Request for Proposal

City of Oak Ridge
Membrane Water Treatment Plant

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City of Oak Ridge
Membrane Water Treatment Plant

Section 1 Introduction/ Overview

1.01 Objective/ Background/ Definitions

On behalf of the City of Oak Ridge (COR) (Owner) we are inviting your Proposal for furnishing the Goods and Special Services described in this Request for Proposal (RFP). Jacobs Engineering Group Inc. is the design engineer (Engineer) for the new COR Membrane Water Treatment Plant (WTP) Project that will be located in Oak Ridge, Tennessee. The Engineer will act as the Owner's representative during the proposal process. The purpose of this RFP is to solicit Proposals from membrane system manufacturers (System Manufacturers) to compare the various manufacturers' products of membrane technology; the only acceptable types of membranes for this Project are encased microfiltration / ultrafiltration membranes.

This solicitation does not constitute an offer by the Engineer or the Owner to enter into a contract. The terms of the Proposal and resulting Agreement shall comply with all applicable federal, state, and local laws. Proposals and the information utilized in the selection process will remain confidential, to the fullest extent allowed by law, except as provided elsewhere in this RFP.

The information provided in the Proposal will be used for determining an Equipment Allowance to be used by the Owner in their construction contract with a Contractor ("Buyer") for providing equipment from the selected System Manufacturer ("Seller").

Section 2 Proposal Instructions and Requirements

2.01 Submission of Proposals

Four copies of the Proposal are to be submitted to the Owner before 2:00 P.M., local time on December 21st, 2017 to:

<u>In Person or Overnight Mail</u>
City of Oak Ridge
Attention: Lyn Majeski
Finance Department
100 Woodbury Lane
Oak Ridge, Tennessee
37830

<u>By Regular Mail</u>
City of Oak Ridge
Attention: Lyn Majeski
Finance Department
P.O. Box 1
Oak Ridge, Tennessee
37831

2.02 Compliance with the RFP

Proposals must be in strict compliance with this RFP. Failure to comply with all provisions of the RFP may result in disqualification.

2.03 Inquiries

To ensure fair consideration for all Proposers, the Owner prohibits communication to or with any department, bureau, elected official, or employee of the Owner during the Proposal process.

Any questions related to this RFP shall be directed to Lyn Majeski (lmajeski@oakridgetn.gov), in writing, at least five working days before the due date of Proposals. Provide reference to the Drawings, Specifications and other attached documentation as appropriate.

Proposers are advised that responses to questions will only be official and binding where issued in a formal written addendum.

2.04 Ambiguity, Conflict or Other Errors in the RFP

If a Proposer discovers any ambiguity, conflict, discrepancy, omission, or other error in the RFP or any document attached to, incorporated into or referenced by the RFP, they shall immediately notify Lyn Majeski of such error in writing and request modification or clarification of the document as outlined in Paragraph 2.03 above. Modifications will be made by issuance of a written addendum. All parties who have received this RFP from the Owner or Engineer will receive addenda.

Failure of Proposers to receive or acknowledge any addendum shall not relieve them of any obligation under this RFP. All addenda shall become part of this RFP.

2.05 Proposals and Presentation Costs

The Owner will not be liable in any way for any costs incurred by any Proposer in the preparation of its Proposal in response to this RFP, nor for the presentation of its Proposal and/or participation in any discussions or negotiations.

2.06 Rejection of Proposals

The Owner reserves the right to accept or reject any or all Proposals submitted. Reasons for which Proposers may be disqualified and their Proposals not considered include, but are not limited to:

- The Owner determines that the Proposal is not responsive to the RFP.
- The Owner determines that the Proposal is not in the Owner's best interest.
- The Proposer fails to complete the Proposal in its entirety in response to this RFP.
- Reasonable grounds exist for believing that any Proposer has a proprietary or pecuniary interest in more than one Proposal, or that collusion exists among the Proposers.
- Failure of the Proposer to satisfy any requirements of the RFP.

2.07 Owner's Right to Research Proposer's Experience

The Owner, prior to or after receipt of the Proposal, shall have the right to research work performed by the Proposer. This research effort will be conducted by Owner

personnel and their representatives, as deemed appropriate by the Owner, and may include site visits and interviews with anyone involved with such projects.

The Owner reserves the right to contact any and all references (including those project references not furnished by the Proposer in their Proposal) to obtain, without limitation for the purpose of evaluating the Proposer's qualifications, the following minimum information regardless of Proposer's performance on the listed jobs:

1. Was Proposer cooperative during the submittal process (e.g., negotiation of scope of supply, schedule, shop drawings, etc.)?
2. Did Proposer effectively address problems that arose during the project?
3. Did Proposer address warranty and punch list items in a timely manner?
4. Were Proposer's project manager, commissioning supervisor, and other key personnel competent and professional?
5. Was the Owner satisfied with the finished product?
6. Were there any issues related to project schedule at any point in the project, including design, construction, startup and commissioning, as a result of the Proposer's design submittals, Proposer's equipment supplied on the project, or the Proposer's personnel involved in the startup and commissioning of the project?
7. Were there any claims or disputes initiated by or involving the Proposer associated with procurement, implementation, or startup of the Proposer's equipment supplied on the project?

2.08 Terms and Conditions of Procurement Contract

The Agreement resulting from this RFP shall be subject to the conditions set forth in the Engineers Joint Contract Documents Committee (EJCDC) procurement documents, as amended, including the "Agreement between Buyer and Seller for Procurement Contracts", and the "Standard General Conditions for Procurement Contracts", included in Appendix L.

Terms of payment shall be in accordance with the "Standard General Conditions for Procurement Contracts" and the "Agreement between Buyer and Seller for Procurement Contracts".

The Proposer's standard preprinted terms and conditions will not be accepted as a substitute to the above referenced EJCDC procurement documents. Should there be other terms and conditions in addition to the above referenced EJCDC procurement documents, those terms and conditions shall be identified on a separate sheet of the Proposer's letterhead and included in the Proposal under the appropriate section (Tab VII – Acceptance of Conditions). Additionally, any conflicting provision in the EJCDC procurement documents and the additional terms and conditions must be identified.

Section 3 Proposal Evaluation and Selection

3.01 Selection Process

Proposals will be evaluated using the criteria stated in the RFP. The Owner reserves the right to request clarifications or corrections to Proposals. Once the evaluation is complete, all responsive Proposals will be ranked from most advantageous to least advantageous.

The process by which a scope of supply, price, and terms and conditions will be negotiated is described in Appendix I, Negotiation Process.

3.02 Projected Timetable of Deliverables

See Appendix K, Deliverables, for a detailed list of non-equipment deliverables required during this project.

The System Manufacturer shall complete the Proposed Project Schedule in Appendix D, subject to the following requirements:

- The proposed schedule is understood to contain the maximum time required for the System Manufacturer to complete the required task. The actual time for delivery of goods will be adjusted as required for the schedule of the general construction contract for the COR Membrane WTP as required by the “Agreement between Buyer and Seller for Procurement Contracts”.
- The Engineer, Owner, and System Manufacturer shall agree upon the delivery schedule for each design submittal (see Appendix K for list of deliverables).
- The delivery schedule for all submittals shall satisfy the projected timetable for the design and construction of the project.

3.03 Price

The System Manufacturer shall complete the Itemized Price Proposal (Appendix B) as part of its Proposal. Proposed prices will be guaranteed by the System Manufacturer until December 31, 2019.

Submittal of a Price Proposal indicates that the System Manufacturer has a full understanding of the scope of work based upon a review of all information furnished with this RFP, including the Drawings and Specifications. The prices entered shall reflect the scope of work requested in this RFP, including any additive and deductive alternates, based on the requirements of this RFP. Modifications and adjustments may be made to the original scope of supply, and price if applicable, as the overall design proceeds.

Provide the total, not-to-exceed (NTE) lump sum price of the Membrane System based on the scope of supply and equipment specified in this RFP, including anticipated material, labor or other component price increases, escalation percentages, and royalty and/or license fees. Prices shall be based on freight-on-board jobsite delivery, and shall not include sales tax.

The Owner shall not be charged additional royalty and/or license fees for the continued use of the Membrane System if and when the Owner should decide to expand the facility beyond the capacity of the current scope of supply.

The cost for the System Manufacturer's field service scope of supply as required by this RFP shall be provided, along with detailed unit cost rates. Standard labor and expense billing rates for additional field service not included in the base scope of supply shall also be provided in the Price Proposal.

Negotiation of the final price of the Membrane System will be based on the scope of supply agreed upon by the Owner and the System Manufacturer, and finalized in the Agreement Between Buyer and Seller For Procurement Contract (to be completed after Proposal accepted).

3.04 Proposal Evaluation Panel and Evaluation Factors

A panel appointed by the Owner will evaluate Proposals and negotiate a final price and scope of supply. Other agencies and representatives of the Owner may, at the sole discretion of the Owner, evaluate the Proposals and/or System Manufacturers. The factors to be considered by the panel in the evaluation of Proposals and the negotiation of an agreement are listed below and further described in Appendix H, Evaluation Criteria.

- Membrane System Capital Cost (Current and Future Expansion)
- Membrane System Impact on Other Project Component Cost (e.g., building footprint)
- Membrane System Life Cycle Cost (as estimated by the Engineer based on the System Manufacturer's data)
- Acceptance of Conditions and Responsiveness
- System Manufacturer Experience and Capabilities
- Membrane System Flexibility
- Performance at Other Locations
- Membrane System Operability and Maintainability
- Early Equipment Information Package (EEIP), shop drawings and equipment delivery schedule
- Response to issues on past projects

Section 4 Proposal Format and Contents

4.01 General

The information listed below shall be submitted with each Proposal and shall be submitted in the order shown. Each section must be clearly labeled with the section names below, with pages numbered and dated and separated by tabs. Failure by a Proposer to include all listed items may result in the rejection of the Proposal. All items in all tabs shall be included in each copy of the Proposal.

4.02 Standards for Drawings

To ensure consistency between drawings and other electronic documents produced by the Engineer and the Proposer, the Proposer shall comply with the following standards for the Proposal and any subsequent design documentation, after negotiations and selection:

- The Proposer shall provide scalable drawings in a sheet size of 11" x 17" or 22" x 34" format. A title block shall be included for each drawing that includes (as a minimum) project title, building name or unit process, date, scale, sheet number, and revision number.
- Dimensions on all drawings and equipment cut sheets shall be shown in English units.
- All equipment, piping, valves and controls not supplied by the Proposer shall be clearly identified as such on the Proposer's drawings.
- The Proposer shall provide all applicable legends for Membrane System drawings.

4.03 Tab I – Proposal Affidavit

The Proposer shall complete the Proposal Affidavit (Appendix A) and enclose under Tab I.

4.04 Tab II – Cost to the Owner

The Proposer shall complete the Price Proposal (Appendix B) in its entirety and enclose under Tab II.

4.05 Tab III – System Manufacturer Experience and Capability

The Proposer shall provide information under Tab III that documents the Proposer's qualifications to produce the required equipment and services, including company background, financial strength, manufacturing capacity, and number of years of experience in providing similar pressurized Membrane Systems. Provide a list of all systems supplied in the last ten years with a capacity greater than the average annual flow rate of 8.0 MGD. For each project, provide the owner's name, project name and location, capacity of the system, the year commissioned, percent of modules requiring pins due to fiber beaks, percent of fibers requiring pins due to breakage, and contact information for the owner and design engineer of record.

Demonstration of financial strength shall be supported by submission, with each Proposal, of a copy of the latest audited financial statements for the firm. Additionally, the System Manufacturer shall provide copies of the most recent Dun and Bradstreet Rating (DUNS) business scope, DUNS business information report, or other similar credit reports to establish financial credibility. A narrative document shall be prepared to accompany the statements to identify any factors, occurrences, etc., taking place after the period covered by the financial statements, which would alter the financial strength presented by the financial statements. If there have been no such factors, occurrences, etc., then the narrative should so state.

