENTS, RESPONSIBILITIES, AND DUTIES**

### **A. OPERATIONAL AND MANAGEMENT REQUIREMENTS**

#### **1. Facilities Operation and Maintenance**

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities only when necessary to achieve compliance with the conditions of the permit.

#### **2. Best Management Practices (BMP)**

- a. Dilution water shall not be added to achieve compliance with discharge limitations except when the Director or his designee has granted prior written authorization for dilution to meet water quality requirements.
- b. The Permittee shall prepare, implement, and maintain a Spill Prevention, Control and Countermeasures (SPCC) Plan in accordance with 40 C.F.R. Section 112 if required thereby.
- c. The Permittee shall prepare, submit for approval and implement a BMP Plan for containment of any or all process liquids or solids, in a manner such that these materials do not present a significant potential for discharge, if so required by the Director or his designee. When submitted and approved, the BMP Plan shall become a part of this permit and all requirements of the BMP Plan shall become requirements of this permit.

#### **3. Certified Operator**

The Permittee shall not operate any wastewater treatment plant unless the competency of the operator to operate such plant has been duly certified by the Director pursuant to AWPCA, and meets the requirements specified in ADEM Administrative Code, Rule 335-10-1.

### **B. OTHER RESPONSIBILITIES**

#### **1. Duty to Mitigate Adverse Impacts**

The Permittee shall promptly take all reasonable steps to mitigate and minimize or prevent any adverse impact on human health or the environment resulting from noncompliance with any discharge limitation specified in Provision I. A. of this permit, including such accelerated or additional monitoring of the discharge and/or the receiving waterbody as necessary to determine the nature and impact of the noncomplying discharge.

#### **2. Right of Entry and Inspection**

The Permittee shall allow the Director, or an authorized representative, upon the presentation of proper credentials and other documents as may be required by law to:

- (1) Enter upon the Permittee's premises where a regulated facility or activity or point source is located or conducted, or where records must be kept under the conditions of the permit;
- (2) Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permits;
- (3) Inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under the permit; and
- (4) Sample or monitor, for the purposes of assuring permit compliance or as otherwise authorized by the AWPCA, any substances or parameters at any location.

### **C. BYPASS AND UPSET**

#### **1. Bypass**

- a. Any bypass is prohibited except as provided in b. and c. below:
- b. A bypass is not prohibited if:
  - (1) It does not cause any discharge limitation specified in Provision I. A. of this permit to be exceeded;
  - (2) It enters the same receiving stream as the permitted outfall; and
  - (3) It is necessary for essential maintenance of a treatment or control facility or system to assure efficient operation of such facility or system.
- c. A bypass is not prohibited and need not meet the discharge limitations specified in Provision I. A. of this permit if:
  - (1) It is unavoidable to prevent loss of life, personal injury, or severe property damage;

- (2) There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime (this condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance); and
  - (3) The Permittee submits a written request for authorization to bypass to the Director at least ten (10) days prior to the anticipated bypass (if possible), the Permittee is granted such authorization, and the Permittee complies with any conditions imposed by the Director to minimize any adverse impact on human health or the environment resulting from the bypass.
- d. The Permittee has the burden of establishing that each of the conditions of Provision II. C. 1. b. or c. have been met to qualify for an exception to the general prohibition against bypassing contained in a. and an exemption, where applicable, from the discharge limitations specified in Provision I. A. of this permit.
2. Upset
- a. A discharge which results from an upset need not meet the discharge limitations specified in Provision I. A. of this permit if:
    - (1) No later than 24-hours after becoming aware of the occurrence of the upset, the Permittee orally reports the occurrence and circumstances of the upset to the Director or his designee; and
    - (2) No later than five (5) days after becoming aware of the occurrence of the upset, the Permittee furnishes the Director with evidence, including properly signed, contemporaneous operating logs, or other relevant evidence, demonstrating that:
      - (i) An upset occurred;
      - (ii) The Permittee can identify the specific cause(s) of the upset;
      - (iii) The Permittee's facility was being properly operated at the time of the upset; and
      - (iv) The Permittee promptly took all reasonable steps to minimize any adverse impact on human health or the environment resulting from the upset.
  - b. The Permittee has the burden of establishing that each of the conditions of Provision II C. 2. a. of this permit have been met to qualify for an exemption from the discharge limitations specified in Provision I. A. of this permit.

#### **D. DUTY TO COMPLY WITH PERMIT, RULES, AND STATUTES**

- 1. Duty to Comply
  - a. The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the AWPCA and the FWPCA and is grounds for enforcement action, for permit termination, revocation and reissuance, suspension, modification, or denial of a permit renewal application.
  - b. The necessity to halt or reduce production or other activities in order to maintain compliance with the conditions of the permit shall not be a defense for a Permittee in an enforcement action.
  - c. The discharge of a pollutant from a source not specifically identified in the permit application for this permit and not specifically included in the description of an outfall in this permit is not authorized and shall constitute noncompliance with this permit.
  - d. The Permittee shall take all reasonable steps, including cessation of production or other activities, to minimize or prevent any violation of this permit or to minimize or prevent any adverse impact of any permit violation.
  - e. Nothing in this permit shall be construed to preclude or negate the Permittee's responsibility to apply for, obtain, or comply with other Federal, State, or Local Government permits, certifications, or licenses or to preclude from obtaining other federal, state, or local approvals, including those applicable to other ADEM programs and regulations.
- 2. Removed Substances
 

Solids, sludges, filter backwash, or any other pollutant or other waste removed in the course of treatment or control of wastewaters shall be disposed of in a manner that complies with all applicable Department Rules.
- 3. Loss or Failure of Treatment Facilities
 

Upon the loss or failure of any treatment facilities, including but not limited to the loss or failure of the primary source of power of the treatment facility, the Permittee shall, where necessary to maintain compliance with the discharge limitations specified in Provision I. A. of this permit, or any other terms or conditions of this permit, cease, reduce, or otherwise control production and/or all discharges until treatment is restored. If control of discharge during loss or failure of the



primary source of power is to be accomplished by means of alternate power sources, standby generators, or retention of inadequately treated effluent, the Permittee must furnish to the Director within six months a certification that such control mechanisms have been installed.

4. Compliance With Statutes and Rules

- a. This permit has been issued under ADEM Administrative Code, Chapter 335-6-6. All provisions of this chapter, that are applicable to this permit, are hereby made a part of this permit. A copy of this chapter may be obtained for a small charge from the Office of General Counsel, Alabama Department of Environmental Management, 1400 Coliseum Boulevard Montgomery, Alabama 36110-2059.
- b. This permit does not authorize the noncompliance with or violation of any Laws of the State of Alabama or the United States of America or any regulations or rules implementing such laws. FWPCA, 33 U.S.C. Section 1319, and Code of Alabama 1975, Section 22-22-14.

**E. PERMIT TRANSFER, MODIFICATION, SUSPENSION, REVOCATION, AND REISSUANCE**

1. Duty to Reapply or Notify of Intent to Cease Discharge

- a. If the Permittee intends to continue to discharge beyond the expiration date of this permit, the Permittee shall file a complete permit application for reissuance of this permit at least 180 days prior to its expiration. If the Permittee does not intend to continue discharge beyond the expiration of this permit, the Permittee shall submit written notification of this intent which shall be signed by an individual meeting the signatory requirements for a permit application as set forth in ADEM Administrative Code Rule 335-6-6-.09.
- b. Failure of the Permittee to apply for reissuance at least 180 days prior to permit expiration will void the automatic continuation of the expiring permit provided by ADEM Administrative Code Rule 335-6-6-.06 and should the permit not be reissued for any reason any discharge after expiration of this permit will be an unpermitted discharge.

2. Change in Discharge

Prior to any facility expansion, process modification or any significant change in the method of operation of the Permittee's treatment works, the Permittee shall provide the Director with information concerning the planned expansion, modification or change. The Permittee shall apply for a permit modification at least 180 days prior to any facility expansion, process modification, any significant change in the method of operation of the Permittee's treatment works or other actions that could result in the discharge of additional pollutants or increase the quantity of a discharged pollutant or could result in an additional discharge point. This condition applies to pollutants that are or that are not subject to discharge limitations in this permit. No new or increased discharge may begin until the Director has authorized it by issuance of a permit modification or a reissued permit.

3. Transfer of Permit

This permit may not be transferred or the name of the Permittee changed without notice to the Director and subsequent modification or revocation and reissuance of the permit to identify the new Permittee and to incorporate any other changes as may be required under the FWPCA or AWPCA. In the case of a change in name, ownership or control of the Permittee's premises only, a request for permit modification in a format acceptable to the Director is required at least 30 days prior to the change. In the case of a change in name, ownership or control of the Permittee's premises accompanied by a change or proposed change in effluent characteristics, a complete permit application is required to be submitted to the Director at least 180 days prior to the change. Whenever the Director is notified of a change in name, ownership or control, he may decide not to modify the existing permit and require the submission of a new permit application.

4. Permit Modification and Revocation

- a. This permit may be modified or revoked and reissued, in whole or in part, during its term for cause, including but not limited to, the following:
  - (1) If cause for termination under Provision II. E. 5. of this permit exists, the Director may choose to revoke and reissue this permit instead of terminating the permit;
  - (2) If a request to transfer this permit has been received, the Director may decide to revoke and reissue or to modify the permit; or
  - (3) If modification or revocation and reissuance is requested by the Permittee and cause exists, the Director may grant the request.
- b. This permit may be modified during its term for cause, including but not limited to, the following:
  - (1) If cause for termination under Provision II. E. 5. of this permit exists, the Director may choose to modify this permit instead of terminating this permit;

- (2) There are material and substantial alterations or additions to the facility or activity generating wastewater which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit;
- (3) The Director has received new information that was not available at the time of permit issuance and that would have justified the application of different permit conditions at the time of issuance;
- (4) A new or revised requirement(s) of any applicable standard or limitation is promulgated under Sections 301(b)(2)(C), (D), (E), and (F), and 307(a)(2) of the FWPCA;
- (5) Errors in calculation of discharge limitations or typographical or clerical errors were made;
- (6) To the extent allowed by ADEM Administrative Code, Rule 335-6-6-.17, when the standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued;
- (7) To the extent allowed by ADEM Administrative Code, Rule 335-6-6-.17, permits may be modified to change compliance schedules;
- (8) To agree with a granted variance under 301(c), 301(g), 301(h), 301(k), or 316(a) of the FWPCA or for fundamentally different factors;
- (9) To incorporate an applicable 307(a) FWPCA toxic effluent standard or prohibition;
- (10) When required by the reopener conditions in this permit;
- (11) When required under 40 CFR 403.8(e) (compliance schedule for development of pretreatment program);
- (12) Upon failure of the state to notify, as required by Section 402(b)(3) of the FWPCA, another state whose waters may be affected by a discharge permitted by this permit;
- (13) When required to correct technical mistakes, such as errors in calculation, or mistaken interpretations of law made in determining permit conditions; or
- (14) When requested by the Permittee and the Director determines that the modification has cause and will not result in a violation of federal or state law, regulations or rules.