4.06 Tab IV – Similar Work Performed

Each System Manufacturer shall provide a list of at least four projects of similar size and scope previously completed and in operation. The average annual flow rate used in the evaluation will be 8.0 MGD. Information for each project shall be provided under Tab IV on the Project Reference Form (Appendix C) provided with this RFP or a reasonable facsimile. The System Manufacturer shall make additional copies of the form as required. Only one project shall be listed on each form. All information requested in the form shall be provided in the order requested.

4.07 Tab V – Scope of Supply, Exceptions, and Alternates

The System Manufacturer shall submit under Tab V a detailed description of the System Manufacturer's scope of supply, including the name of the component manufacturer of all equipment supplied.

Any exceptions to or deviations from the requirements of this RFP shall clearly be described in the Proposal under this Tab.

The System Manufacturer shall consider the cost of items required in this RFP and whether some scope items would be more cost effective if provided by the Contractor or different component manufacturer than specified. Provide itemized price deductions for these items along with a description of alternate scope of supply.

In addition, the System Manufacturer may propose scopes and costs for optional items they feel may be desired by the Owner (e.g., design and 3-D model generation of interconnecting piping, turbidimeters, particle counters and/or long-term service contracts).

4.08 Tab VI – Schedule

The System Manufacturer shall provide the information required on the Proposed Project Schedule (Appendix D) provided with this RFP, as well as any other relevant schedule information, under Tab VI.

4.09 Tab VII – Acceptance of Conditions

The System Manufacturer shall indicate under Tab VII, on a separate sheet of the System Manufacturer's letterhead, any requested exceptions to the requirements of this RFP, General Conditions, or Agreement between Buyer and Seller for Procurement Contracts. These requested exceptions or modifications shall be specifically referenced to the attached Specifications (Appendix L).

4.10 Tab VIII – Membrane System Information

The System Manufacturer shall provide a complete description of the proposed Membrane System under Tab VIII. Proposed systems must conform to the requirements outlined in the Appendices. Appendix F provides a general project description and outlines the System Manufacturer scope of supply. Appendix G

provides the specific design criteria for this system including warranty requirements. The System Manufacturer shall provide information requested on the forms included in Appendix E. For the Capital and Life Cycle Cost Summary table, provide a detailed explanation of how the costs were determined. Include under Tab VIII all forms and supplemental documentation as required, including the following:

1. A description of the proposed Membrane System, including number and type of feed pumps, and any other required pumps, strainers, screens, ancillary tanks, blowers, air compressors, receivers, instrumentation, clean-in-place (CIP) system components, control system, electrical gear, valves, and piping. Include details of skid and non-skid mounted components. Include pump and blower types, motor horsepower, hydraulic operating conditions, discharge pressures, and whether variable- or constant-speed drives are proposed.
2. A narrative describing operation of the membrane system, including production, backwash, and flushing; all types of membrane cleaning, such as backwash or maintenance cleans (with or without chemicals, any duration or frequency), relax (i.e., membranes not producing permeate with or without air scour), and periodic chemical CIP for permeability recovery; integrity monitoring and testing procedures, including membrane integrity test (MIT) pressure, contact angle θ, κ and any information to support the values used to calculate the MIT pressure if worst-case conditions were not used; membrane module repair; and membrane module replacement.
3. General Arrangement drawings showing the system configuration for both 16.0 MGD and the future 20.0 MGD plant capacity (required permeate production under all raw water quality conditions listed in Appendix G) including location of all above listed components, interconnecting piping, and electrical and control panels. Include sections showing end and side views of one membrane train. Plans and sections shall indicate the termination points for permeate, reject, and spent cleaning solution drain piping. Also indicate on both the 16.0 MGD and 20.0 MGD arrangement drawings the additional space required if 10 percent spare membrane module spaces in each rack are provided (see Appendix G, System Configuration and Other Requirements, Item 2). The General Arrangement drawings shall include the required inside dimensions for the membrane treatment building required to house the equipment and systems identified in the System Manufacturer's scope of work. Provide a layout and breakdown of overall space allocated for specific purposes and scope items. The treatment building size shall conform to site constraints and location of ancillary facilities as shown on the Drawings (Appendix M).
4. Include a narrative describing the proposed control system architecture for the Membrane System including interface with main plant control system. The Proposal shall provide a list of proposed instruments and control system devices and include, as a minimum, the component manufacturer, model number, output signal type, enclosure type, and power requirements.
5. The System manufacturer shall design the Membrane System to meet the following flux rate criteria:

Membrane	Design Flux Rate (gfd)
Ceramic	50-90
Polymeric	20-50

Provide the selected flux and recovery percentage for the proposed system along with a detailed justification. Detailed justification of recovery percentage shall include water balance calculations that identify and quantify how all raw water entering the membrane system is anticipated to leave the system as either permeate, membrane backwash, membrane cleaning wastewater, or other flow stream(s) leaving the system. The water balance shall be based on operating at capacity over a one-year period under the average raw water conditions provided in Appendix G. Additionally, list experience of full-scale and pilot studies operated under similar conditions and duration of studies.

6. If any proprietary chemicals are needed for cleaning, include the chemical and its unit cost in Appendix E.
7. The Proposal shall include a criterion for membrane replacement. Permeability, for purposes of this RFP, shall be defined as the Flux (plus or minus 10 percent of the Design Flux) divided by the TMP normalized to 20 degrees Celsius water temperature. Permeability measurements shall be made one hour after startup and continuous operation of membranes following a periodic recovery clean. Normalization based on temperature shall use the following equation:

   Permeability = (Flux/TMP) * exp [0.0246 * (20 – T)], where

   Flux is in gallons per minute per square foot of feed-side membrane area,

   TMP is the differential pressure in pounds per square inch, and

   T is the water temperature in degrees Celsius.

4.11 Tab IX – System Manufacturer Field Services

Describe under Tab IX the System Manufacturer's field services that will be provided during installation, start-up, and performance testing (refer to Specification 01 75 16 for requirements). Include a description of field services that the System Manufacturer will have performed by component manufacturers where applicable.

Identify the number of field personnel in attendance, service duration (in days), number of trips planned, and specific tasks to be performed for the following activities at a minimum:

- Contractor receipt of System Manufacturer supplied equipment.
- Installation and inspection of Membrane System equipment and membrane modules.
- Functional Testing of the Membrane System and associated components.
- Operating Test Period: Indicate the duration of on-site assistance and the method of continued support throughout the test period.

- Operator Training: Indicate the number and hours of training sessions provided and purpose of each session.
- I&C Coordination: Include a minimum of two, one-day, I&C coordination meetings between the System Manufacturer, Contractor, plant control system integrator, and the Engineer. Items to be coordinated include project tag naming convention, Ethernet IP addressing, PLC programming convention and addressing, and communication of flow pacing signals, etc.

4.12 Tab X – Warranty

The System Manufacturer shall include under Tab X a description of the proposed Membrane System warranty, as well as details of optional extended warranties included as additional work, per requirements listed in Appendix G. The cost of the base warranty shall be included in the Price Proposal.

4.13 Tab XI – Installation Instructions and Contractor's Responsibilities

The System Manufacturer shall include under Tab XI details regarding the Contractor's scope of work for System Manufacturer supplied equipment. Include a list of any required components not included in the System Manufacturer's scope of supply that must be provided by the Contractor. Also include requirements for installation checklists and support during commissioning.

4.14 Tab XII – Spare Parts

Identify under Tab XII spare parts included or recommended for the Membrane System components to maintain 5-year operation beyond the base warranty period. Include costs associated with the recommended spare parts. (Note that these spare parts are not necessarily part of the base scope of supply.) Spare parts required in the base scope of supply are identified in the Specifications (Appendix L).

4.15 Tab XIII – Proposal Appendices

The content of this tab is left to the Proposer's discretion. However, the Proposer should limit materials included here to those that will be helpful to the Owner in understanding the Proposal.

APPENDIX A

Proposal Affidavit

Membrane Water Treatment System
for
City of Oak Ridge, Tennessee

ARTICLE 1 – PROPOSAL RECIPIENT

1.01 This Proposal is submitted to the Engineer, Jacobs Engineering Group Inc., on behalf of the Owner, City of Oak Ridge (COR).

1.02 The undersigned Proposer proposes and agrees, if this Proposal is accepted, to enter into an Agreement with the Buyer in the form included in the Request for Proposal (RFP) to furnish the Goods and Special Services as specified or indicated in the RFP for the prices and within the times indicated in this Proposal and in accordance with the other terms and conditions of the RFP.

1.03 The Buyer of the Goods and Special Services will be the successful Bidder (Contractor) for the referenced Project.

ARTICLE 2 - PROPOSER'S ACKNOWLEDGMENTS

2.01 Proposer accepts all of the terms and conditions of the RFP. At the present time the City of Oak Ridge is applying for state and federal funding through the DWSRF and WIFIA Loan Programs, respectively. It is anticipated that bidding for the construction of the new WTP will take place in calendar year 2019, but the exact timing is dependent on funding. Therefore, the successful Bidder of the general construction project (Contractor/Buyer) will be given a Notice to Proceed by the Owner after confirmation of funding. This Proposal will remain subject to acceptance for 90 days after the date of the anticipated Notice to Proceed, or for such longer period of time that Proposer may agree to in writing upon request of Engineer or Buyer.

2.02 Proposer accepts the provisions of the Agreement between Buyer and Seller as to liquidated damages in the event of its failure to furnish the Goods and Special Services in accordance with the schedule set forth in the Agreement between Buyer and Seller.

2.03 As a condition of the Owner requiring the Proposer's Membrane System to be provided for this Project, the Proposer may be required to commence shop drawing preparation prior to execution of the Agreement between Buyer and Seller. Subsequent manufacturing of the system, based upon approved shop drawings, will occur only after execution of the Agreement between Buyer and Seller. Should the Agreement between the Buyer and Seller fail to be executed by the Buyer, the Owner will be obligated to the Proposer to the extent indicated in the General Conditions included in this RFP, Article 11. The total maximum liability of the Owner to the System Manufacturer will be the amount agreed to for shop drawing preparation.

2.04 The Proposer hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner or Owner's representatives in verification of the recitals comprising this Proposal. By the signature provided below, the signer affirms that

the information provided herein is true and correct to the best of his/her knowledge and belief.

ARTICLE 3 – PROPOSER'S REPRESENTATIONS

3.01 In submitting this Proposal, Proposer represents, as set forth in the Agreement, that:

A. Proposer has examined and carefully studied the RFP, other related data identified, and the following Addenda, receipt of all of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Proposer has become familiar with and is satisfied as to the local conditions that may affect cost, progress, delivery or the furnishing of Goods and Special Services.

C. Proposer is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of Goods and Special Services.

D. Proposer has carefully studied and correlated the information known to Proposer, and information and observations obtained from Proposer's visits, if any, with the RFP.

E. Proposer has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Proposer has discovered in the RFP, and the written resolution thereof by Engineer is acceptable to Proposer.

F. The RFP is generally sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Proposal is submitted.

G. Proposer further represents that this Proposal 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; Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or sham Proposal; Proposer has not solicited or induced any individual or entity to refrain from submitting a Proposal; and Proposer has not sought by collusion to obtain for itself any advantage over any other Proposer or over Buyer.

ARTICLE 4 – BASIS OF PROPOSAL

4.01 The cost for the proposed work shall be as identified in Tab II of this Proposal.

4.02 Additional Proposed Costs:

A. US $_____/day: The Seller's fee for storage of Goods at Seller's designated facilities in the event that Buyer desires to delay shipment beyond the shipment date stated below in Article 5.02. Such fee shall include interest on money due Seller.

B. US $_____/day: The Seller's fee for Buyer delaying the initiation of manufacturing of Goods or for not executing the Agreement between Buyer and Seller within the time specified in 4.03 below.

4.03 Seller and Buyer shall execute the Agreement between Buyer and Seller within 90 days after the Contractor's/Buyer's Notice to Proceed from the Owner. Should the Agreement between Buyer and Seller not be executed within said 90 days due to the fault of the Buyer, the Buyer shall be subject to the prorated additional costs identified in Paragraph 4.02 above. Should the Agreement between Buyer and Seller not be executed within the said 90 days due to the fault of the Seller, Seller shall be subject to the liquidated damages provisions in the Agreement between Buyer and Seller. The issue of fault will be determined by the Engineer.

ARTICLE 5 – TIME OF COMPLETION

5.01 Proposer agrees that the furnishing of Goods and Special Services will conform to the schedules set forth in Tab VI of this Proposal, which will be incorporated into Article 5 of the Agreement between Buyer and Seller.

5.02 Proposer agrees that the prices in Article 4 above are based on the condition that shipment of goods may be delayed by the Buyer.

ARTICLE 6 – PROPOSAL DOCUMENTS

6.01 The following documents are attached to and made a condition of this Proposal:

A. Proposer's supporting data included in Tabs I through XIII of this Proposal.

6.02 The following documents are incorporated by reference as included in the RFP and as amended by addenda, if any:

A. Specifications: See Appendix L

B. Drawings: See Appendix M

ARTICLE 7 – DEFINED TERMS

7.01 The terms used in this Proposal have the meanings indicated in the General Conditions. The significance of terms with initial capital letters is described in the General Conditions.

ARTICLE 8 – PROPOSAL SUBMITTAL

8.01 This Proposal submitted by:

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: _____

_____

E-mail address: _____

Phone: _____ Facsimile: _____

Date of Qualification to do business is _____

8.02 This Proposal is submitted this _____ day of _____, 2017.

APPENDIX B

Price Proposal

Item	Description	Proposed Price	Units
1.a.	Not-to-Exceed Lump Sum Price of Membrane System	$	US $
1.b.	Cost of Pilot Testing	$	US $
1.c.	Cost of Early Engineering Information Package (EEIP) and Final Proposal Preparation	$	US $
1.d.	Cost of Shop Drawing Preparation	$	US $
1.e.	Cost of Manufacturer's Field Service	$	US $
	TOTAL Not-To-Exceed Price of Membrane System (Items 1.a. through 1.e.)	$	US $
2.	**Additional Work if Ordered:**		
2.a.	Additional Field Service Labor Rate	$	US$/Hr
2.b.	Additional Field Service Expense Rate	$	US$/Day
2.c.	Year 2019 Guaranteed Membrane Module Replacement Cost (per each, assuming identical parameters as specified herein)	$	US $/Ea Module
2.d.	Cost For 10% Spare Membrane Spaces (See Appendix G, System Configuration and Other Requirements, Item 2)	$	US $
2.e.	Cost For Extended Warranty (10-, 15-, or 20-years) (See Appendix G, Membrane System Warranty)	$ (10 years) $ (15 years) $ (20 years)	US $
2.f.	Cost of Six Months of Operational Assistance	$	US $
2.g.	Membrane Monitoring Service (Annual)	$ (year 1)	US $
		$ (year 2)	US $
		$ (year 3)	US $
		$ (year 4)	US $
		$ (year 5)	US $
3.	**Additional Costs**		
3.a.	Total Not-To-Exceed Price for Expansion of the Membrane System from 16.0 MGD to 20.0 MGD (year 2019 dollars)	$	US$

Future guaranteed membrane module replacement cost (Item 2.c.) and cost to expand from 16.0 MGD to 20.0 MGD (Item 3.a.) will be tied to the stated year 2019 membrane module replacement cost and the U.S. Consumer Price Index, as calculated by the U.S. Bureau of Labor and Statistics. Proposed prices listed in Appendix B will be guaranteed by the System Manufacturer until December 31, 2019.

Note: If the Owner decides not to construct the project, the Owner will terminate the contract for convenience, and compensate the proposer for the work performed for items 1.b Cost of Pilot Testing, 1.c Cost of EEIP and Final Proposal Preparation, and 1.d Cost of Shop Drawing Preparation. Payment of these costs shall be final and complete compensation.

APPENDIX C

Project Reference Form

Project Name	
Project Location (City, State)	
Owner's Name	
Owner's Phone Number	
Owner's Contact Name & Title	
Design Engineering Firm Name	
Design Engineering Firm Phone Number	
Design Engineering Firm Contact Name & Title	
Design Start Date / Construction Start Date	
Design Completion Date / Construction Completion Date	
Reason for Delays (if any) Design: Construction:	
Original Construction Contract Value of Project / Original Membrane System Contract Value of Project (if known)	
Final Construction Contract Value of Project / Final Membrane System Contract Value of Project (if known)	
Reasons for Changes to Contract Value	
Membrane System Scope of Supply	
Major Process Design Parameters	
Type of Membranes Used	
Capacity of Membrane System (MGD)	
Number and Capacity of Each Train	
Raw Water Source and Quality Design Basis	
Design Flux (gfd)	
Backwash Interval (min)	
Recovery Clean Interval (days)	

List other relevant info:

Copy this form as required for multiple project references. Electronic versions of these forms can be made available upon request.

APPENDIX D

Project Schedule

Item	Description	Proposed Date	Units
1.	Owner Issues RFP	November 21, 2017	n/a
2.	System Manufacturers Submit Proposals	December 21, 2017	n/a
3.	Pilot Protocol Submitted to Engineer	[ENTER # WEEKS]	weeks after notice from Owner that pilot testing is required
4.	System Manufacturer Submits Pilot Testing Draft Report	[ENTER # WEEKS]	weeks after pilot testing ends
5.	System Manufacturer Submits Final Pilot Testing Report	[ENTER # WEEKS]	week(s) after Engineer comments are received
6.	System Manufacturer Submits Initial EEIP*	[ENTER # WEEKS]	weeks after issuance of Notice to Begin Preparation of EEIP
7.	System Manufacturer Submits Final EEIP*	[ENTER # WEEKS]	weeks from receipt of comments on Initial EEIP
8.	System Manufacturer Submits Final Proposal	[ENTER # WEEKS]	weeks from receipt of comments on Final EEIP
9.	System Manufacturer Submits Approvable Shop Drawings	[ENTER # WEEKS]	weeks from Buyer's executed Purchase Order
10.	Membrane System Delivered to Job Site	[ENTER # WEEKS]	minimum # of weeks from receipt of approved Shop Drawings (see Appendix A, Paragraph 5.02)

***** EEIP = Early Equipment Information Package

APPENDIX E

Table 1
Membrane System Information

Capacity of Membrane System (Permeate at 10 degrees C)	MGD	
Nominal Feed Flow Rate	gpm	
Model Number or Designation	list	
Number of Membrane Trains Proposed	qty	
Number of Modules per Train	qty	
Membrane Surface Area per Module	sq ft	
Membrane Surface Area per Train	sq ft	
Total Membrane Surface Area Proposed	sq ft	
Number of Spare Modules Provided if 10% Additional Space is Selected (see Appendix G, System Configuration and Other Requirements, Item 2)	qty	
Proposed Average Flux (account for correction to 10 deg C)	gfd	
Proposed Instantaneous Flux (account for correction to 10 deg C)	gfd	
Maximum Net Flux (account for correction to 10 deg C)	gfd	
Normal Operating Range of Trans-Membrane Pressure (TMP)	psi	
TMP at Start-up	psi	
TMP Immediately After a Chemical Clean-in-Place	psi	
Maximum Warranted TMP	psi	
Typical percent TMP recovery after CIP	psi	
Recovery Under Average Raw Water Quality Conditions	%	
Recovery Under Minimum Raw Water Quality Conditions	%	
Recovery Under Maximum Raw Water Quality Conditions	%	
Recovery During Production (for systems that reject a fraction of feed during production)	%	
Justification for Flux and Recovery	attach	
Calculated Maximum Continuous Raw Water Flow Rate to Membranes (under worst case/maximum raw water quality conditions at 10 degrees C) for 16.0 MGD Permeate Production	MGD	
Calculated Maximum Continuous Raw Water Flow Rate to Membranes (under worst case/maximum raw water quality conditions at 10 degrees C) for 20.0 MGD Permeate Production	MGD	
Compatible with Chlorine (as chlorine, mg/L)	yes/no/limit	
Compatible with Chloramines (as chlorine, mg/L)	yes/no/limit	
Compatible with Ozone (as ozone, mg/L)	yes/no/limit	
Compatible with Chlorine Dioxide (as chlorine dioxide, mg/L)	yes/no/limit	
Compatible with Hydrogen Peroxide (as hydrogen peroxide, mg/L)	yes/no/limit	
Compatible with Potassium Permanganate (as potassium permanganate, mg/L)	yes/no/limit	
Compatible with Powdered Activated Carbon (Lignite Based)	yes/no/limit	
Compatible with Powdered Activated Carbon (Bituminous Based)	yes/no/limit	
Compatible with Ferric Chloride (as ferric chloride, mg/L)	yes/no/limit	
Compatible with Sodium Permanganate (as sodium permanganate, mg/L)	yes/no/limit	
Compatible with Lime (as CaCO3, mg/L)	yes/no/limit	

Compatible with Alum (as alum, mg/L)	yes/no/limit	
Compatible with Polyaluminum Chloride (as polyaluminum chloride, mg/L)	yes/no/limit	
Compatible with Aluminum Chlorohydrate (as aluminum chlorohydrate, mg/L)	yes/no/limit	
Compatible with Sodium Hydroxide (as sodium hydroxide, mg/L)	yes/no/limit	
A list of any and all chemicals and their respective concentrations to which the membranes should not be exposed, including their compatibility with ultraviolet light	attach	
Flow Direction (Outside-In or Inside-Out)	list	Outside-In
Membrane Material	list	
Pore Size (Attach a pore distribution graph showing range from minimum to maximum pore sizes)	micron	
Molecular Weight Cutoff	Daltons	
Pore Density	pores/sq m	
Fiber Outside Diameter	mm	
Fiber Inside Diameter	mm	
Fiber Length	inches	
Number of Fibers per Module	number	
Building Area for Membrane System (as Proposed)	sq ft	
Building Area for Membrane System (Future)	sq ft	
Building Area for Excluded Items Required by RFP	sq ft	
Building Height Required	ft	
Requirements for Overhead Hoists or Cranes	list	
Required Tank Volume for Cleaning Solution Storage and Makeup	gallons	
Required Tank Volume for Spent Cleaning Solution Neutralization	gallons	
Special Requirements for Tank Coatings (cleaning or membrane tanks)	list	
Provide Durations of Downtime for the Following:		
Membrane Integrity Testing (MIT)	Minutes	
List of Operator Tasks During MIT	Attach	
Membrane Module or Fiber Repair	Minutes	
List of Operator Tasks During Fiber Repair	Attach	
Membrane Module Replacement	Minutes	
List of Operator Tasks During Module Replacement	Attach	
Provide the Following Maximum Values for Raw Water Quality and Associated Durations:		
Highest Acceptable Turbidity	NTU	
Highest Acceptable Iron	mg/L	
Highest Acceptable Manganese	mg/L	
Highest Acceptable Apparent Color	PCU	
Highest Acceptable True Color	PCU	
Highest Acceptable UV-254	/cm	
Highest Acceptable Total Organic Carbon	mg/L	
Giardia removal/inactivation credit and operating conditions to which the credit applies	log	

Cryptosporidium removal/inactivation credit and operating conditions to which the credit applies	log	
Virus removal/inactivation credit and operating conditions to which the credit applies	log	
List of states where these credits are approved (provide a signed letter from the state health department)	list	
Guaranteed Membrane Life	years	
Criterion for Membrane Replacement	attach	

Provide the following information pertaining to each type of cleaning cycle utilized in the operation of the membrane system as applicable to the type of cleaning being described. Copy and repeat the table to cover each type of cleaning cycle employed by the system.