#### 5. Termination

This permit may be terminated during its term for cause, including but not limited to, the following:

- a. Violation of any term or condition of this permit;
- b. The Permittee's misrepresentation or failure to disclose fully all relevant facts in the permit application or during the permit issuance process or the Permittee's misrepresentation of any relevant facts at any time;
- c. Materially false or inaccurate statements or information in the permit application or the permit;
- d. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge;
- e. The Permittee's discharge threatens human life or welfare or the maintenance of water quality standards;
- f. Permanent closure of the facility generating the wastewater permitted to be discharged by this permit or permanent cessation of wastewater discharge;
- g. New or revised requirements of any applicable standard or limitation that is promulgated under Sections 301(b)(2)(C), (D), (E), and (F), and 307(a)(2) of the FWPCA that the Director determines cannot be complied with by the Permittee; or
- h. Any other cause allowed by the ADEM Administrative Code, Chapter 335-6-6.

#### 6. Suspension

This permit may be suspended during its term for noncompliance until the Permittee has taken action(s) necessary to achieve compliance.

#### 7. Stay

The filing of a request by the Permittee for modification, suspension or revocation of this permit, in whole or in part, does not stay any permit term or condition.

**F. COMPLIANCE WITH TOXIC POLLUTANT STANDARD OR PROHIBITION**

If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the FWPCA, 33 U.S.C. Section 1317(a), for a toxic pollutant discharged by the Permittee, and such standard or prohibition is more stringent than any discharge limitation on the pollutant specified in Provision I. A. of this permit or controls a pollutant not limited in Provision I. A. of this permit, this permit shall be modified to conform to the toxic pollutant effluent standard or prohibition, and the Permittee shall be notified of such modification. If this permit has not been modified to conform to the toxic pollutant effluent standard or prohibition before the effective date of such standard or prohibition, the Permittee shall attain compliance with the requirements of the standard or prohibition within the time period required by the standard or prohibition and shall continue to comply with the standard or prohibition until this permit is modified or reissued.

**G. NOTICE TO DIRECTOR OF INDUSTRIAL USERS**

1. The Permittee shall not allow the introduction of wastewater, other than domestic wastewater, from a new direct discharger prior to approval and permitting, if applicable, of the discharge by the Department.
2. The Permittee shall not allow an existing indirect discharger to increase the quantity or change the character of its wastewater, other than domestic wastewater, prior to approval and permitting, if applicable, of the increased discharge by the Department.
3. The Permittee shall report to the Department any adverse impact caused or believed to be caused by an indirect discharger on the treatment process, quality of discharged water, or quality of sludge. Such report shall be submitted within seven days of the Permittee becoming aware of the adverse impacts.

**H. PROHIBITIONS**

The Permittee shall not allow, and shall take effective enforcement action to prevent and terminate, the introduction of any of the following into its treatment works by industrial users:

1. Pollutants which create a fire or explosion hazard in the treatment works;
2. Pollutants which will cause corrosive structural damage to the treatment works, or dischargers with a pH lower than 5.0 s.u., unless the works are specifically designed to accommodate such discharges;
3. Solid or viscous pollutants in amounts which will cause obstruction of flow in sewers, or other interference with the treatment works;
4. Pollutants, including oxygen demanding pollutants, released in a discharge of such volume or strength as to cause interference in the treatment works;
5. Heat in amounts which will inhibit biological activity in the treatment plant resulting in interference or in such quantities that the temperature of the treatment plant influent exceeds 40°C (104° F) unless the treatment plant is designed to accommodate such heat; and
6. Pollutants in amounts which exceed any applicable pretreatment standard under Section 307 of FWPCA or any approved revisions thereof.

## **PART III ADDITIONAL REQUIREMENTS, CONDITIONS, AND LIMITATIONS**

### **A. CIVIL AND CRIMINAL LIABILITY**

#### **1. Tampering**

Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained or performed under the permit shall, upon conviction, be subject to penalties as provided by the AWPCA.

#### **2. False Statements**

Any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be subject to penalties as provided by the AWPCA.

#### **3. Permit Enforcement**

a. Any NPDES permit issued or reissued by the Department is a permit for the purpose of the AWPCA and the FWPCA, and as such, any terms, conditions, or limitations of the permit are enforceable under state and federal law.

b. Any person required to have a NPDES permit pursuant to ADEM Administrative Code Chapter 335-6-6 and who discharges pollutants without said permit, who violates the conditions of said permit, who discharges pollutants in a manner not authorized by the permit, or who violates applicable orders of the Department or any applicable rule or standard of the Department, is subject to any one or combination of the following enforcement actions under applicable state statutes:

(1) An administrative order requiring abatement, compliance, mitigation, cessation, clean-up, and/or penalties;

(2) An action for damages;

(3) An action for injunctive relief; or

(4) An action for penalties.

c. If the Permittee is not in compliance with the conditions of an expiring or expired permit the Director may choose to do any or all of the following provided the Permittee has made a timely and complete application for reissuance of the permit:

(1) Initiate enforcement action based upon the permit which has been continued;

(2) Issue a notice of intent to deny the permit reissuance. If the permit is denied, the owner or operator would then be required to cease the activities authorized by the continued permit or be subject to enforcement action for operating without a permit;

(3) Reissue the new permit with appropriate conditions; or

(4) Take other actions authorized by these rules and AWPCA.

#### **4. Relief from Liability**

Except as provided in Provision II. C. 1. (Bypass) and Provision II. C. 2. (Upset), nothing in this permit shall be construed to relieve the Permittee of civil or criminal liability under the AWPCA or FWPCA for noncompliance with any term or condition of this permit.

### **B. OIL AND HAZARDOUS SUBSTANCE LIABILITY**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities or penalties to which the Permittee is or may be subject under Section 311 of the FWPCA, 33 U.S.C. Section 1321.

### **C. PROPERTY AND OTHER RIGHTS**

This permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to persons or property or invasion of other private rights, or any infringement of federal, state, or local laws or regulations, nor does it authorize or approve the construction of any physical structures or facilities or the undertaking of any work in any waters of the state or of the United States.

### **D. AVAILABILITY OF REPORTS**

Except for data determined to be confidential under Code of Alabama 1975, Section 22-22-9(c), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. Effluent data shall not be considered confidential.

**E. EXPIRATION OF PERMITS FOR NEW OR INCREASED DISCHARGES**

1. If this permit was issued for a new discharger or new source, this permit shall expire eighteen months after the issuance date if construction of the facility has not begun during the eighteen-month period.
2. If this permit was issued or modified to allow the discharge of increased quantities of pollutants to accommodate the modification of an existing facility and if construction of this modification has not begun during the eighteen month period after issuance of this permit or permit modification, this permit shall be modified to reduce the quantities of pollutants allowed to be discharged to those levels that would have been allowed if the modification of the facility had not been planned.
3. Construction has begun when the owner or operator has:
  - a. Begun, or caused to begin as part of a continuous on-site construction program:
    - (1) Any placement, assembly, or installation of facilities or equipment; or
    - (2) Significant site preparation work including clearing, excavation, or removal of existing buildings, structures, or facilities which are necessary for the placement, assembly, or installation of new source facilities or equipment; or
  - b. Entered into a binding contractual obligation for the purpose of placement, assembly, or installation of facilities or equipment which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation under this paragraph.
4. Final plans and specifications for a waste treatment facility at a new source or new discharger, or a modification to an existing waste treatment facility must be submitted to and examined by the Department prior to initiating construction of such treatment facility by the Permittee.
5. Upon completion of construction of waste treatment facilities and prior to operation of such facilities, the Permittee shall submit to the Department a certification from a registered professional engineer, licensed to practice in the State of Alabama, that the treatment facilities have been built according to plans and specifications submitted to and examined by the Department.

**F. COMPLIANCE WITH WATER QUALITY STANDARDS**

1. On the basis of the Permittee's application, plans, or other available information, the Department has determined that compliance with the terms and conditions of this permit should assure compliance with the applicable water quality standards.
2. Compliance with permit terms and conditions notwithstanding, if the Permittee's discharge(s) from point sources identified in Provision I. A. of this permit cause or contribute to a condition in contravention of state water quality standards, the Department may require abatement action to be taken by the Permittee in emergency situations or modify the permit pursuant to the Department's Rules, or both.
3. If the Department determines, on the basis of a notice provided pursuant to this permit or any investigation, inspection or sampling, that a modification of this permit is necessary to assure maintenance of water quality standards or compliance with other provisions of the AWPCA or FWPCA, the Department may require such modification, and, in cases of emergency, the Director may prohibit the discharge until the permit has been modified.

**G. GROUNDWATER**

Unless specifically authorized under this permit, this permit does not authorize the discharge of pollutants to groundwater. Should a threat of groundwater contamination occur, the Director may require groundwater monitoring to properly assess the degree of the problem, and the Director may require that the Permittee undertake measures to abate any such discharge and/or contamination.

**H. DEFINITIONS**

1. Average monthly discharge limitation – means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month (zero discharge days shall not be included in the number of "daily discharges" measured and a less than detectable test result shall be treated as a concentration of zero if the most sensitive EPA approved method was used).
2. Average weekly discharge limitation - means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week (zero discharge days shall not be included in the number of "daily discharges" measured and a less than detectable test result shall be treated as a concentration of zero if the most sensitive EPA approved method was used).