Table 2
Membrane System Cleaning Information

Manufacturer's Term for Cleaning Cycle	list	
Frequency of Cleaning Cycle Under Average Conditions listed in Appendix G	minutes/days/ weeks/months	
Frequency of Cleaning Cycle Under Minimum Conditions listed in Appendix G	minutes/days/ weeks/months	
Frequency of Cleaning Cycle Under Maximum Conditions listed in Appendix G	minutes/days/ weeks/months	
Downtime per Cleaning Cycle	seconds or minutes per train	
Duration of Cleaning Cycle Under Average Conditions listed in Appendix G	seconds or minutes per train	
Duration of Cleaning Cycle Under Minimum Conditions listed in Appendix G	seconds or minutes per train	
Duration of Cleaning Cycle Under Maximum Conditions listed in Appendix G	seconds or minutes per train	
Describe how these durations will change over the expected range of raw water temperature.	attach	
Volume of Water Used per Cleaning Cycle (include cleaning solution and rinse)	gallons/train	
List Chemicals Used in Cleaning Cycle (include cleaning solution neutralization, assume 12.5% sodium hypochlorite will be available)	list	
Concentration of Each Chemical Solution Used in Cleaning Cycle (maximum amount)	mg/L	
Volume of Chemical Used per Cleaning Cycle	gallons	
Dosing Rate of Chemicals Used in Cleaning Cycle (if applicable)	gpm	
Spent Cleaning Water Chlorine Residual	mg/L	
Heating Requirements for Cleaning Solutions used in Cleaning Cycle (include kW and temperature)	list	
List of Operator Tasks Required During Cleaning Cycle	attach	

If any of the chemicals used in the cleaning cycle are considered proprietary, include the cost per unit for the chemical in the table above.

Table 3
Capital and Life Cycle Cost Estimate Summary

Item	Description	Proposed Cost	Units
1.	Annual Operating Costs at 8.0 MGD Average Flow and at 10 degrees C Approximate Average Temperature (includes Items 1a. through 1d. below)	$	US $/yr
1.a.	Annual Power (kwh x $0.10/ kwh)	$	US $/yr
1.b.	Annual Chemical Cost for Cleaning	$	US $/yr
1.c.	Annualized Membrane Replacement Cost (Cost for membrane replacement at the expected membrane life over a 20-year operating period at the design flow. List expected membrane life if different from guaranteed membrane life)	$	US $/yr
1.d.	Year 2019 membrane module/cassette replacement cost	$	US $
2.	Capital Cost (Item 1a from Appendix B, Price Proposal) Provide total capital cost of equipment provided under the Manufacturer's scope of supply	$	US $
3.	Other Data		
3.a.	Total Required Membrane Rack Footprint (encased systems)		sq ft
3.b.	Total Membrane System Power Requirement (provide total connected horsepower (HP) for all equipment supplied by System Manufacturer)		HP

Provide a detailed explanation of how the above costs were determined. Include supplemental information to back up all calculations under Tab VIII.

Note: The Engineer will evaluate the System Manufacturer's estimate of life cycle cost. Adjustments may be made to facilitate comparison with other Proposals.

APPENDIX F

Project Description

Project Overview

The City of Oak Ridge (COR) has decided to construct a new membrane filtration water treatment plant (WTP) on approximately 4 acres of undeveloped property adjacent to the existing water treatment plant raw water intake. The new WTP will withdraw raw water from Melton Hill Lake. A site map of the area showing the approximate location of the proposed intake structure and WTP is included in the Drawings, in Appendix M.

The new WTP will be constructed in two phases. The initial phase of the project will construct facilities required for 16.0 MGD of membrane filtration, with a firm peak day finished water capacity of 12.0 MGD, and an annual average capacity of 8.0 MGD. Space will be allocated inside the pre-engineered treatment building to allow the WTP to be easily expanded to a firm peak day finished water capacity of 20.0 MGD by the addition of membrane modules or trains. The WTP will be designed to meet the firm finished water capacity at a minimum raw water temperature of 10.0 degrees Celsius (°C) for all projected raw water quality conditions.

Raw water will be pumped from Melton Hill Lake through a new transmission main to the membrane filtration system located inside the membrane treatment building. The capacity of the raw water pumps will account for treatment capacity requirements plus internal plant backwash cleaning systems, including feed water strainer backwash and membrane cleaning, as proposed by the System Manufacturer. The membranes will be preceded by a flow meter, strainer, and pretreatment chemical injection rapid-mix system. Strainers or screens, if required by the System Manufacturer, shall be provided as part of the Membrane System.

It is the responsibility of the System Manufacturer to include in the Proposal the required flow capacity of the raw water pumps to meet the membrane system demands at the peak day capacity (both initial and future capacity), including cleaning requirements. The raw water pump station, pumps, raw water transmission main and pretreatment facilities will be designed by the Engineer and constructed by the Contractor and are considered outside the scope of supply of the System Manufacturer.

Chemical addition and mixing for pre-oxidation, coagulation, and pH adjustment will be required. Pre-oxidation will occur by addition of hydrogen peroxide; coagulation will be accomplished by the addition of aluminum chlorohydrate; pH adjustment will occur by addition of caustic. Lignite or bituminous based powdered activated carbon (PAC) may be added to the raw water periodically for taste and odor control.

The pre-treatment chemicals listed above are subject to change; therefore it is the System Manufacturer's responsibility to clearly list any chemical incompatibilities or limitations in the membrane system Proposal. Additionally, membrane system overall performance is dependent on pretreatment; therefore it is the System Manufacturer's responsibility to coordinate with the Engineer and provide information required to optimize the pretreatment process to best suit the proposed membrane system.

Permeate will pass through a static mixer (outside the scope of supply of the System Manufacturer) where post-filtration chemicals will be added, and directed into a clearwell. The distribution system will be fed by high service finished water pumps that draw water from the clearwell.

Membrane system reject water and spent/neutralized chemical cleaning solution will be neutralized and dechlorinated, and then discharged to a solids lagoon or tank on the WTP site. Decant from the pond or

tank will be discharged to Melton Hill Lake / Clinch River, in accordance with National Pollutant Discharge Elimination System (NPDES) permit. Assume for the purposes of this RFP that reuse of cleaning chemicals will not be allowed. The pH and total residual chlorine discharge limits to the existing solids lagoons are listed below.

- pH between 6.5 and 9.0
- Total residual chlorine < 0.5 mg/L as chlorine

The WTP may operate continuously for 24 hours per day or may operate intermittently. The System Manufacturer shall take into consideration full-time or part-time operation and design provisions for ease of shut-down to ensure preservation of equipment and membrane fibers.

System Manufacturer Equipment Scope of Supply

The Membrane System, for the purposes of this RFP, shall include all equipment required to treat pretreated water from the Raw Water Pump Station (designed by the Engineer, constructed by the Contractor), and produce permeate under the specified raw water conditions to the specified finished water quality requirements. This system cost shall be included as Item 1 in the Price Proposal.

The cost of piping and associated valves required to connect the Raw Water Pump Station to the membrane system and to connect the membrane system to the finished water clearwell shall not be included in the System Manufacturer's scope of supply. The cost of piping from the raw water storage tank to the Membrane System, shown in the Process Flow Diagram in Appendix M, shall not be included in the System Manufacturer's Scope of Supply either. Strainers or screens, if required by the System Manufacturer, shall be provided as part of the Membrane System.

The Membrane System shall be provided with all necessary equipment, components, accessories, and appurtenances required to make a complete and operable system, with the exception of the post-filtration chemical addition mixer and finished water storage, and interconnecting piping between these processes and the Membrane System. The System Manufacturer's scope of supply shall include, but not be limited to, membrane modules or cassettes, feed pumps, other pumps, strainers, screens, valves, ancillary tanks, air compressors and receivers, instrumentation, membrane cleaning and chemical feed systems, control system, electrical equipment, valves, valve actuators and piping on any skid mounted units. Interconnecting piping between the System Manufacturer's scope items fall in the scope of supply by Others.

If support beams, frames, or racks are required, the System Manufacturer shall design and supply all support beams, frames, and racks, and associated anchoring systems including design and supply of said anchors. The raw water storage tank preceding the Membrane System, as shown in the Process Flow Diagram in Appendix M, is excluded from the scope of supply of the System Manufacturer. However, it is the System Manufacturer's responsibility to provide tank size recommendations for each proposed Membrane System.

The System Manufacturer's scope of supply shall include a local programmable logic controller (PLC)-based control system that shall control all aspects of the Membrane System. The membrane control system will receive start/stop commands and a production rate setpoint from the main plant control system. All instruments that are part of the membrane system shall be connected to the membrane control system, making their measurements available to the main plant control system. The membrane control system shall transmit operating data to the main plant control system over an Ethernet network. The Contractor will provide the main plant control system and Ethernet network.

The System Manufacturer's base scope of supply (included in Item 1 of the Price Proposal) shall also include the following items:

1. Pilot testing, that will occur for a duration of approximately 60 days. (described in Appendix J).
2. Preparation of EEIP, Final Proposal, and approvable Shop Drawings (non-equipment deliverables are described in Appendix K).
3. System Manufacturer Field Services (as described in the Specifications in Appendix L).

Additional Work if Ordered and Additional Costs

The Price Proposal includes additional costs that may be considered by the Owner during the negotiation process or may be encountered as the project nears completion. These include:

1. Labor and Expense rates for additional field service.
2. Guaranteed membrane module replacement cost.
3. Cost of 10% extra space in each membrane train for additional membrane modules. (See Appendix G, System Configuration and Other Requirements, Item 2)
4. Additional membrane replacement warranty, above the requirements of this RFP. (See Appendix G, Membrane System Warranty)
5. Six months of operational assistance from the System Manufacturer to the Owner after final acceptance of the project. Include one service person on site for five 8-hour days per week for the first 30 days of operation and one service person for one week (on site for five 8-hour days) per month for five months. Include a detailed scope.
6. The cost to furnish the Membrane System equipment required to complete the second phase of the WTP construction, expansion of the system to 20.0 MGD firm capacity.
7. Membrane Monitoring Service - The annual cost to provide automated data collection and graphical reporting of key process information. The service shall include bi-weekly reports to be generated and issued by the manufacturer. The reports shall include review of data screens, key trends and provide recommendations to improve plant operation, membrane cleaning and overall system performance. An annual report shall also be provided and shall include summary of plant production, membrane performance, cleaning performance, water quality and membrane integrity. 24/7 emergency telephone support shall also be provided as part of the service. The service shall also include 4 site visits per year for 2 days (8 hours each day). The service shall be assumed to begin after Final Completion of the project. Provide the cost for year 1 through 5.

Specifications and Drawings

Specification Sections and Drawings listed in Appendices L and M are applicable and binding to the prices quoted.

The equipment specifications included with this RFP are for items anticipated to be provided in the System Manufacturer's scope of supply. Should the proposed Membrane System require additional equipment not included in the Specifications, the System Manufacturer shall submit cut sheets and product data for those items in the Proposal under Tab V.

The System Manufacturer may propose alternative equipment suppliers from those specified in the Specifications. For proposed substitutions, the System Manufacturer shall submit cut sheets and product data for those items.

APPENDIX G

Design Criteria

Raw Water Quality

A summary of available raw water quality data obtained from samples collected from Melton Hill Lake from January 2014 through June 2017 is presented below. Additionally, the table presents the raw water Basis of Design criteria for this project. These criteria are based on raw water quality data obtained from the samples, with adjustments made to estimate the anticipated worst-case conditions that may occur.

Melton Hill Lake Raw Water Quality Data and Basis of Design

Parameter	Units	Water Quality Data / Basis of Design					
		Average	Minimum	Maximum	7-Day (Weekly) Average	7-Day Minimum Average	7-Day Maximum Average
Temperature	°C	18.9	10.4	25.8	18.9	12.8	24.8
Turbidity	NTU	5.5	0.40	61	5.5	0.74	20.8
pH	s.u.	7.5	7.0	8.0	--	--	--
Alkalinity	mg/L as $CaCO_3$	115	62	138	--	--	--
Iron	mg/L	0.18	0.01	0.55	--	--	--
Manganese	mg/L	0.7	0.05	4.2	--	--	--
Total Organic Carbon	mg/L	1.50	1.28	1.78	--	--	--

The maximum or minimum basis of design values should be assumed as worst-case values that could occur continuously for up to a week.

Pretreatment

Chemical addition and mixing for pre-oxidation, pH adjustment, and coagulation will be required. Pre-oxidation will occur by addition of peroxide; pH adjustment will occur by addition of caustic. Lignite or bituminous based powdered activated carbon (PAC) may be added to the raw water periodically for taste and odor control. It is anticipated that aluminum chlorohydrate (ACH), polyaluminum chloride (PACL), or aluminum sulfate (alum) will be used as the coagulant. During periods of average raw water quality the dose of ACH, PACL, or alum 15 mg/L (calculated based on 50% concentration, specific gravity of 1.34), 25 mg/L (calculated based on 100% concentration, specific gravity of 1.28), or 25 mg/L (calculated based on 48.5% concentration, 1.34), respectively. During worst-case raw water quality the maximum dose of ACH, PACL, or alum is 30 mg/L (calculated based on 50% concentration, specific gravity of 1.34), 50 mg/L (calculated based on 100% concentration, specific gravity of 1.28), or 50 mg/L (calculated based on 48.5% concentration, 1.34), respectively. Pre-settling will not be included in the water treatment process flow.

Treated Water Quality Requirements

The Membrane System shall produce permeate meeting the finished water quality requirements specified below. Pretreated water will be delivered to the Membrane System from the raw water storage tank, preceded by the rapid-mix/chemical addition process, as shown in the Process Flow Diagram in Appendix M.

The proposed membrane system shall produce permeate meeting the following requirements:

1. The Membrane System shall be capable of producing 16.0 MGD of permeate under the full range of raw water conditions stated above. The membrane system shall also be easily upgradeable to a firm peak day finished water capacity of 20.0 MGD with the addition of membrane modules or trains in existing structures. The system shall be capable of producing a minimum permeate flow rate of 1.0 MGD under the full range of raw water conditions listed above. The capacities listed above shall be based on 24-hour operation.

2. The Membrane System shall produce permeate having turbidity less than 0.10 Nephelometric Turbidity Units (NTU) 95 percent of the time and less than 0.15 NTU 100 percent of the time under all stated raw water conditions.

3. Assuming coagulation and pre-oxidation are optimized, the Membrane System shall produce permeate with a maximum color of 10 color units, maximum total iron concentration of 0.15 mg/L and a maximum total manganese concentration of 0.025 mg/L.

System Configuration and Other Requirements

The proposed Membrane System shall meet the following requirements:

1. The Membrane System trains of the base Proposal are not required to include space for any additional membrane modules. It is the System Manufacturer's responsibility to ensure that adequate membrane surface area and appropriate design parameters are selected so that additional surface area is not required under actual raw water conditions.

   Additional Work if Ordered: Provide the Price for the membrane system to include spare spaces for an additional 10 percent of the initial quantity of membrane modules.

2. The loss of a single piece of ancillary equipment (from the point where flow enters the membrane building to the point where the flow enters the finished water storage tank) shall not result in the loss of the system's capability to process 100 percent of the design permeate capacity as required below. This requirement shall also apply to capacity during any type of cleaning cycle. This requirement applies to strainers, screens, air compressors, air receivers, air dryers, blowers, pumps, membrane trains, and any other component included in the proposed Membrane System. The Membrane System shall maintain 12.0 MGD of permeate capacity during any type of cleaning cycle.

3. A minimum 30-day interval between chemical (recovery) cleaning is required while meeting the required treated water quality objectives at the design flow capacity and raw water quality parameters as required above. As part of the Proposal, the System Manufacturer shall provide the warranted maximum trans-membrane pressure as well as the typical percent recovery of trans-membrane pressure following a recovery clean.

4. Unless otherwise stated in the Request for Proposals, all parts of the membrane system that come in contact with raw or treated water shall meet National Sanitation Foundation (NSF) 61 requirements for drinking water treatment.

5. The membrane integrity test shall be performed at a minimum pressure to achieve a 3-μm resolution to meet the required criteria in the Membrane Filtration Guidance Manual, referenced by the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

6. The Membrane System piping shall be configured such that there is a single flanged termination point for each of the following: feed, permeate, reject, and spent cleaning solution drain. "Bleed and feed" systems, where high concentrations of retentate are continuously or periodically bled from the system in lieu of backwashing, shall not be acceptable for this Proposal.

7. All Membrane System reject water or spent chemical cleaning solution must be neutralized and dechlorinated, as specified in Appendix F, within the membrane system prior to discharge into the sediment ponds.

8. The membrane cleaning system and cleaning solution neutralization system shall utilize, where possible, bulk chemicals that are also stored for the plant chemical feed systems. Bulk sodium hypochlorite (10-15%), sodium hydroxide (25%), citric acid (38%) and sodium bisulfite (39.5%) will be stored in bulk storage tanks (storage tanks will be designed by the Engineer and provided by the Contractor). The Membrane System shall include feed pumps for these chemicals, sized for Membrane System requirements. The System Manufacturer shall provide information regarding minimum, maximum, and average feed rates for calculation of storage volumes. Additional chemical systems (including tanks, pumps, piping, and controls) required for membrane system cleaning or cleaning chemical disposal shall be provided by the System Manufacturer.

9. If maintenance cleans (EFMs) are proposed, the membrane System Manufacturer shall define the frequency and types/quantity of chemicals. The system shall be designed with the flexibility to perform these cleaning cycles on minimum 24-hour intervals during periods of high demand or worst-case water quality.

10. The Membrane System shall provide a minimum of 10 psi of residual permeate pressure to fill the clearwell.

Membrane System Warranty

The System Manufacturer shall provide an equipment warranty for all components of the Membrane System. The warranty shall commence upon successful completion and certification of the Operational Test Period, or six (6) months from the date of delivery of equipment, whichever is earliest.

The System Manufacturer shall warrant all products supplied by the System Manufacturer for a minimum period of two years after successful completion and certification of the Operational Test Period.

The System Manufacturer shall provide, for the membranes, a minimum warranty period of ten years, with a two-year absolute warranty period and the remaining eight years prorated as described below. The guaranteed membrane life, based on the flow rates and operating conditions specified in this RFP, shall be stated in the warranty.

The System Manufacturer shall provide as part of the Price Proposal the year 2019 guaranteed membrane module replacement cost. Prior to the end of the second year after successful completion

and certification of the Operational Test Period, full replacement will be required at no cost to the Owner. After the second year of operation, when successful completion and certification of the Operational Test Period is concluded, the Owner will pay for replacement membrane modules based on the number of years of actual use divided by the guaranteed membrane life stated in the warranty (value not to exceed 1.0).

The System Manufacturer shall provide the additional cost for providing an extended warranty for membrane replacement to supply a total warranty period of 10, 15, and 20 years after successful completion and certification of the Operational Test Period. The System Manufacturer shall specify absolute and prorated periods for these extended warranties. In no case shall the extended warranty provide less coverage than what is required in the third paragraph of this Section for the first ten years of operation after successful completion and certification of the Operational Test Period.

If the Membrane System fails to perform as required, either in terms of water quality, quantity, or fiber breaks the System Manufacturer shall be required to make modifications to the Membrane System. Modifications required and failure modes are as follows:

1. Module replacement shall be required if more than one percent of the fibers in a module have been repaired, during the System Manufacturer's guaranteed membrane life.

2. If the Membrane System as a whole is unable to produce permeate at the required plant capacity on a continuous basis, the System Manufacturer shall be responsible for the cost to modify the Membrane System to meet the capacity requirements as stated in this RFP. The first method of addressing the failure will be to provide additional membrane surface area. If, in the opinion of the Engineer and Owner, adequate membrane surface area has been provided, other modifications to the Membrane System may be required to achieve the required capacity.

3. If the Membrane System produces permeate that does not meet the filtered water requirements (listed in Appendix G, Treated Water Quality Requirements), then modifications to the Membrane System shall be made by the System Manufacturer at no additional cost to the Owner.

Process Warranty

As part of the Proposal, the System Manufacturer shall provide a Membrane System Process Performance Guarantee that the membrane system is capable of meeting the treated water quality, quantity (capacity), and membrane life expectancy criteria defined in the RFP and Proposal.

APPENDIX H

Evaluation Criteria

Acceptance of the Proposal will be based upon the Engineer's and Owner's evaluation of the System Manufacturer's Proposal. Proposals will be evaluated based on economic and non-economic criteria. Non-responsive Proposals will not be evaluated.

Economic Evaluation Criteria

Economic criteria that will be used in the evaluation of Proposals include the capital cost of the Membrane System; capital cost of handling reject water and spent cleaning solution; capital cost of the membrane equipment building (provided by the Contractor at an assumed cost of $200 per square foot); and operation and maintenance (O&M) costs. Additional labor costs for installation of systems that are not skid-mounted will also be included in the evaluation. Unit costs that will be used to calculate O&M costs include the following:

Power cost	$0.10 per kWh
Labor cost	$30.00 per man-hour
Spent cleaning solution handling cost	$0.10 per gallon (for flux maintenance and CIP)
Aluminum Chlorohydrate	$0.385 per lb as delivered product
Corrosion Inhibitor	$0.26 per lb as delivered product
Hydrogen Peroxide cost (50%)	$0.44 per lb as delivered product
Sodium Hydroxide cost (25%)	$1.92 per lb as delivered product
Sodium Hypochlorite cost (12.5%)	$0.88 per gallon
Citric Acid cost (38%)	$0.65 per lb as delivered product
Sodium Bisulfite (38%)	$1.90 per gallon
HFS Acid, 23%	$0.25 per lb as delivered product

The O&M cost of reject water handling will be based on the cost of neutralization and the cost of dechlorination, if applicable.

A 20-year life cycle at 3-percent interest rate will be used to determine the present worth of O&M costs. The average annual flow rate used in the evaluation will be 8.0 MGD.

Non-Economic Evaluation Criteria

Non-economic criteria that will be used in the evaluation of Proposals include the following items:

1. Acceptance of Conditions and Responsiveness
   a. Completeness of Proposal
   b. Organization of Proposal
   c. Exceptions taken to requirements of RFP
   d. Clarity of Proposal

2. System Manufacturer's Experience and Capabilities
   a. Years experience manufacturing the proposed system
   b. Number of systems supplied similar in size and complexity to proposed system
   c. Expected responsiveness of local and national service facilities
   d. Company references (non-financial)
   e. Company financial strength
   f. Design support capability and availability
   g. Manufacturing capability and availability

3. Membrane System Flexibility
   a. Flexibility to meet future water quality criteria
   b. Ability to handle water quality upsets
   c. EPA/NSF Environmental Technology Verification (ETV) program certification for pathogen removal

4. Performance at Other Locations
   a. All types of plants (water and wastewater, municipal and industrial) with proposed membrane product (constructed and operating)
   b. Municipal water plants with proposed membrane product (constructed and operating)
   c. Successful performance demonstrated, including proposed flux rates
   d. References and contact information, including shop drawings and delivery compliance.
   e. Timely performance and adherence to schedules in preparation and delivery of EEIP, shop drawings, and equipment delivery schedule.

5. Membrane System Operability and Maintainability
   a. Complexity of membrane system and pretreatment requirements
   b. Degree of reliability of automation
   c. Ease of operation
   d. Ease of maintenance
   e. Membrane integrity test method
   f. Membrane performance maintenance procedures (e.g., backwashing with and without chemicals, etc.)
   g. Membrane performance recovery procedures (e.g., chemical cleanings and types of chemicals used)
   h. Compatibility with other chemicals used
   i. Maintenance requirements and frequency
   j. Membrane failure – ease of locating and repairing membranes
   k. Waste stream – quantity
   l. Waste stream – quality and special treatment needs

APPENDIX I

Negotiation Process

Proposals will be evaluated using the criteria stated in the RFP. Once the evaluation is complete, all responsive Proposals will be ranked from most advantageous to least advantageous to the Owner, considering the evaluation factors stated in this RFP.