3. Arithmetic Mean – means the summation of the individual values of any set of values divided by the number of individual values.
4. AWPCA – means the Alabama Water Pollution Control Act.
5. BOD – means the five-day measure of the pollutant parameter biochemical oxygen demand.
6. Bypass – means the intentional diversion of waste streams from any portion of a treatment facility.
7. CBOD – means the five-day measure of the pollutant parameter carbonaceous biochemical oxygen demand.
8. Daily discharge – means the discharge of a pollutant measured during any consecutive 24-hour period in accordance with the sample type and analytical methodology specified by the discharge permit.
9. Daily maximum – means the highest value of any individual sample result obtained during a day.
10. Daily minimum – means the lowest value of any individual sample result obtained during a day.
11. Day – means any consecutive 24-hour period.
12. Department – means the Alabama Department of Environmental Management.
13. Director – means the Director of the Department.
14. Discharge – means "[t]he addition, introduction, leaking, spilling or emitting of any sewage, industrial waste, pollutant or other waste into waters of the state". Code of Alabama 1975, Section 22-22-1(b)(9).
15. Discharge Monitoring Report (DMR) – means the form approved by the Director to accomplish reporting requirements of an NPDES permit.
16. DO – means dissolved oxygen.
17. 8HC – means 8-hour composite sample, including any of the following:
  - a. The mixing of at least 8 equal volume samples collected at constant time intervals of not more than 1 hour over a period of not less than 8 hours between the hours of 6:00 a.m. and 6:00 p.m. If the sampling period exceeds 8 hours, sampling may be conducted beyond the 6:00 a.m. to 6:00 p.m. period.
  - b. A sample continuously collected at a constant rate over period of not less than 8 hours between the hours of 6:00 a.m. and 6:00 p.m. If the sampling period exceeds 8 hours, sampling may be conducted beyond the 6:00 a.m. to 6:00 p.m. period.
18. EPA – means the United States Environmental Protection Agency.
19. FC – means the pollutant parameter fecal coliform.
20. Flow – means the total volume of discharge in a 24-hour period.
21. FWPCA – means the Federal Water Pollution Control Act.
22. Geometric Mean – means the Nth root of the product of the individual values of any set of values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered one (1).
23. Grab Sample – means a single influent or effluent portion which is not a composite sample. The sample(s) shall be collected at the period(s) most representative of the discharge.
24. Indirect Discharger – means a nondomestic discharger who discharges pollutants to a publicly owned treatment works or a privately owned treatment facility operated by another person.
25. Industrial User – means those industries identified in the Standard Industrial Classification manual, Bureau of the Budget 1967, as amended and supplemented, under the category "Division D – Manufacturing" and such other classes of significant waste producers as, by regulation, the Director deems appropriate.
26. MGD – means million gallons per day.
27. Monthly Average – means the arithmetic mean of all the composite or grab samples taken for the daily discharges collected in one month period. The monthly average for flow is the arithmetic mean of all flow measurements taken in a one month period.
28. New Discharger – means a person, owning or operating any building, structure, facility or installation:
  - a. From which there is or may be a discharge of pollutants:
  - b. From which the discharge of pollutants did not commence prior to August 13, 1979, and which is not a new source; and

- c. Which has never received a final effective NPDES permit for dischargers at that site.
29. NH<sub>3</sub>-N – means the pollutant parameter ammonia, measured as nitrogen.
30. Notifiable sanitary sewer overflow – means an overflow, spill, release or diversion of wastewater from a sanitary sewer system that:
- Reaches a surface water of the State; or
  - May imminently and substantially endanger human health based on potential for public exposure including but not limited to close proximity to public or private water supply wells or in areas where human contact would be likely to occur.
31. Permit application – means forms and additional information that is required by ADEM Administrative Code Rule 335-6-6-.08 and applicable permit fees.
32. Point source – means "any discernible, confined and discrete conveyance, including but not limited to any pipe, channel, ditch, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, . . . from which pollutants are or may be discharged." Section 502(14) of the FWPCA, 33 U.S.C. Section 1362(14).
33. Pollutant – includes for purposes of this permit, but is not limited to, those pollutants specified in Code of Alabama 1975, Section 22-22-1(b)(3) and those effluent characteristics specified in Provision I. A. of this permit.
34. Privately Owned Treatment Works – means any devices or system which is used to treat wastes from any facility whose operator is not the operator of the treatment works, and which is not a "POTW".
35. Publicly Owned Treatment Works – means a wastewater collection and treatment facility owned by the State, municipality, regional entity composed of two or more municipalities, or another entity created by the State or local authority for the purpose of collecting and treating municipal wastewater.
36. Receiving Stream – means the "waters" receiving a "discharge" from a "point source".
37. Severe property damage – means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
38. Significant Source – means a source which discharges 0.025 MGD or more to a POTW or greater than five percent of the treatment work's capacity, or a source which is a primary industry as defined by the U.S. EPA or which discharges a priority or toxic pollutant.
39. TKN – means the pollutant parameter Total Kjeldahl Nitrogen.
40. TON – means the pollutant parameter Total Organic Nitrogen.
41. TRC – means Total Residual Chlorine.
42. TSS – means the pollutant parameter Total Suspended Solids.
43. 24HC – means 24-hour composite sample, including any of the following:
- The mixing of at least 8 equal volume samples collected at constant time intervals of not more than 2 hours over a period of 24 hours;
  - A sample collected over a consecutive 24-hour period using an automatic sampler composite to one sample. As a minimum, samples shall be collected hourly and each shall be no more than one twenty-fourth (1/24) of the total sample volume collected; or
  - A sample collected over a consecutive 24-hour period using an automatic composite sampler composited proportional to flow.
44. Upset – means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit discharge limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
45. Waters – means "[a]ll waters of any river, stream, watercourse, pond, lake, coastal, ground, or surface water, wholly or partially within the state, natural or artificial. This does not include waters which are entirely confined and retained completely upon the property of a single individual, partnership, or corporation unless such waters are used in interstate commerce." Code of Alabama 1975, Section 22-22-1(b)(2). Waters "include all navigable waters" as defined in Section 502(7) of the FWPCA, 22 U.S.C. Section 1362(7), which are within the State of Alabama.
46. Week – means the period beginning at twelve midnight Saturday and ending at twelve midnight the following Saturday.

47. Weekly (7-day and calendar week) Average – is the arithmetic mean of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. The calendar week is defined as beginning on Sunday and ending on Saturday. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for the calendar week shall be included in the data for the month that contains the Saturday.

#### **I. SEVERABILITY**

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.



## PART IV SPECIFIC REQUIREMENTS, CONDITIONS, AND LIMITATIONS

### A. SLUDGE MANAGEMENT PRACTICES

1. Applicability
  - a. Provisions of Provision IV.A. apply to a sewage sludge generated or treated in treatment works that is applied to agricultural and non-agricultural land, or that is otherwise distributed, marketed, incinerated, or disposed in landfills or surface disposal sites.
  - b. Provisions of Provision IV.A. do not apply to:
    - (1) Sewage sludge generated or treated in a privately owned treatment works operated in conjunction with industrial manufacturing and processing facilities and which receive no domestic wastewater.
    - (2) Sewage sludge that is stored in surface impoundments located at the treatment works prior to ultimate disposal.
2. Submitting Information
  - a. If applicable, the Permittee must submit annually with its Municipal Water Pollution Prevention (MWPP) report the following:
    - (1) Type of sludge stabilization/digestion method;
    - (2) Daily or annual sludge production (dry weight basis);
    - (3) Ultimate sludge disposal practice(s).
  - b. The Permittee shall provide sludge inventory data to the Director as requested. These data may include, but are not limited to, sludge quantity and quality reported in Provision IV.A.2.a as well as other specific analyses required to comply with State and Federal laws regarding solid and hazardous waste disposal.
  - c. The Permittee shall give prior notice to the Director of at least 30 days of any change planned in the Permittee's sludge disposal practices.
3. Reopener or Modification
  - a. Upon review of information provided by the Permittee as required by Provision IV.A.2. or, based on the results of an on-site inspection, the permit shall be subject to modification to incorporate appropriate requirements.
  - b. If an applicable "acceptable management practice" or if a numerical limitation for a pollutant in sewage sludge promulgated under Section 405 of FWPCA is more stringent than the sludge pollutant limit or acceptable management practice in this permit. This permit shall be modified or revoked or reissued to conform to requirements promulgated under Section 405. The Permittee shall comply with the limitations no later than the compliance deadline specified in applicable regulations as required by Section 405 of FWPCA.

### B. EFFLUENT TOXICITY TESTING REOPENER

Upon notification under Part II.G. of any newly introduced toxic industrial wastewaters, the Director may reopen the permit to include effluent toxicity limitations and testing requirements.

### C. TOTAL RESIDUAL CHLORINE (TRC) REQUIREMENTS

1. If chlorine is not utilized for disinfection purposes, TRC monitoring under Part I of this Permit is not required. If TRC monitoring is not required (conditional monitoring), "9" or "NODI = 9" (if hard copy) should be reported on the DMR forms.
2. Testing for TRC shall be conducted according to either the amperometric titration method or the DPD colorimetric method as specified in Section 408(C) or (E), Standards Methods for the Examination of Water and Wastewater, 18th edition. If chlorine is not detected prior to actual discharge to the receiving stream using one of these methods (i.e., the analytical result is less than the detection level), the Permittee shall report on the DMR form "B", "NODI = B" (if hard copy), or "0". The Permittee shall then be considered to be in compliance with the daily maximum concentration limit for TRC.
3. This permit contains a maximum allowable TRC level in the effluent. The Permittee is responsible for determining the minimum TRC level needed in the chlorine contact chamber to comply with E.coli limits. The effluent shall be dechlorinated if necessary to meet the maximum allowable effluent TRC level.
4. The sample collection point for effluent TRC shall be at a point downstream of the chlorine contact chamber (downstream of dechlorination if applicable). The exact location is to be approved by the Director.

#### D. PLANT CLASSIFICATION

The Permittee shall report to the Director within 30 days of the effective date of this permit, the name, address and operator number of the certified wastewater operator in responsible charge of the facility. Unless specified elsewhere in this permit, this facility shall be classified in accordance with ADEM Admin. Code R. 335-10-1-.03.