The Owner will then issue the highest ranked System Manufacturer a "Notice of Tentative Selection" indicating that, subject to final negotiations, the System Manufacturer's equipment will be incorporated into the Project as the Basis of Design and will be included in the Contract Documents. The Owner will then negotiate the scope of supply, price, and terms and conditions with the highest ranked System Manufacturer. If a satisfactory agreement cannot be reached, negotiations may be conducted, in the sole discretion of the Owner, with the second, and then the third, and so on, ranked System Manufacturers. If the Owner is unsuccessful in its first round of negotiations, it may reopen negotiations with any System Manufacturer with whom it previously negotiated or elect to issue a new RFP. The scope of the work may be changed during this negotiation process at the sole discretion of the Owner in an effort to reduce the cost and/or to benefit the Project in any manner.

Upon receipt of "Notice of Tentative Selection", the System Manufacturer may be required, at the sole discretion of the Owner, to validate the proposed Membrane System through on-site pilot testing for a minimum period of 60 days, with an additional 2 weeks after pilot decommission for report preparation. See Appendix J, Pilot Testing, for details regarding pilot testing requirements. All of the System Manufacturer's costs associated with the pilot testing shall be included in the Price Proposal (Item 1.b).

If pilot testing is deemed necessary, negotiations will continue until a satisfactory agreement has been reached; the required pilot testing will proceed in parallel with negotiations. Determination of successful pilot testing, or remedial actions if pilot testing is not successful, is detailed in Appendix J.

After successful negotiations, the System Manufacturer will be issued a "Notice to Begin Preparation of Shop Drawings". The Manufacturer's Proposal and any modifications made to the Proposal during the negotiation phase shall become part of the Contract Documents and shall be provided in its entirety to the Contractor (Buyer).

APPENDIX J

Pilot Testing
Microfiltration / Ultrafiltration Membrane
Drinking Water Pilot Study Protocol

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1 Introduction

The City of Oak Ridge (COR) is planning to construct a 16-million gallon per day (MGD) drinking water treatment plant (WTP). The raw water source for this WTP will be Melton Hill Lake. Process treatment alternatives for the new WTP have been evaluated and the results showed that using membrane filtration will provide COR with a means of producing high-quality finished water at a feasible cost.

Several manufacturers of microfiltration and ultrafiltration membranes are being invited by COR to propose on the project. The membrane manufacturer's proposals will be evaluated by COR to select a membrane manufacturer for the WTP project. The selected membrane system will be piloted to demonstrate its ability to effectively treat raw water from Melton Hill Lake at the flux rates proposed.

The purpose of this pilot study is to demonstrate that the proposed treatment system can meet regulatory requirements for reduction of disinfection by-product (DBP) formation, for removal of pathogens, as well as for other specific requirements. Another key objective is to demonstrate equipment performance for purposes of bid qualification and full-scale facility design. This document serves as a protocol for pilot testing, and provides the necessary operational and analytical details for proper operation and monitoring. The proposed work plan has been prepared based on the information available to date and is subject to revision depending upon actual performance and site conditions. Specific items of note regarding this protocol:

- The pilot plant will be set up at the raw water intake / pump station located on Melton Hill Lake. Raw water will be applied directly to the membranes.
- The total withdrawal from the lake will be less than 100,000 gallons per day for this pilot testing. The existing raw water withdrawal permit will accommodate the temporary pumping withdrawals from the lake for the pilot plant operation.
- The proposed protocol is based on a 60-day pilot testing period; up to 90 days for pilot installation, study, decommissioning, and report preparation.
- Discharge (permeate and backwash water) from the pilot plant will be sent to the lake. Discharge from chemical cleaning processes shall be collected and disposed of off-site in accordance with federal and state requirements.

2 Objectives

The overall objectives for the pilot study are to:

1. Demonstrate that the proposed microfiltration / ultrafiltration membrane process will produce treated water that will meet and exceed all applicable federal and state drinking water quality standards.
2. Determine the physical design parameters (flux, recovery etc.) that will provide a basis on which a full-scale plant may be designed. The target chemical recovery cleaning interval (CIP) for the full-scale facility is 30 days at a minimum design temperature of 10.0°C under all raw water quality conditions.
3. Determine the optimum oxidant and coagulant dose rates for reduction of iron, manganese, TOC and DBP formation potential.
4. Verify that particle counts, in addition to pressure decay tests, may be used to provide verification of membrane integrity. The membrane integrity test will be performed using an air pressure-hold at a minimum pressure to achieve a 3-micron (µm) defect resolution to meet the recommended design criteria in the Membrane Filtration Guidance manual, referenced by the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).
5. Verify that the membrane system can produce high quality permeate that has a turbidity of less than 0.10 NTU 95 percent of the time and less than 0.15 NTU 100 percent of the time under all raw water quality conditions.

6. Demonstrate that pretreatment followed by membrane filtration will produce treated water resulting in the required reduction of Total Organic Carbon (TOC) to achieve maximum TTHM and HAA5 96-hour Simulated Distribution System (SDS) formation potentials of less than the EPA regulated MCLs (80 and 60 µg/L for TTHM and HAA5, respectively) under all raw water quality conditions. The Uniform Formation Conditions (UFC), as specified by the Information Collection Rule (ICR), will be used as the method for the SDS formation potential test.
7. Verify the effectiveness of the selected membrane manufacturer's proposed specific cleaning protocols. Cleanings include daily maintenance cleans using back pulse of permeate and air, as well as periodic chemical cleanings including Enhanced Flux Maintenance (EFM) and Chemical Clean In Place (CIP). Cleaning regimes including type of chemicals, concentration of chemicals and minimum time between cleanings will be verified.

3 Process Description

3.1 Pretreatment Process Description

Pretreatment will consist of chemical addition and mixing with a static mixer. Chemical addition and mixing for pre-oxidation, coagulation, and pH adjustment will precede the membrane system. Pre-oxidation will occur by addition of sodium hypochlorite or hydrogen peroxide; coagulation will be accomplished by the addition of either Aluminum Chlorohydrate (ACH), Ferric Chloride or Aluminum Sulfate (Alum) coagulant. Necessary pH adjustments will occur by addition of caustic. Lignite or bituminous based powdered activated carbon (PAC) may be added to the raw water periodically for taste and odor control. Pretreated water will be delivered to the Membrane System after the rapid-mix/chemical addition process.

Particle aggregation is then promoted in a flocculation stage where interparticle collisions create larger particles amenable to separation from the treated water. Here the fine microfloc begins to agglomerate into larger floc particles. Gentle agitation of the water will be imparted with a variable-speed mixer capable of being adjusted to provide a velocity gradient of 750 fps/ft-min.

3.2 Membrane Process Description

The microfiltration / ultrafiltration membrane process will provide a single step process effectively replacing both the clarification and granular media type filtration processes found in conventional water treatment plants. Equipment requirements for the pilot membrane process are presented in Section 4, which follows.

4 Pilot Equipment Description

The membrane manufacturer will supply a pilot scale pretreatment system, as well as a microfiltration / ultrafiltration membrane system for the pilot evaluation study for COR. A description of the various components is presented below. The pilot treatment process shall contain:

- Shelter to house the pilot plant equipment, instrumentation and controls
- Raw water pump
- Raw water storage tank (if required)
- Inlet strainer
- Chemical feed dosing equipment
- Chemical holding tanks
- Coagulation / flocculation tankage and mixing equipment
- Feed pumps for the membrane system
- Self-contained skid mounted, c/w integral PLC control and SCADA system

- Membrane process vessels
- Molded Backpulse / Clean-In-Place tank
- Microfiltration / ultrafiltration membranes
- Blower (if required)
- Air Compressor
- On-line flow meter
- On-line Turbidimeters (Feed and Permeate)
- Particle Counter (Feed and Permeate)
- On-line temperature probe
- On-line pressure sensor to measure and record Transmembrane Pressure (TMP)
- On-line data logger
- Filtrate storage tank (if required)

An operations manual will be provided with the system by the Manufacturer. The operations manual will include details of the membrane system's components, their recommended maintenance schedules, along with specific information relating to each component.

5 Feed Water Characteristics

Raw water from Melton Hill Lake will be used as the feed water source for the pilot system. Raw water quality data for the new WTP has been collected by COR from January 2014 to June 2017. A raw water quality Basis of Design was established for the new WTP based on this data. The Basis of Design reflects anticipated worst-case conditions for water quality from the intake structure located in Melton Hill Lake. A summary of the historical Melton Hill Lake data, as well as the Basis of Design data is provided in Table 1.

Table 1
Melton Hill Lake Raw Water Quality Data and Basis of Design

Parameter	Units	Water Quality Data / Basis of Design					
		Average	Minimum	Maximum	7-Day (Weekly) Average	7-Day Minimum Average	7-Day Maximum Average
Temperature	°C	18.9	10.4	25.8	18.9	12.8	24.8
Turbidity	NTU	5.5	0.40	61	5.5	0.74	20.8
pH	s.u.	7.5	7.0	8.0	--	--	--
Alkalinity	mg/L as $CaCO_3$	115	62	138	--	--	--
Iron	mg/L	0.18	0.01	0.55	--	--	--
Manganese	mg/L	0.7	0.05	4.2	--	--	--
Total Organic Carbon	mg/L	1.50	1.28	1.78	--	--	--

The maximum (or minimum, as in temperature) design values should be assumed as worst-case values that could occur continuously for up to a week. Higher values could occur on one or more consecutive days during that week.

6 Proposed Schedule

6.1 Project Outline Schedule

The proposed project outline schedule is presented in Table 2.

Table 2
Proposed Project Schedule

Time Period	Task
1 Day	Pilot to arrive at site
1 Week	Pilot Installation, Commissioning and Operator Training
60 Days	Pilot Evaluation Study
2 Days	Pilot Decommissioning
1 Day	Pilot to depart site
	Final Report is completed two weeks after pilot decommissioning

It should be noted that this schedule is subject to change depending on what occurs during the study. The time periods are not firm and can be altered if necessary.

6.2 Operating Schedule

The goal for optimizing the membrane process is to determine the maximum net flux and recovery and verify that the net flux rate and recovery proposed by the manufacturer are met while maintaining stable permeability and producing high quality permeate water. To achieve this, the pilot unit will be operated at various flux and recovery values, as well as different chemical addition schemes. Table 3 outlines the proposed phases and the corresponding operational and analytical parameters that will be changed during each phase.

6.3 Phase Description

A brief outline summarizing each phase is presented below.

6.3.1 Phase 1 – Membrane Conditioning Period

To allow the membranes to acclimate to the feed water, the pilot unit will run at an average flux, at 95% recovery for a period that will be determined by the manufacturer. All preconditioning, if required, will be completed prior to beginning the pilot study.

At the end of Phase 1, a full recovery clean (CIP) and direct integrity test will be performed.

Table 3
Pilot Plant Operating Schedule

	Phase 1	Phase 2	Phase 3	Phase 4
Description	Membrane Conditioning Period	Pretreatment Optimization and Development of Membrane Operating Parameters	Testing Membrane With Pretreatment Optimized and Membrane Operating Parameters Established from Phase 2	Determine Percent Loss of Original Specific Flux (Irreversible Fouling)
Duration	TBD	1 to 2 weeks	4 weeks	2 weeks
Flux (gfd)	TBD	TBD	TBD	TBD
Recovery (%)	TBD	95	95	95
BP Frequency (min)	TBD	TBD	TBD	TBD
BP Duration (sec)	TBD	TBD	TBD	TBD
BP Drain Option	Yes	Yes	Yes	Yes
Air Flow rate (dcfm)	TBD	TBD	TBD	TBD
Maintenance Clean	TBD	TBD	TBD	TBD

TBD = to be determined based on the parameters proposed by the membrane manufacturer.

6.3.2 Phase 2 – Pretreatment Optimization and Verification of Membrane Operating Parameters

In this phase of the study, optimum doses of pretreatment chemicals will be determined based on turbidity reduction, TOC (DBP precursor) reduction, and increased membrane flux. Additionally the mixing energy imparted to the pretreatment process will be optimized. To determine the optimal (maximum) flux that can be achieved, the flux will be increased stepwise and the slope of pressure will be examined. The start flux will depend on feed water quality. The flux will be increased by a membrane manufacturer specified amount every 2 days until a calculated CIP interval of approximately 30 days is achieved. Depending on the number of parameters to be adjusted, this phase can last from 1 to 2 weeks. The following data will be collected and recorded to establish the test conditions that will be used during the two subsequent stages of the pilot test.

1. Pretreatment requirements.
2. Backwash / backflush / reverse flow duration.
3. Backwash / backflush / reverse flow frequency.
4. Backwash / backflush / reverse flow rate.
5. Feed water flow rate.
6. Range and average filtrate flux.
7. Range and average TMP.
8. Specific and filtrate flux rate (adjusted to a temperature of 20˚C).
9. Percent system recovery.
10. Expected time frame between CIP procedures.
11. Frequency, duration and procedure for each CIP and chemicals used during each CIP.
12. Frequency, duration, procedure and chemicals for any other chemical cleaning procedures such as membrane manufacturer referenced EFM or chemical soaking.

At the end of Phase 2, a full recovery clean (CIP) and direct integrity test will be performed.

6.3.3 Phase 3 – Testing Membrane with Pretreatment Optimized and Membrane Operating Parameters Established from Phase 2

This phase includes testing the membrane unit under its optimum set of simulated, full-scale WTP design conditions that will be determined from the data collected in Phase 2 of the study. After conducting a CIP and direct integrity test, the membrane unit must be operated under its chosen full-scale plant design conditions for a period of not less than 30 days.

If at the end of Phase 3 of the study, the membrane unit has not fouled to a point where it requires a CIP, the engineer and COR may choose to continue Phase 3 of the study until the membrane unit's filtrate flux or TMP reaches unacceptable levels for full-scale WTP operation, or conduct a CIP procedure and direct integrity test and proceed to Phase 4 of the study.

If the membrane unit fouls to a point that a CIP is required prior to the end of the 30-day simulated, full-scale test period, a CIP procedure and direct integrity test will be conducted. At this time the engineer or COR may choose to restart this phase of the study using different pretreatment or membrane operating parameters, or continue the test until the required 30 days of operational testing is completed. The out of production time for the CIP procedure will be recorded from this phase and the CIP duration will be considered in the evaluation of the daily net production.

The pilot unit will run at steady-state with a steady feed water pre-treatment regimen for a period of 4 weeks. At the end of Phase 3, a full recovery clean (CIP) and direct integrity test will be performed.

6.3.4 Phase 4 – Determine Percent Loss of Original Specific Flux (Irreversible Fouling)

Phase 4 of the study will be conducted to determine the percent loss of original specific flux and if irreversible fouling has occurred. After conducting a CIP procedure and direct integrity test, the membrane unit will be operated under the same simulated full-scale WTP design conditions for a minimum of 10 days. The duration of this phase may be extended if the engineer and COR believe that additional time is needed to accurately determine if an undesirable percent loss of original specific flux or irreversible fouling has occurred under the selected operating parameters.

At the end of Phase 4, a full recovery clean (CIP) and direct integrity test will be performed.

7 Operational and Analytical Requirements

To determine the operational performance of the pilot, there are several parameters that are recorded at various frequencies. A list of operational parameters and their respective recording frequencies is provided in Table 4.

Table 4
Operation Recording Schedule

Parameter	Frequency
Permeate Flow	on-line / continuous
Feed Flow	on-line / continuous
Feed Water Temperature	on-line / continuous
Membrane Rack / Tank Inlet Pressure	on-line / continuous
Permeate Pressure	on-line / continuous
During Backpulse Vacuum or Pressure	on-line / continuous
Instantaneous Permeate Flux	on-line / continuous
Permeability	on-line / continuous
Recovery	on-line / continuous
Permeation Cycle Time	on-line / continuous
Backpulse Cycle Time	on-line / continuous

To characterize the analytical performance of the membrane system, raw, feed and permeate analytical sampling will be carried out on a regular basis. Sampling will be performed under stable conditions (i.e., once a set flux and recovery are established), and will follow the schedule presented in Table 5.

Table 5
Analytical Schedule

Parameter	Raw	Feed	Permeate
Turbidity	on-line	-	on-line
Particle Counts	on-line	-	on-line
pH	1/day	1/day	1/day
Total Hardness	1/week	1/week	1/week
Alkalinity	1/day	1/day	1/day
TSS	-	1/week	1/week
TDS	-	1/week	1/week
Total Iron	-	1/day	1/day
Dissolved Iron	-	1/day	1/day
Total Manganese	-	1/day	1/day
Dissolved Manganese	-	1/day	1/day
TOC/DOC	1/week	-	1/week
Color (apparent/true)	1/week	-	1/week
UV_{254}	1/day	-	1/day
Total coliform and E.coli	1/week	-	1/week
96-hour SDS TTHM and HAA5	-	-	1/week

Other parameters that will be recorded include the following:

- The type of chemicals being fed and their dosages along with the chemical injection and monitoring points.
- Hydrogen Peroxide residual in the feed water to the membrane process and in the membrane permeate and chlorite residual in the membrane permeate.
- The CIP, EFM and chemical soaking solutions pH, disinfectant residual and temperature levels.
- The backwash / backflush / reverse flow supply water's disinfectant residual and pH levels.
- The date, duration and amount of all rainfall events during the pilot study.

The study period will include at least one raw water turbidity spike associated with a major rainfall event or alternatively an artificial turbidity spike will be created.

Discharge (permeate and backwash water) from the pilot plant will be discharged to the lake. Discharge from chemical cleaning processes shall be collected and disposed of off-site in accordance with federal and state requirements. The total withdrawal from the lake will be less than 100,000 gallons per day for the pilot testing unit. The existing raw water withdrawal permit will accommodate the temporary pumping withdrawals from the river for the pilot plant operation.

8 Responsibilities

The following will be the responsibility of COR during the pilot study:

- Supplying electrical power at 480-volt, 60 Hz, 3-phase.
- Supplying a Wi-Fi network and internet access to the pilot.

The following is the responsibility of membrane manufacturer during the pilot study:

- Receiving the pilot unit on site.
- Providing a forklift or crane and operator for unloading the system from the shipping truck and the proper placement of the pilot unit and membranes near the associated utilities required for the pilot study.
- Installing fencing for security around the intake structure where the pilot plant will be located.
- Providing personnel to operate the pilot plant, including routine monitoring to verify that the pilot plant is operating, collecting water quality samples, maintaining chemical feed systems, and making adjustments to the pilot plant as necessary. Routine maintenance will be performed daily on the system. This includes checking the hoses, fittings, and valves for leaks. The water will be drained from the filter trap on the compressor on a daily basis especially in locations where high humidity is encountered.
- Collection, shipment, and laboratory analysis by a state certified laboratory of the raw, feed, and permeate water samples required for the pilot study. Laboratory tests will be paid for by the City.
- Reporting analytical results to the Engineer.
- Purchasing or supplying all pretreatment chemicals required for the pilot study. Recommendations on the type and concentration of chemicals will be the responsibility of the membrane manufacturer.
- Preparing the pilot unit and membranes for return shipment to the membrane manufacturer. A complete procedure for decommissioning the unit will be provided by the membrane manufacturer.
- Providing, delivering, and setting up the pretreatment unit and membrane pilot plant.
- Providing a shelter for the pilot plant equipment, instrumentation and controls.
- Providing an on-site technician for the startup of the system to commission the unit and complete preliminary tasks.
- Optimizing pretreatment and making recommendations on pretreatment chemical doses.
- Collecting data electronically and reporting the results to the Engineer on a weekly basis via e-mail.
- Providing replacement parts, for those items which can fail under normal operation. Maintenance or repair of the membrane pilot plant equipment during the pilot study will be performed by the membrane manufacturer.
- Providing cleaning chemicals for the membrane.

Failure of the System Manufacturer to demonstrate achieving the proposed design parameters (including but not limited to flux, TMP, percent recovery, cleaning frequency and minimum membrane integrity test pressure) or the treated water quality requirements as specified in the RFP shall require the System

Manufacturer to modify its proposed system and start the pilot test period over. All modifications required to be made to the full-scale Membrane System to achieve the design parameters and water quality requirements as specified in the RFP and as proposed shall be the sole responsibility of the System Manufacturer, at no additional cost to the Owner. These modifications could include, but are not limited to, providing additional membrane surface area and associated items to achieve the required operating conditions.

9 Membrane Cleaning

It will be necessary to carry out at least one recovery cleaning (CIP) during each phase of the pilot study to demonstrate procedures and establish the optimum cleaning conditions. Additional cleans may be recommended by the membrane manufacturer as the project proceeds.

The cleaning procedure will be as recommended by the membrane manufacturer. The membrane manufacturer's project manager will supply the procedure and training for the pilot system cleaning.

10 Membrane Integrity

Membrane integrity will be monitored daily throughout the pilot study using pressure decay tests (PDTs) and particle counts. The pressure decay test will consist of pressurizing the membrane system with clean air to a minimum pressure to achieve a 3-µm resolution to meet the recommended design criteria in the Membrane Filtration Guidance Manual, referenced by the LT2ESWTR. The PDT will be fully automated on the pilot unit and may be initiated remotely by the membrane manufacturer's project manager.

11 Reporting

A final report will be prepared based on the data collected from the entire pilot testing program, following completion of the entire pilot study.

APPENDIX K

Deliverables

Early Equipment Information Package (EEIP) Scope of Supply

To ensure consistency between drawings and other electronic documents produced by the Engineer and the System Manufacturer, the System Manufacturer shall comply with the standards for the Proposal and any subsequent design documentation, after negotiations and selection as defined in the RFP (Section 4.02).

Information included in the EEIP shall include, but not be limited to, the following items:

1. General arrangement drawings showing equipment dimensions and weights required for design of the equipment foundations by the Engineer, for all equipment included in the Membrane System scope of supply.

2. Membrane cassette support beam layout (if applicable).

3. Sizing requirements for all Membrane System piping within the treatment building including feed, backwash, cleaning, permeate, and air scour headers as applicable to the system. All piping connection points shall be identified and located on the drawings.

4. Cut sheets for equipment included in the Membrane System scope of supply indicating equipment dimensions, materials of construction, performance data, power requirements and control options.

5. Calculations and other background information to confirm sizing of membrane air scour blowers and air compressors. Provide estimate of number of compressor starts per hour.

6. Process and instrumentation diagrams (P&IDs) for equipment in the membrane system scope of supply. P&IDs shall clearly distinguish between System Manufacturer- and Contractor-supplied equipment and piping. If P&IDs show equipment not supplied by the System Manufacturer, that equipment shall be identified using the tag numbers established by the Engineer.

7. List of Input/Output (I/O) points for the Membrane System, including designation as status or control.

8. List of signals that can be provided to the plant control system for monitoring purposes. In general, the plant control system HMI graphics will duplicate the Membrane System HMI graphics with the exception of control capabilities. All signals being provided to the plant control system shall be via 100 Base-T Ethernet TCP/IP with Modbus/TCP protocol at the application layer.

9. Cut sheets for I&C components.

10. Contractor information package describing responsibilities of the Contractor during construction, installation, and startup of Membrane System Equipment. Include requirements for disposal of materials, system flushing requirements, checklists, etc. to clearly describe the scope of work of installation to the Contractor.

EEIP Submittals

To allow review and coordination of the design between the System Manufacturer and the Engineer, the System Manufacturer shall provide submittals for the Membrane System in several phases including:

1. Initial EEIP – includes deliverable items included in Items 1 through 6 above

2. Final EEIP – includes deliverable items included in the Initial EEIP and remaining Items 7 through 11 above

All EEIP submittals shall be provided to the Engineer by electronic submittal only.