#### E. SANITARY SEWER OVERFLOW RESPONSE PLAN

##### 1. SSO Response Plan

Within 120 days of the effective date of this Permit, the Permittee shall develop a Sanitary Sewer Overflow (SSO) Response Plan to establish timely and effective methods for responding to notifiable sanitary sewer overflows. The SSO Response Plan shall address each of the following:

##### a. General Information:

- (1) Approximate population of City/Town, if applicable
- (2) Approximate number of customers served by the Permittee
- (3) Identification of any subbasins designated by the Permittee, if applicable
- (4) Identification of estimated linear feet of sanitary sewers
- (5) Number of Pump/Lift Stations in the collection system

##### b. Responsibility Information:

- (1) The title(s) and contact information of key position(s) who will coordinate the SSO response, including information for a backup coordinator in the event that the primary SSO coordinator is unavailable. The SSO coordinator is the person responsible for assessing the SSO and initiating a series of response actions based on the type, severity, and destination of the SSO, except for routine SSOs for which the coordinator may pre-approve written procedures. Routine SSOs are those for which the corrective action procedures are generally consistent.
- (2) The title(s), and contact information of key position(s) who will respond to SSOs, including information for backup responder(s) in the event the primary responder(s) are unavailable (i.e., position(s) who provide notification to the Department, the public, the county health department, and other affected entities such as public water systems; position(s) responsible for organizing crews for response; position(s) responsible for addressing public inquiries)

##### c. SSO and Surface Water Assessment

- (1) Identification of locations within the collection system at which an SSO is likely to occur (e.g., based upon historical SSOs, lift stations where electricity may be lost, etc.)
- (2) A map of the general collection system area, including identification of surface waterbodies and the location(s) of public drinking water source(s). Mapping of all collection system piping, pump stations, etc. is not required; however, if this information is already available, it should be included.
- (3) Identification of surface waterbodies within the collection system area which are classified as Swimming according to ADEM Admin. Code chap. 335-6-11. References available to assist in this requirement include: <http://www.adem.state.al.us/alEnviroRegLaws/files/Division6Vol1.pdf> and [http://gis.adem.alabama.gov/ADEM\\_Dash/use\\_class/index.html](http://gis.adem.alabama.gov/ADEM_Dash/use_class/index.html)
- (4) Identification of surface waterbodies within the collection system area which are not classified as Swimming as indicated in paragraph c above, but are known locally as areas where swimming occurs or as areas that are heavily recreated

##### d. Public Reporting of SSOs

- (1) Contact information for the public to report an SSO to the Permittee, during both normal and outside of normal business hours (e.g., telephone number, website, email address, etc.)

- (2) Information requested from the person reporting an SSO to assist the Permittee in identifying the SSO (e.g., date, time, location, contact information)
      - (3) Procedures for communication of the SSO report to the appropriate positions for follow-up investigation and response, if necessary
    - e. Procedures to immediately notify the Department, the county health department, and other affected entities (such as public water systems) upon becoming aware of notifiable SSOs
    - f. Public Notification Methods for SSOs
      - (1) A listing of methods that are feasible, as determined by the Permittee, for public notifications (e.g., flyers distributed to nearby residents; signs posted at the location of the SSO, where the SSO enters a water of the state, and/or at a central public location; signs posted at fishing piers, boat launches, parks, swimming waterbodies, etc.; website and/or social media notifications; local print or radio and broadcast media notifications; "opt in" email, text message, or automated phone message notifications)
        - (a) If signage is a feasible method for public notification, procedures for use and removal of signage (e.g., availability and maintenance of signs, appropriate duration of postings)
      - (2) Minimum information to be included in public notifications (e.g., identification that an SSO has occurred, date, duration if known, estimated volume if known, location of the SSO by street address or other appropriate method, initial destination of the SSO)
      - (3) Procedures developed by the Permittee for determining the appropriate public notification method(s) based upon the potential for public exposure to health risks associated with the SSO
    - g. Standard Procedures shall be developed by the Permittee and shall include, at a minimum:
      - (1) General SSO Response Procedures (e.g., procedures for dispatching staff to assess/correct an SSO; procedures for routine SSO corrective actions such as those for sewer blockages, overflowing manholes, line breakages, pump station power failure, etc.; procedures for disinfection of affected area, if applicable);
      - (2) Procedures for collection and proper disposal of the SSO, if feasible.
      - (3) General procedures for coordinating instream water quality monitoring, including, but not limited to, procedures for mobilizing staff, collecting samples, and typical test methods should the Department or the Permittee determine monitoring is appropriate following an SSO. Identification of a contractor who will collect and analyze the sample(s) may be listed in lieu of the procedures.
      - (4) References to other documents (such as Standard Operating Procedures for SSO Responses) may be acceptable for this section; however, the referenced document shall be identified and shall be reviewed at a frequency of at least that required by the Administrative Procedures Section.
    - h. Date of the SSO Response Plan, dates of all modifications and/or reviews, the title and signature of the reviewer(s) for each date and the signature of the responsible official or the appropriate designee.
  2. SSO Response Plan Implementation

Except as otherwise required by this Permit, the Permittee shall fully implement the SSO Response Plan as soon as practicable, but no later than 180 days after the effective date of this Permit.
  3. Department Review of the SSO Response Plan
    - a. When requested by the Director or his designee, the Permittee shall make the SSO Response Plan available for review by the Department.
    - b. Upon review, the Director or his designee may notify the Permittee that the SSO Response Plan is deficient and require modification of the Plan.
    - c. Within thirty days of receipt of notification, or an alternate timeframe as approved by the Department, the Permittee shall modify any SSO Response Plan deficiency identified by the Director or his designee and shall certify to the Department that the modification has been made.
  4. SSO Response Plan Administrative Procedures

- a. The Permittee shall maintain a copy of the SSO Response Plan at the permitted facility or an alternate location approved by the Department in writing and shall make it available for inspection by the Department.
- b. The Permittee shall make a copy of the SSO Response Plan available to the public upon written request within 30 days of such request. The Permittee may redact information which may present security issues, such as location of public water supplies, identification of specific details of vulnerabilities, employee information, etc.
- c. The Permittee shall provide training for any personnel required to implement the SSO Response Plan and shall retain at the facility documentation of such training. This documentation shall be available for inspection by the Department. Training shall be provided for existing personnel prior to the date by which implementation of the SSO Response Plan is required and for new personnel as soon as possible. Should significant revisions be made to the SSO Response Plan, training regarding the revisions shall be conducted as soon as possible.
- d. The Permittee shall complete a review and evaluation of the SSO Response Plan at least once every three years. Documentation of the SSO Response Plan review and evaluation shall be signed and dated by the responsible official or the appropriate designee as part of the SSO Response Plan.

## NPDES PERMIT RATIONALE

NPDES Permit No: **AL0024171** Date: April 20, 2020  
Revised: July 7, 2020

Permit Applicant: Water, Sewer, & Gas Board of the Town of Wedowee  
Post Office Box 935  
Wedowee, Alabama 36278

Location: Wedowee Lagoon  
Woodland Lane, Off of Alabama Highway 48  
Wedowee, Alabama 36278  
Randolph County

Draft Permit is: Initial Issuance:  
Reissuance due to expiration:   
Modification of existing permit:  
Revocation and Reissuance:

Basis for Limitations: Water Quality Model: CBOD<sub>5</sub>, NH<sub>3</sub>N, and DO  
Reissuance with no modification: DO, pH, TSS, and Percent Removals  
Instream calculation at 7Q10: IWC ≈ 21%  
Toxicity based: TRC  
Secondary Treatment Levels: CBOD<sub>5</sub> Percent Removal  
Other (described below): TSS, pH, TSS % Removal, and E. coli

Design Flow in Million Gallons per Day: 0.25 MGD

Major: No

Description of Discharge: Outfall Number 0021; Effluent discharge to Wedowee  
Creek, which is classified as Fish and Wildlife (F&W).

Discussion: This is a permit reissuance due to permit expiration. This discharge limits for Five Day Carbonaceous Biochemical Oxygen Demand (CBOD<sub>5</sub>), Total Ammonia Nitrogen (NH<sub>3</sub>N), and Dissolved Oxygen (DO) were developed by the Municipal Section based on a Waste Load Allocation (WLA) model performed by the Department's Water Quality Branch on October 24, 2019.

This permit reissuance includes seasonal limits. The monthly average summer (April through October) and winter (November through March) limits for CBOD<sub>5</sub> are 7.0 mg/L and 25.0 mg/L, respectively, while NH<sub>3</sub>N summer and winter monthly average limits are 4.5 mg/L and 20.0 mg/L, respectively. The DO has daily minimum limit of 6.0 mg/L.

The pH limits were developed in accordance with the Water-Use designation of the receiving stream and the Municipal Section's Permit Development Guidance. The daily minimum and daily maximum limits are 6.0 s.u. and 9.0 s.u., respectively.

The monthly average Total Suspended Solids (TSS) limit is established at 90.0 mg/L in accordance with ADEM's Permit Development Rationale and 40 CFR 133.105. Minimum percent removal limits of 65 percent

and 85 percent are being imposed on TSS and CBOD<sub>5</sub>, respectively, in accordance with 40 CFR 133.105 and 40 CFR 133.102, respectively.

Because this is a minor facility (design capacity less than 1.0 MGD) treating only domestic wastewater with no industrial wastewater contributions, no potential toxicity concerns are anticipated and thus there is no need to impose chronic and acute bioassay testing under this permit.

The receiving stream is the Wedowee Creek and it is a Tier I stream. The stream is not listed on the current 303(d) list and there are no State of Alabama TMDL affecting this discharge point at this time.

This permit imposes monthly monitoring during the summer season (April through October) for the following nutrient-related parameters: Total Kjeldahl Nitrogen (TKN), Total Phosphorus (TP), and Nitrate plus Nitrite (NO<sub>2</sub> + NO<sub>3</sub>N). Monitoring for these nutrient-related parameters is being imposed so that sufficient information will be available regarding the nutrient contribution from this point source should it be necessary at some later time to impose nutrient limits on this discharge.

The Department revised bacteriological criteria in ADEM Administrative Code R.335-6-10-.09. As a result, this permit includes E. coli limits and seasons that are consistent with the revised regulations. The imposed E. coli limits were determined based on the water-use classification of the receiving stream. Since Wedowee Creek is classified as Fish & Wildlife, the E. coli limits for summer (May through October) are 126 col/100 mL (monthly average) and 298 col/100 mL (daily maximum), while the limits for the winter (November through April) are 548 col/ 100 mL (monthly average) and 2507 col/100 mL (daily maximum).

The monthly average and daily maximum limits of 0.053 mg/L and 0.091 mg/L, respectively, for Total Residual Chlorine (TRC) are being imposed in this permit. The TRC limits were developed based on EPA suggested Water Quality (WQ) criteria which considers the available dilution in the receiving stream. If monitoring is not applicable during the monitoring period, enter \*9 on the monthly DMR. In accordance with a letter date August 11, 1998 from EPA Headquarters and a 1991 memorandum from EPA Region 4's Environmental Services Division (ESD), due to testing and method detection limitations, a Total Residual Chlorine measurement below 0.05 mg/L shall be considered below detection for compliance purposes.

The monitoring frequency for most parameters is monthly. The monitoring frequency for nutrient-related parameters is once per month during the summer season (April – October). Flow is to be monitored continuously as in the previous permit. The reporting frequency for percent removals of TSS and CBOD<sub>5</sub> is monthly.

ADEM Administrative Rule 335-6-10-.12 requires applicants to new or expanded discharges to Tier II waters demonstrate that the proposed discharge is necessary for important economic or social development in the area in which the waters are located. The application submitted by the facility is not for a new or expanded discharge to a Tier II waterbody, so the applicant is not required to demonstrate that the discharge is necessary for economic and social development.

Revision:

This permit is being revised to correct the facility location from Woodlane Lane, Off of Alabama Highway 48, Wedowee, AL 36278 to Woodland Lane, Off of Alabama Highway 48, Wedowee, AL 36278

Prepared by: Torbert

## TOXICITY AND DISINFECTION RATIONALE

Facility Name:	<b>Wedowee Lagoon</b>	
NPDES Permit Number:	<b>AL0024171</b>	
Receiving Stream:	<b>Wedowee Creek</b>	
Facility Design Flow (Qw):	<b>0.250 MGD</b>	
Receiving Stream 7Q10:	<b>1.470 cfs</b>	
Receiving Stream 1Q10:	<b>1.290 cfs</b>	
Winter Headwater Flow (WHF):	<b>7.02 cfs</b>	
Summer Temperature for CCC:	<b>30 deg. Celsius</b>	
Winter Temperature for CCC:	<b>20 deg. Celsius</b>	
Headwater Background NH3-N Level:	<b>0.11 mg/l</b>	
Receiving Stream pH:	<b>7.0 s.u.</b>	
Headwater Background FC Level (summer):	<b>N/A.</b>	(Only applicable for facilities with diffusers.)
(winter):	<b>N/A.</b>	

The Stream Dilution Ratio (SDR) is calculated using the 7Q10 for all stream classifications.

$$\text{Stream Dilution Ratio (SDR)} = \frac{Q_w}{7Q_{10} + Q_w} = 20.83\%$$

### AMMONIA TOXICITY LIMITATIONS

Toxicity-based ammonia limits are calculated in accordance with the Ammonia Toxicity Protocol and the General Guidance for *Writing Water Quality Based Toxicity Permits*.

If the Limiting Dilution is less than 1%, the waterbody is considered stream-dominated and the CMC applies.

If the Limiting Dilution is greater than 1%, the waterbody is considered effluent-dominated and the CCC applies.

$$\begin{aligned} \text{Limiting Dilution} &= \frac{Q_w}{7Q_{10} + Q_w} \\ &= 20.83\% \qquad \qquad \qquad \text{Effluent-Dominated, CCC Applies} \end{aligned}$$

Criterion Maximum Concentration (CMC):  $CMC = 0.411 / (1 + 10^{(7.204 - pH)}) + 58.4 / (1 + 10^{(pH - 7.204)})$

Criterion Continuous Concentration (CCC):  $CCC = [0.0577 / (1 + 10^{(7.688 - pH)}) + 2.487 / (1 + 10^{(pH - 7.688)})] * \text{Min}[2.85, 1.45 * 10^{(0.028 * (25 - T))}]$

	<u>CMC</u>	<u>CCC</u>
Allowable Summer Instream NH3-N:	<b>36.09 mg/l</b>	<b>2.18 mg/l</b>
Allowable Winter Instream NH3-N:	<b>36.09 mg/l</b>	<b>4.15 mg/l</b>

$$\begin{aligned} \text{Summer NH3-N Toxicity Limit} &= \frac{[(\text{Allowable Instream NH3-N}) * (7Q_{10} + Q_w)] - [(\text{Headwater NH3-N}) * (7Q_{10})]}{Q_w} \\ &= 10.1 \text{ mg/l NH3-N at 7Q10} \end{aligned}$$

$$\begin{aligned} \text{Winter NH3-N Toxicity Limit} &= \frac{[(\text{Allowable Instream NH3-N}) * (\text{WHF} + Q_w)] - [(\text{Headwater NH3-N}) * (\text{WHF})]}{Q_w} \\ &= 77.5 \text{ mg/l NH3-N at Winter Flow} \end{aligned}$$

The ammonia limits established in the permit will be the lesser of the DO-based ammonia limit (from the wasteload allocation model) or the toxicity limits calculated above.

	<u>DO-based NH3-N limit</u>	<u>Toxicity-based NH3-N limit</u>
Summer	<b>4.50 mg/l NH3-N</b>	<b>10.10 mg/l NH3-N</b>
Winter	<b>20.00 mg/l NH3-N</b>	<b>77.50 mg/l NH3-N</b>

**Summer: The DO based limit of 4.50 mg/l NH3-N applies.**

**Winter: The DO based limit of 20.00 mg/l NH3-N applies.**

**TOXICITY TESTING REQUIREMENTS (REFERENCE: MUNICIPAL BRANCH TOXICITY PERMITTING STRATEGY)**

The following factors trigger toxicity testing requirements:

1. Facility design flow is equal to or greater than 1.0 MGD (major facility).
2. There are significant industrial contributors (SID permits).

Acute toxicity testing is specified for A&I receiving streams, or for stream dilution ratios of 1% or less.

Chronic toxicity testing is specified for all other situations requiring toxicity testing.

**This is a minor facility (Qw < 1.0 MGD) with no SID permits. No toxicity testing is required.**

$$\text{Instream Waste Concentration (IWC)} = \frac{Q_w}{7Q_{10} + Q_w} = 20.83\%$$

Note: This number will be rounded up for toxicity testing purposes.

**DISINFECTION REQUIREMENTS**

Bacteria limits are required, and will be the water quality limit for the receiving stream, except where diffusers are used the limit may be adjusted for the dilution provided by the diffuser.

See the attached Disinfection Guidance for applicable stream standards.

**(Non-coastal limits apply)**

Applicable Stream Classification: **Fish & Wildlife**

Disinfection Type: **Chlorination**

Limit calculation method: **Limits based on meeting stream standards at the point of discharge.**

	Stream Standard (colonies/100ml)	Effluent Limit (colonies/100ml)
<b><u>E. Coli (applies to Non-coastal and Shellfish Harvesting Coastal)</u></b>		
Monthly limit as monthly average (November through April):	548	<b>548</b>
Monthly limit as monthly average (May through October):	126	<b>126</b>
Daily Max (November through April):	2507	<b>2507</b>
Daily Max (May through October):	298	<b>298</b>
<b><u>Enterococci (applies to Coastal)</u></b>		
Monthly limit as geometric mean (November through April):	Not applicable	<b>Not applicable</b>
Monthly limit as geometric mean (May through October):	Not applicable	<b>Not applicable</b>
Daily Max (November through April):	Not applicable	<b>Not applicable</b>
Daily Max (May through October):	Not applicable	<b>Not applicable</b>

**MAXIMUM ALLOWABLE CHLORINATION LIMITS**

Toxicity-based chlorine limits are calculated in accordance with the General Guidance for Writing Water Quality Based Toxicity Permits.

Chlorine has been shown to be acutely toxic at 0.019 mg/l and chronically toxic at 0.011 mg/l.

Maximum allowable TRC in effluent:	0.053 mg/l (chronic)	(0.011)/(SDR)
Maximum allowable TRC in effluent:	0.091 mg/l (acute)	(0.019)/(SDR)

NOTE: A maximum chlorine limit will be imposed such that the instream concentration will not exceed acutely toxic concentrations in A & I streams and chronically toxic concentrations in all other streams, but may not exceed 1.0 mg/l.

Prepared By: Shanda Torbert Date: 4/15/2020



# Waste Load Allocation Summary

Page 1

## REQUEST INFORMATION

Request Number: 3633

From:	Shanda Torbert	In Branch/Section	Municipal		
Date Submitted	6/11/2019	Date Required	7/11/2019	FUND Code	605
Receiving Waterbody	Wedowee Creek	Date Permit application received by NPDES program	6/10/2019		
Previous Stream Name					
Facility Name	Wedowee Lagoon	(Name of Discharger-WQ will use to file)			
		Previous Discharger Name			
River Basin	Tallapoosa	Outfall Latitude	33.31571 (decimal degrees)		
*County	Randolph	Outfall Longitude	-85.48094 (decimal degrees)		
Permit Number	AL0024171	Permit Type	Permit Reissuance		
		Permit Status	Active		
		Type of Discharger	MUNICIPAL		

Do other discharges exist that may impact the model?  Yes  No

If yes, impacting dischargers names.

Impacting dischargers permit numbers.

Existing Discharge Design Flow	0.25	MGD
Proposed Discharge Design Flow	0.25	MGD

Note: The flow rates given should be those requested for modeling.

Comments included

Yes  No

Information Verified By NC

Year File Was Created

Response ID Number 1714

Lat/Long Method GPS

12 Digit HUC Code 031501080904

Use Classification F&W

Site Visit Completed?  Yes  No

Date of Site Visit 9/11/2019

Waterbody Impaired?  Yes  No

Date of WLA Response 11/14/2019

Antidegradation  Yes  No

Approved TMDL?

Yes  No

Waterbody Tier Level Tier I

Use Support Category 3

Approval Date of TMDL

## Waste Load Allocation Information

Modeled Reach Length 14.2 Miles

Date of Allocation 10/24/2019

Name of Model Used QUAL2K

Allocation Type 2 Seasons

Model Completed by NC

Type of Model Used Desk-top

Allocation Developed by Water Quality Branch

# Waste Load Allocation Summary

Annual Effluent Limits	Conventional Parameters				Other Parameters									
	Qw	0.25	MGD		Qw	0.25	MGD		Qw		MGD	Qw		MGD
Season	Summer		Season	Winter		Season			Season			Season		
From	May		From	Dec		From			From			From		
Through	Nov		Through	Apr		Through			Through			Through		
CBOD5			CBOD5	7	mg/L	CBOD5	25	mg/L	TP			TP		
NH3-N			NH3-N	4.5	mg/L	NH3-N	20	mg/L	TN			TN		
TKN			TKN			TKN			TSS			TSS		
D.O.			D.O.	6	mg/L	D.O.	6	mg/L						

"Monitor Only" Parameters for Effluent:	Parameter	Frequency	Parameter	Frequency
	TKN	Monthly (Apr - Oct)		
	NO2+NO3-N	Monthly (Apr - Oct)		
	TP	Monthly (Apr - Oct)		

Water Quality Characteristics Immediately Upstream of Discharge				
Parameter	Summer		Winter	
CBODu	2	mg/l	2	mg/l
NH3-N	0.11	mg/l	0.11	mg/l
Temperature	30	°C	20	°C
pH	7	su	7	su

Hydrology at Discharge Location		
Drainage Area	41.41	sq mi
Stream 7Q10	1.47	cfs
Stream 1Q10	1.29	cfs
Stream 7Q2	7.02	cfs
Annual Average	57.12	cfs

Method Used to Calculate
ADEM Estimate w/USGS Gage Data
ADEM Estimate w/USGS Gage Data
ADEM Estimate w/USGS Gage Data
ADEM Estimate w/USGS Gage Data

Drainage Area Qualifier
Exact

Comments and/or Notations

Honorable Tim Coe, Mayor  
Water, Sewer, & Gas Board of the Town of Wedowee  
Post Office Box 935  
Wedowee, AL 36278

# APPENDIX E

## STREAM LAKE & WETLANDS REPORT



# Stream, Lake And Wetland Solutions, LLC dba iDredge.com

Sediment, Silt, Sludge and Muck Removal with a Specialty in Dewatering  
www.iDredge.com · PO Box 1286, Louisburg, KS 66053 · (913) 710-2518 · mark@iDredge.com

## WEDOWEE, ALABAMA TESTING AND MEASUREMENT

Total Surface Area in Sq/ft	297,675
Slope of Sides	3:1
Average Depth of Bottom in Feet	4.98
Total Volume of lagoon in Cu/Ft	1,393,476
Estimated Depth of Sludge	1 Ft
Total Cu/Yds of Sludge	9,702 Cu/Yds
Percentage of Solids in Sludge	3.2%
Specific Gravity of Sludge	2.61
Calculated Bone-Dry Tons in Sludge	682.6
Polymer Required for Separation	TMB 834
Suggested Dosing	2.18 Pounds per Bone-Dry Ton

It was our observation that there is minimal density of sludge in the bottom of the lagoon but the material that is suspended in the water that does not seem to settle out to the bottom. It appears that the material flowing in needs to be pre-treated with some sort of flocculant to settle the material and drop it to the bottom of the lagoon.

Lab samples to follow.

Sincerely

Mark Hannah



1775 Moriah Woods Blvd., Ste. 12 ▪ Memphis, TN 38117 ▪ (901) 398-4001

Cornerstone Report#:090-21-002  
 Attn: Mark Hannah, iDredge.  
 Address; Box 1286, Lewisburg, KS 66216.  
 Cornerstone Reference #(s): 162584.

Date Sampled: 02/24/2021  
 Date Received: 03/31/2021  
 Date of Report:04/05/2021

## Analytical Results

### Wedowee

Analysis	Results	Units	Reference Method	Regulatory Threshold
Arsenic (D004)	<0.05	ppm, w/v	USEPA-1311/6010D	5.0
Barium (D005)	<0.05	ppm, w/v	USEPA-1311/6010D	100.0
Cadmium (D006)	<0.05	ppm, w/v	USEPA-1311/6010D	1.0
Chromium (D007)	<0.05	ppm, w/v	USEPA-1311/6010D	5.0
Lead (TCLP-D008)	<0.05	ppm, w/v	USEPA-1311/6010D	5.0
Mercury (TCLP-D009)	<0.01	ppm, w/v	USEPA-1311/7471B	0.2
Selenium (TCLP-D010)	<0.05	ppm, w/v	USEPA-1311/6010D	1.0
Silver (TCLP-D011)	<0.01	ppm, w/v	USEPA-1311/6010D	5.0

Analysis	Results	Units	Reference Method	Ceiling Concentration
Total Arsenic (dry wt.)	<1	ppm, w/w	USEPA-6010D	75
Total Cadmium (dry wt.)	<1	ppm, w/w	USEPA-6010D	85
Total Chromium (dry wt.)	<1	ppm, w/w	USEPA-6010D	3,000
Total Copper (dry wt.)	271	ppm, w/w	USEPA-6010D	4,300
Total Lead (dry wt.)	<1	ppm, w/w	USEPA-6010D	840
Total Mercury (dry wt.)	<1	ppm, w/w	USEPA-7471A	57
Total Molybdenum (dry wt.)	<1	ppm, w/w	USEPA-6010D	75
Total Nickel (dry wt.)	<1	ppm, w/w	USEPA-6010D	420
Total Selenium (dry wt.)	<1	ppm, w/w	USEPA-6010D	100
Total Zinc (dry wt.)	370	ppm, w/w	USEPA-6010D	7,500

### Methods

Reference from USEPA-SW846 Update VI, Revision 4, June 2018 & 40 CFR Section 503.13 Table 1, February 1994.

Samuel J. LaBonia  
 President

# APPENDIX F

## ENVIRONMENTAL RESOURCE ANALYSTS, INC. RESULTS OF ANALYSIS



# ENVIRONMENTAL RESOURCE ANALYSTS, INC.

Auburn Technology Park - 2975 Brown Ct. - Auburn, AL 36830

Tel. (334) 502-3444 Fax (334) 502-8888

**Results of Analysis For:** Mayor Tim Coe  
Wedowee WWTP  
P.O. Box 935  
Wedowee, AL 36278

Project: 442-0919  
Date Received: 9/30/2019

<b>Sample Number:</b> 196943-01	<b>Collection Date:</b> 09/30/2019 11:00
Description: grab	Location: sludge

Analysis	Result	Units	Qual.	MDL	PQL	Method	Collection Date/Time	Analysis Date/Time	Analyst
pH	7.3	SU	H3			EPA 150.1	09/30/19 11:00	09/30/19 16:05	EC
Temperature at pH measurement	22.7	degrees C					09/30/19 11:00	09/30/19 16:05	EC
Total Solids	1.98	%		0.01	0.01	SM 2540 B-2011	09/30/19 11:00	10/01/19 14:00	BEH
Volatile Solids	45.8	%		0.1	0.1	EPA 160.4	09/30/19 11:00	10/01/19 14:00	BEH

Analytes - NOT NELAC Certified

Total Solids                      Volatile Solids

MDL: Method Detection Limit  
PQL: Practical Quantitation Limit  
BMDL: Below Method Detection Limit

*Erin Consuegra*  
Erin Consuegra, QA/QC Manager                      10/14/2019  
Date

This person may be contacted for questions at the number listed above.

All collection and test times are reported as central standard time.  
The results shown relate only to these samples.

**Qualifiers**  
H3 = Sample was received and analyzed past holding time.



# APPENDIX G

## ENVIRONMENTAL RESOURCE ANALYSTS, INC. INFLUENT PUMP STATION SAMPLE REPORT



**Environmental Resource Analysts, Inc.**

**2975 Brown Court  
Auburn, AL 36830  
334-502-3444  
(Fax) 334-502-8888**

**28 Years in Business, and counting  
[www.eralab.com](http://www.eralab.com)**

**Laboratory Testing Report**

**Sample #: 221282**

**Prepared For:**

The Kelley Group  
105 West 2nd St  
Tuscumbia, AL 35674

**Attention: Bart Taft**

*We appreciate the opportunity to provide testing results for you. The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data, please do not hesitate to contact the Technical Manager or the Lab Director at the number listed above.*

The analyses presented in this report were performed by ERA, Inc. Any exceptions or problems with the analyses are noted in the Laboratory Testing Report.

Any issues encountered during sample receipt are documented on the Cooler Receipt Form.

The results as reported relate only to the item(s) submitted for testing.

This report shall be used or copied only in its entirety. ERA, Inc. is not responsible for the consequences arising from the use of a partial report.



# ENVIRONMENTAL RESOURCE ANALYSTS, INC.

Auburn Technology Park - 2975 Brown Ct. - Auburn, AL 36830

Tel. (334) 502-3444 Fax (334) 502-8888

**Results of Analysis For:** The Kelley Group  
105 West 2nd St  
Tuscumbia, AL 35674

Project: 195-1021  
Date Received: 10/14/2021

**Sample Number: 221282-01**

Description: comp

Collection Date: 10/14/2021 8:00

Location: Wedowee Influent Pump Station

Analysis	Result	Units	Qual.	MDL	PQL	Method	Collection Date/Time	Analysis Date/Time	Analyst
Ammonia	42.0	mg N/L		0.6	0.6	EPA 350.1	10/14/21 08:00	10/19/21 11:02	TE
BOD	144	mg/L		2	2	SM 5210B-2016	10/14/21 08:00	10/14/21 16:15	SKC
CBOD	139	mg/L		2	2	SM 5210 B-2016	10/14/21 08:00	10/14/21 16:15	SKC
COD	395	mg/L		20	50	HACH 8000	10/14/21 08:00	10/13/21 17:45	IP
Nitrate as N	0.251	mg N/L		0.096	0.226	EPA 300.0	10/14/21 08:00	10/15/21 23:05	BG
TKN	42.2	mg N/L		0.88	2.5	EPA 351.2	10/14/21 08:00	10/29/21 13:32	TE
TOC	75.7	mg/L		10	10	SM 5310 C-2011	10/14/21 08:00	10/15/21 19:03	JA
TSS	111	mg/L(Dry)				SM 2540D Mod-2011	10/14/21 08:00	10/15/21 18:20	DS

MDL: Method Detection Limit

PQL: Practical Quantitation Limit

BMDL: Below Method Detection Limit

All collection and test times are reported as central standard time.

NO3 was analyzed by EPA 300.0 from the unpreserved -01a bottle. -102821AO

Revised report issued to change the location name per client request. 111221DH

The results shown relate only to these samples.

This report was reviewed for completeness and approved.

Date Complete: 11/02/2021

Dyana Hughes, Reporting Manager

All data on this report is in compliance with the reported method unless otherwise noted.

Erin Consuegra, QA/QC Manager



# CHAIN OF CUSTODY



**ENVIRONMENTAL RESOURCE ANALYSTS, INC.**  
 Auburn Technology Park - 2975 Brown Ct. - Auburn, AL 36830  
 Tel. (334) 502-3444 Fax (334) 502-8888

Standard  
 Expedite (Additional Fees Apply)  
 Date Required \_\_\_\_\_

Client: The Kelley Group  
 Project: 195-102-1

Sample No.	Location	Collector	Date/Time Sampled	Composite Sample(s)	
				Subsample Frequency	Last Subsample Date/Time
221282-01	Wedowee influent	Clay Chennings	10-14-21 10:55 AM	1/br 300ml 9:00 AM	10-14-21 8:00 AM

Flow Rate: \_\_\_\_\_

Sample	Preservation	Analysis	Sample	Preservation	Analysis	Preservation CK
-01a	None	BOD	-01b	H2SO4	Ammonia	<i>[Signature]</i>
-01c	H2SO4	COD - HR	-01d	H2SO4	NO3	<i>[Signature]</i>
-01e	H2SO4	TKN	-01f	H2SO4	TOC	<i>[Signature]</i>
-01g	None	TSS	-01h	H2SO4	Duplicate	<i>[Signature]</i>

For Client Use:

Date Prepared: 10/14/21 PZ

Relinquished By: Clay Chennings

Relinquished By: \_\_\_\_\_

Relinquished By: \_\_\_\_\_

Date/Time: 10-14-21 1:13 PM

Date/Time: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Received at Lab By: PZ

Date/Time: 10/14/21 13:13

Relinquished To Sealed Container:

Client M. Kelleher Group Sample # 221282

ERA LAB

# ERA Cooler Receipt Form

### 1. Condition of Cooler Upon Unpacking

A. Date & Time of Cooler Unpacking 10/21/16 Receiving Analyst: [Signature]

B. Method of Delivery:

Fed Ex  UPS  USPS  ERA Driver  Client Drop Off  Other \_\_\_\_\_  
Tracking Number \_\_\_\_\_

C. Condition of Custody Seal upon arrival:  Absent  Present & Broken by ERA Driver  Present & sealed  Present & broken

### 2. Condition of Cooler Contents

A. Chain Of Custody Information:  Completed  Incomplete, \_\_\_\_\_

B. Cooling Process  Solid Ice  Ice pack  Dry Ice  None  Other \_\_\_\_\_

C. Broken Bottles?  No  Yes If yes, which? \_\_\_\_\_

D. Temperature °C 2.4 Thermometer ID: [Signature]  
Reason for incorrect temp: ( $>6.0^{\circ}\text{C}$ )  Frozen  Beginning of Cooling process  Ice melted  Other \_\_\_\_\_

### 3. Sample Information and Verification

A. Sample Numbers match Chain of Custody?  Yes  No, CBOO to be added

Correct bottle types used for each sample?  Yes  No, \_\_\_\_\_

All samples arrived within holding time?  Yes  No, \_\_\_\_\_

Sufficient volume in each bottle for tests?  Yes  No, \_\_\_\_\_

B. All samples were verified & marked on the Chain of Custody?  Yes  No, \_\_\_\_\_

C. Samples with preservative have been checked and are in the correct pH range?  Yes, no preservatives needed  No, see preservative info  Not applicable  
pH Strip Lot #: 223819AV/228720V

Additional Preservative information	
1 Preservative Type:	_____
2 Preservative Lot #	_____
3 Preservative Type:	_____
4 Preservative Lot #	_____

D. Hexane Lot for O&G 2102005  N/A

E. Trip Blanks  Absent  Present  N/A

### 4. Comments and Resolutions

If any non-compliance was noted (temp out of range, holding time exceedance), contact the client to inform them and document here. Note how client was contacted (email/phone) when/who contacted and result of communication:  
How was client contacted: \_\_\_\_\_ Who contacted? \_\_\_\_\_ Date/Time of contact: \_\_\_\_\_  
Result of communication: \_\_\_\_\_

### 5. Analyst Conformation

The information regarding cooler, chain of custody, and sample receipt is correct and verified by the analyst. If conditions are not met the appropriate actions were taken by the receiving analyst and/or the lab manager.

Primary Reviewer: [Signature] Secondary Reviewer: [Signature]



# ENVIRONMENTAL RESOURCE ANALYSTS, INC.

Auburn Technology Park - 2975 Brown Ct. - Auburn, AL 36830

Tel. (334) 502-3444 Fax (334) 502-8888

**Sample #:** 221282

All results are reported in Central Time.

## **Definitions**

BMDL – Below Method Detection Limit  
BOD – Biochemical Oxygen Demand  
BTEX – Benzene, Ethylbenzene, Toluene, Xylenes  
cBOD – Carbonaceous Biochemical Oxygen Demand  
CCV – Continuing Calibration Verification  
COD – Chemical Oxygen Demand  
DO – Dissolved Oxygen  
DOC – Dissolved Organic Carbon  
DW – Drinking Water  
HAA – Halo Acetic Acid  
HPC – Heterotrophic Plate Count  
HR – High Range  
ICP – Inductively Coupled Plasma  
LCS – Laboratory Control Sample  
LR – Low Range  
MDL – Method Detection Limit  
MS – Mass Spectrometer  
MS – Matrix Spike  
ND – Not Detected at or above the MDL  
NPDES – National Pollutant Discharge Elimination System  
PQL – Practical Quantitation Limit  
RECRA – Resource Conservation and Recovery Act  
RL – Reporting Limit  
SID – State Indirect Discharge  
SOC – Synthetic Organic Compound  
SVOC – Semi-volatile Organic Compound  
TCLP – Toxic Characteristic Leaching Procedure  
TD – Total Dissolved  
TDS – Total Dissolved Solids  
TKN – Total Kjeldahl nitrogen  
TNI – The NELAC Institute  
TOC – Total Organic Carbon  
TOX – Toxicity  
TS – Total Solids  
TSS – Total Suspended Solids  
TTHM – Total Trihalomethanes  
UV – Ultraviolet  
VOC – Volatile Organic Compound  
VS – Volatile Solids  
WW – Wastewater

**End of Report**

# APPENDIX H

## EBARA PUMP START-UP REPORT



**EBARA Pumps Americas Corporation**  
Standard Pump Division

1651 Cedar Line Drive, Rock Hill, South Carolina 29730 USA  
P: (803) 327-5005 F: (803) 327-5097 www.pumpsebara.com

**PUMP START-UP REPORT**

**WARRANTY VOID IF NOT COMPLETED AND SENT TO  
EBARA PUMPS AMERICAS CORPORATION WITHIN 30 DAYS OF PUMP(S) START-UP.**

Start-up Date: \_\_\_\_\_ Installation Date: \_\_\_\_\_  
Job Name: \_\_\_\_\_ Location: \_\_\_\_\_  
Contractor: \_\_\_\_\_ Signature: \_\_\_\_\_

Design Conditions: #1 – TDH \_\_\_\_\_ Flow \_\_\_\_\_ #2 TDH \_\_\_\_\_ Flow \_\_\_\_\_

Pump Model: \_\_\_\_\_ HP: \_\_\_\_\_ RPM: \_\_\_\_\_ Voltage: \_\_\_\_\_  
*Please circle appropriate voltage.* 208/230/3/60 460/3/60

Pump Serial Number: P-#1 \_\_\_\_\_ P-#2 \_\_\_\_\_ P-#3 \_\_\_\_\_

Control Manufacture: \_\_\_\_\_ Level Control Type: \_\_\_\_\_

Operating Amp: \_\_\_\_\_ Overload set / Heater Size: \_\_\_\_\_ Other: \_\_\_\_\_

Ground Connected: \_\_\_\_\_ Pump Control Tested: \_\_\_\_\_ Note: \_\_\_\_\_

Megger Test: P-1 Red: \_\_\_\_\_ White: \_\_\_\_\_ Black: \_\_\_\_\_ Note: (to Ground) \_\_\_\_\_

Megger Test: P-2 Red: \_\_\_\_\_ White: \_\_\_\_\_ Black: \_\_\_\_\_ Note: (to Ground) \_\_\_\_\_

Megger Test: P-3 Red: \_\_\_\_\_ White: \_\_\_\_\_ Black: \_\_\_\_\_ Note: (to Ground) \_\_\_\_\_

Resistance Check: P-1 RW \_\_\_\_\_ RB \_\_\_\_\_ WB \_\_\_\_\_ Note: (Rated) \_\_\_\_\_

Resistance Check: P-1 RW \_\_\_\_\_ RB \_\_\_\_\_ WB \_\_\_\_\_ Note: (Rated) \_\_\_\_\_

Resistance Check: P-1 RW \_\_\_\_\_ RB \_\_\_\_\_ WB \_\_\_\_\_ Note: (Rated) \_\_\_\_\_

Running Voltage: P-1, T1 \_\_\_\_\_, T-2 \_\_\_\_\_, T-3 \_\_\_\_\_, Note: \_\_\_\_\_

Running Voltage: P-1, T1 \_\_\_\_\_, T-2 \_\_\_\_\_, T-3 \_\_\_\_\_, Note: \_\_\_\_\_

Running Voltage: P-1, T1 \_\_\_\_\_, T-2 \_\_\_\_\_, T-3 \_\_\_\_\_, Note: \_\_\_\_\_

Amperage Check: P-1, T1 \_\_\_\_\_, T-2 \_\_\_\_\_, T-3 \_\_\_\_\_, FLA \_\_\_\_\_ Note: \_\_\_\_\_

Amperage Check: P-1, T1 \_\_\_\_\_, T-2 \_\_\_\_\_, T-3 \_\_\_\_\_, FLA \_\_\_\_\_ Note: \_\_\_\_\_

Amperage Check: P-1, T1 \_\_\_\_\_, T-2 \_\_\_\_\_, T-3 \_\_\_\_\_, FLA \_\_\_\_\_ Note: \_\_\_\_\_

Performance Test: P-1 GPM \_\_\_\_\_ THD \_\_\_\_\_ Wet Well Water Level \_\_\_\_\_

Performance Test: P-1 GPM \_\_\_\_\_ THD \_\_\_\_\_ Wet Well Water Level \_\_\_\_\_

Performance Test: P-1 GPM \_\_\_\_\_ THD \_\_\_\_\_ Wet Well Water Level \_\_\_\_\_





**EBARA Pumps Americas Corporation**  
Standard Pump Division

1651 Cedar Line Drive, Rock Hill, South Carolina 29730 USA  
P: (803) 327-5005 F: (803) 327-5097 www.pumpsebara.com

1 – Oil Level Check \_\_\_\_\_  
Yes/No

8 – Check Valves operating properly \_\_\_\_\_  
Yes/No

2 – Sensor Cables Connected \_\_\_\_\_  
Yes/No

9 – Pump seated QDC: \_\_\_\_\_  
Yes/No

3 – Check Moisture Sensor: \_\_\_\_\_  
Yes/No

10 – Piping leaks: \_\_\_\_\_  
Yes/No

4 – Check Thermal Sensor: \_\_\_\_\_  
Yes/No

11 – flow meter installed: \_\_\_\_\_  
Yes/No

5 – Check rotation: \_\_\_\_\_  
Yes/No

12 – discharge pressure gage installed: \_\_\_\_\_  
Yes/No

6 - Guide Rails Plumb: \_\_\_\_\_ Secured \_\_\_\_\_  
Yes/No Yes/No

13 – Single Phase – Capacitor Check \_\_\_\_\_  
Yes/No

7 - Wet well free of debris: \_\_\_\_\_  
Yes/No

Notes / Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Official Start Date: \_\_\_\_\_

Start-Up Performed By:

Company: \_\_\_\_\_ Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Accepted By:

Company: \_\_\_\_\_ Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_

-----

# APPENDIX I

## SCREENS INSTALLATION INSPECTION REPORT



## INSTALLATION INSPECTION REPORT

Date:

Applicable Products:

- Fine Screen (FS)
- Micro Strainer (MS)
- Rotary Drum Screen (RDS)
- Septage Acceptance Plant (SAP)

Date of Service:

Job Name:

Shop Order No.:

Equipment:

Purpose of Trip:

Plant Address:

Plant Phone:

Contractor:

Contractor's Rep.:

Title:

P:

E:

Other Personnel Present:

Lakeside Rep.:

Spare Parts Verified:

(Take Photos)

Service O&M To:

## INSTALLATION INSPECTION REPORT

ITEM	QUESTIONS / TASKS	YES	NO	N/A	COMMENT/ VALUE
1.	Is the screen located per the installation drawings?				
2.	Has specified anchorage been utilized?				
3.	Have shipping materials and hold down straps been removed?				
4.	Is there a permanent means to lift the screen out of the channel?				
5.	Are there any obstructions under the upper transport tube that would prevent the screen from being rotated on the support?				
6.	Has the screen been in service prior to this inspection?				
7.	Is there evidence of rust or damage to the screen? If yes, provide photos.				
8.	Is the screen properly supported so the lower end of the basket or trough does not bear any of the potentially deforming weight of the screen?				
9.	Is the deflector plate sealed along the side walls and across the invert of the channel per the installation instructions on the RDS?				
10.	Is the permanent wash water supply connected to the screen?				
11.	Has a flexible wash water connection been made?				
12.	Is there a flexible conduit installed in the power lines going to the solenoid valves?				
13.	What is the wash water pressure?				
14.	Is there a shut off valve installed in the wash water supply line?				
15.	Is there a strainer or filter installed in the wash water line downstream from the shut off valve and is it installed in the correct flow direction?				
16.	Do the solenoid valves function as they are supposed to?				
17.	What is the method for level control? (Ultrasonic, Floats, Other-Describe)				
18.	If floats have been installed, and the channel is deep (> 10 ft), has a means to secure the cables from tangling been installed?				
19.	If ultrasonic, has the level controller been programmed?				
20.	What is the start level?				
21.	What is the alarm level?				
22.	Has the correct grade of lubricant been discussed with the owner/operator?				
23.	Has the oil level in the speed reducer has been checked and, if necessary, topped off to the proper level?				
24.	Is there a weatherproof breather vent installed in the vent port of the speed reducer?				
25.	If a proximity sensor is provided, has the target been adjusted to clear the sensor and to function properly?				
26.	Check the torque setting of the Taper Grip bushing screws and indicate the torque setting.				
27.	Check the bolts and locking mechanism securing the rake arm or drum to the lower stub shaft of the screw to assure they are tight and assembled properly.				

# INSTALLATION INSPECTION REPORT

ITEM	QUESTIONS / TASKS	YES	NO	N/A	COMMENT/ VALUE
<b>CONTROL PANEL</b>					
28.	Verify and note that the power supply coming into the control panel agrees with the electrical drawings. Record all three phases. Also record secondary voltage.				
29.	Is the main control panel located outdoors or indoors?				
30.	Was a local control station furnished and has it been installed within view of the screen?				
31.	Note the conduit entry points on the control panel. (Top, Bottom, or side)				
32.	Note and photograph any damage to the control panel such as broken pilot devices, rust, dents, and so forth.				
33.	Check that all field wiring connections have been made and note any changes on the service copy of the electrical drawings.				
34.	Check motor rotation and change as necessary.				
35.	Manually operate screen and check for free rotation. Note unusual noise or dragging.				
36.	Motor full load amps (FLA) on nameplate.				
37.	Noted motor amps in test run.				
38.	If a VFD has been supplied, have the parameters set in the factory been checked against the values in the O&M? If any unusual parameters record them.				
39.	Has the sticker been removed from the top of the VFD?				
40.	Does the screen cycle properly in the auto mode?				
41.	Do the solenoid valves cycle properly when operated in the auto mode?				
42.	Does the screen operate properly in the auto and manual modes?				
43.	Does the rake arm fully reverse through the comb?				
44.	Does the rake arm park at the home position?				
45.	Has the E-Stop switch been tested?				
46.	Have alarms that can be simulated and tested?				
47.	Has heat tracing been installed and tested?				
48.	Has the heat tracing thermostat been tested and set for local conditions?				
49.	If Moeller, has the calendar been set for cold weather operation if the screen is outside?				
50.	Is there any damage to the fiberglass covers?				
<b>General</b>					
51.	Once all settings have been put into PLC and all fault counters if available has the program been saved to EPROM if there is one?				
51.	Have Lakeside signs and labels been installed?				
52.	Have installation photographs been taken?				
53.	Has operator training been given?				
54.	Have the spare parts been accounted for?				
55.	Is the screen approved for operation?				

# INSTALLATION INSPECTION REPORT

---

## MOTOR TABLE (if more than one unit)

UNIT DESCRIPTION	MANUFACTURER	SERIAL NO.	T1	T2	T3

## GEAR BOX (if more than one unit)

UNIT DESCRIPTION	MANUFACTURER	SERIAL NO.	TAPER GRIP TORQUE SETTING

# INSTALLATION INSPECTION REPORT

---

## COMMENTS & ACTION ITEMS

Comments

Action Items

# APPENDIX J

## FIVE STAR PRE-STARTUP CHECKLIST



# FIVE STAR PRE-START UP CHECKLIST

	Item	Description	Complete (Yes/No)	Notes
<b><u>A</u></b>	Plumbing	Backwash piping has been installed and backwash pumps are mounted to a manifold that each actuated valve has direct access to. (Valve #1 and #2 are backwash valves on either end and Valve #3 is the sludge draw/drain valve)		
a1		Ensure all filter and pump valves are in proper position for discharge		
<b><u>B</u></b>	Valves	Remove cover and check wiring (jumper installed between "B &D")		
b1		Check valve using manual fly wheel for ease of operation – DO NOT over torque butterfly valves as damage will occur to valve seat.		
b2		Make sure handwheel is pushed in for electric operation		
<b><u>C</u></b>	Control Panel	Check all connections before powering up the system		
c1		Place all switches into "OFF" position		
c2		Turn power "ON" and check all power terminations and control screen reads correct (valves red in closed position, grey in motion (25 to 27 seconds and green when in open position, pump & drive grey when off and green when running)		
c3		Valves should turn from RED to GREY when traveling and GREEN when open		
c4		Level Transmitter installed and terminated in CP. Transmitter should be 6" above the floor of the filter tank on each filter unit.		
<b><u>D</u></b>	Pump	Pumps to be anchored		
d1		Prime Pumps		
d2		Check rotation		
d4		Backwash piping completed from pump to discharge point		

<b>E</b>	Drive	Check rotation (Pull from the bottom)		
e1		Upper and Lower Sprockets installed		
e2		Drive chain in place		
e3		Automatic tensioner is installed		
e4		Chain guard is properly installed on drive motor/gearbox		
<b>F</b>	Disks	Install cloth media on each disk and install in filter tank.		
f1		Connect "Fernco" and secure band clamps		
f2		Six disks in each filter cell.		

I \_\_\_\_\_ report that all items have been successfully installed and ready for operation.

Signature \_\_\_\_\_

Company \_\_\_\_\_

Title \_\_\_\_\_

Once all of the items above are complete and signed for then the unit is ready to be placed into service. Please contact Five Star for the next steps.