Other Requirements

The following additional requirements shall be included as part of the EEIP:

1. Attendance by, as a minimum, a Project Manager and Process Engineer of the System Manufacturer at engineering coordination meetings throughout the EEIP phase at the Engineer's office, including but not limited to:

   a. A one-day kickoff meeting

   b. Up to two one-day progress meetings

   c. A one-day final coordination meeting

2. Attendance by an Instrumentation and Controls Engineer and an Electrical Engineer of the System Manufacturer is required for the kickoff meeting and for the final coordination meeting (one day each meeting).

3. Meeting times shall be 8:00 AM to 5:00 PM local time.

4. Coordination and correspondence with the Engineer by telephone and e-mail throughout the EEIP phase. This is in addition to the time required for attendance at engineering coordination meetings outlined above.

5. Review of drawings produced by the Engineer for coordination and placement of System Manufacturer-supplied equipment and instruments.

6. The System Manufacturer shall be available to coordinate a visit to the System Manufacturer's headquarters, if desired by the Engineer or the Owner.

Final Proposal

Following completion of the EEIP phase, a Final Proposal shall be submitted by the System Manufacturer. The Final Proposal shall include all deliverable items from the Final EEIP. It will be based on the final Scope of Supply agreed upon by the Engineer, the Owner, and the System Manufacturer. The Final Proposal will become part of the Bid and Contract Documents and will be provided to all parties purchasing bidding documents. The Final Proposal is subject to the following requirements:

1. An electronic version of the Final Proposal shall be provided (in .pdf, .tif or similar format acceptable to the Engineer), with permission to distribute with all bidding documents. Files shall be logically arranged in folders and shall be provided with readily identifiable file names.

Shop Drawings

The System Manufacturer shall provide complete and approvable sets of general shop drawings to the Engineer in accordance with the delivery schedule agreed upon by the Engineer, the Owner and the System Manufacturer. Shop drawings shall be coordinated, prepared, and submitted in accordance with Specification 01 33 23 and as called for by other Specifications included in Appendix L. The required number of copies of shop drawings shall be in accordance with Specification 01 33 23 unless otherwise agreed to by the Contractor and Engineer.

Shop drawings shall be considered approved for manufacturing when they are marked “No Exceptions Taken” or “Make Corrections Noted”, as defined in Specification 01 33 23. Shop drawings marked “Amend and Resubmit” or “Rejected” are not approved, will be returned to the System Manufacturer, and must be resubmitted. The System Manufacturer shall be responsible for the time required to revise and resubmit shop drawings returned for revisions.

The shop drawing Scope of Supply shall include but not be limited to the following items (hardcopy, except as noted):

1. Detailed shop drawings with mechanical, electrical, and instrumentation connection types and sizes shown and dimensioned.

2. Plan, section, detail drawings, as well as P&IDs of the Membrane System in hardcopy and electronic formats.

3. Assembly drawings and instructions, including general equipment layouts, required to assemble and erect the Membrane System by the Contractor.

4. Control system architecture diagram including the HMI, PLCs, and data highway. Provide proposed layouts and development of all HMI screens for control of the Membrane System. Provide a protocol gateway as required for communications to the plant control system. Provide control panel drawings including internal panel layout and front of panel.

5. For pumps, gates, valves, blowers, and compressors:

    a. Make, model, weight, power supply requirements, and horsepower of each equipment assembly.

    b. Complete catalog information, descriptive literature, specifications, and materials of construction. Seal, coupling, and bearing literature shall be included with the pump/blower information.

    c. Detailed mechanical drawings showing equipment dimensions, locations of connections and weights of associated equipment.

    d. Power and control wiring diagrams, including terminals and numbers.

    e. Complete motor nameplate data (as defined by NEMA), motor manufacturer, and any motor modifications.

6. Performance curves for pumps and blowers.

7. Make, weight, dimensions of CIP system tanks.

8. Make, model number and power requirements of heaters associated with the CIP system.

9. Installation information including mounting requirements, access, approximate weight of each major piece of equipment, and required conduit size.

10. Electronic copy of all PLC software, ladder logic for PLC(s), number and location of PLC(s), and I/O panels.

11. Electrical shop drawings and information:

    a. One-line diagram(s) including all transformers, drives, panel boards, meters, and protective devices.

    b. Diagrams of pre-wired panels including control devices and auxiliary devices.

    c. Wiring and control diagrams of systems and equipment.

    d. List of special motor features being furnished (i.e., space heaters, altitude corrections, and thermal protectors).

    e. Complete motor rating for all motors 15 HP and larger, including motor no-load, starting, and full-load current at rated voltage; full-load speed and full-load current at 100 percent voltage; motor efficiency and power factor at ½, ¾, and full load at rated voltage.

    f. Number and capacity of transformer(s), if any. List of any components that will run off power supply other than 480V, three-phase.

Other Submittals

The System Manufacturer shall provide the following items to the Contractor in accordance with the delivery schedule agreed upon by the Engineer, the Owner and the Manufacturer:

1. Executed warranties.

2. Draft operations and maintenance (O&M) manual in accordance with Specification 01 78 23 for all equipment in the Membrane System scope of supply.

3. Final O&M manual in accordance with Specification 01 78 23 and incorporating review comments from the draft O&M.

4. System Manufacturer's Certificate of Proper Installation.

5. Data summary from testing and start-up period.

6. List of all original equipment by model and part number (detailed bill of materials). List of component manufacturer names, addresses, and phone numbers.
7. Fully-annotated PLC ladder logic program. Provide both electronic and hardcopy formats.

APPENDIX L

Specifications

Section	Title
00 40 00	Proposal Form for Procurement Contracts
00 52 00	Agreement Between Buyer and Seller (to be completed after Proposal accepted)
00 70 00	General Conditions
01 21 26	Equipment Allowances
01 33 23	Shop Drawings, Product Data and Samples
01 42 00	Codes and Standards
01 43 33	Manufacturer Services
01 45 29	Testing Laboratory Services
01 61 16	General Equipment Stipulations
01 65 00	Transportation and Handling
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01 75 16	Starting of Systems
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01 78 36	Warranties and Bonds
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09 91 00	Painting
26 05 53	Electrical Identification
26 05 86	Motors
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40 91 00	Instrumentation Devices
40 94 43	Programmable Logic Controllers
40 95 00	Digital System Hardware
40 95 13	Control Panels
40 96 00	Digital System Software
43 00 00	Minimum Process Equipment Requirements

Note:

The specifications included in Appendix L are intended to provide the System Supplier guidance on the level of quality expected for equipment to be provided in the Scope of Services by the Membrane System Supplier, and by the General Contractor for construction of the water treatment plant. The specifications are not intended to be a comprehensive list of all items in the Scope of Services.

Part 3 of several of the specification sections includes both requirements for installation by the General Contractor and requirements for start-up field services by the System Supplier. Specifications for several sections, including motor control centers (MCC), are not required by the Scope of Services, but are intended to provide the System Supplier information regarding the type and capabilities of equipment that will be provided by the General Contractor to help ensure compatibility.

PROPOSAL FORM
FOR PROCUREMENT CONTRACTS

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

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and the

Construction Specifications Institute

Project # C6A01402 City of Oak Ridge Membrane WTP

NOTE:

EJCDC publications may be ordered from any of the three sponsoring organizations above and from CSI headquarters at 99 Canal Center Plaza, Suite 300, Alexandria VA 22314.

PROPOSAL FORM
PRESELECTED EQUIPMENT ALLOWANCE

Membrane System
City of Oak Ridge Membrane Water Treatment Plant

for

City of Oak Ridge
100 Woodbury Lane
Oak Ridge, TN 37830

TABLE OF ARTICLES

ARTICLE 1 - PROPOSAL RECIPIENT

1.01 This Proposal is submitted to the Engineer, Jacobs Engineering Group Inc. company

1.02 The undersigned Proposer proposes and agrees, if this Proposal is accepted, to enter into an Agreement with the Buyer in the form included in the Request for Proposal Documents to furnish the Goods and Special Services as specified or indicated in the Proposal Documents for the prices and within the times indicated in this Proposal and in accordance with the other terms and conditions of the Proposal Documents.

1.03 The Buyer of the Goods and Special Services will be the successful Bidder (Contractor) for the referenced Project.

ARTICLE 2 - PROPOSER'S ACKNOWLEDGMENTS

2.01 Proposer accepts all of the terms and conditions of the RFP. At the present time the City of Oak Ridge is applying for state and federal funding through the DWSRF and WIFIA Loan Programs, respectively. It is anticipated that bidding for the construction of the new WTP will take place in calendar year 2019, but the exact timing is dependent on funding. Therefore, the successful Bidder of the general construction project (Contractor/Buyer) will be given a Notice to Proceed by the Owner after confirmation of funding. The Proposal will remain subject to acceptance for 90 days after the date of the anticipated Notice to Proceed, or for such longer period of time that Proposer may agree to in writing upon request of Engineer or Buyer.

2.02 Proposer accepts the provisions of the Agreement as to liquidated damages in the event of its failure to furnish the Goods and Special Services in accordance with the schedule set forth in the Agreement.

2.03 As a condition of the Owner requiring the Proposer's Membrane System to be provided for this Project, the Proposer will be required to commence shop drawing preparation prior to execution of the Agreement between Buyer and Seller. Subsequent manufacturing of the system, based upon approved shop drawings, will occur only after execution of the Agreement between Buyer and Seller. Should the Agreement between the Buyer and Seller fail to be executed by the General Contractor, the Owner will be obligated to the Proposer to the extent indicated in the General Conditions included in this Request for Proposal, Article 11. The total maximum liability of the Owner to the Manufacturer will be the amount agreed to for shop drawing preparation.

ARTICLE 3 - PROPOSER'S REPRESENTATIONS

3.01 In submitting this Proposal, Proposer represents, as set forth in the Agreement, that:

A. Proposer has examined and carefully studied the Proposal Documents included with the Request for Proposal, other related data identified, and the following Addenda, receipt of all of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Proposer has become familiar with and is satisfied as to the local conditions that may affect cost, progress, delivery or the furnishing of Goods and Special Services.

C. Proposer is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of Goods and Special Services.

D. Proposer has carefully studied and correlated the information known to Proposer, and information and observations obtained from Proposer's visits, if any, to the Point of Destination with the Proposal Documents.

E. Proposer has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Proposer has discovered in the Proposal Documents, and the written resolution thereof by Engineer is acceptable to Proposer.

F. The Proposal Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Proposal is submitted.

G. Proposer further represents that this Proposal 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; Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or sham Proposal; Proposer has not solicited or induced any individual or entity to refrain from Proposal; and Proposer has not sought by collusion to obtain for itself any advantage over any other Proposer or over Buyer.

ARTICLE 4 - BASIS OF PROPOSAL

4.01 Proposer will furnish the Goods and Special Services in accordance with these Contract Documents for the following price(s), which do not include sales tax:

- $_____ Shop Drawing Preparation
- $_____ Manufacturing of Goods
- $_____ Special Services
- $_____ TOTAL Lump Sum

4.02 Additional Proposed Costs:

- $_____ The Seller's monthly fee for storage of Goods at Seller's facilities in the event that Buyer desires to delay shipment beyond the shipment date stated below in Article 5.02. Such fee shall include interest on money due Seller
- $_____ The Seller's monthly fee for Buyer delaying the initiation of manufacturing of Goods or for not executing the Procurement Agreement within the time specified in 4.03 below

4.03 Seller and Buyer shall execute the Procurement Agreement within 90 days after the Contractor's/Buyer's Notice to Proceed from the Owner. Should the Procurement Agreement not be executed within said 90 days due to the fault of the Buyer, the Buyer shall be subject to the prorated additional costs identified in Paragraph 4.02 above. Should the Procurement Agreement not be executed within the said 90 days due to the fault of the Seller, Seller shall be subject to the liquidated damages provisions in the Procurement Agreement. The issue of fault will be determined by the Engineer.

ARTICLE 5 - TIME OF COMPLETION

5.01 Proposer agrees that the furnishing of Goods and Special Services will conform to the schedules set forth below, which will be incorporated into Article 5 of the Agreement.

Time required by Seller to prepare approvable Shop Drawings: _____ consecutive calendar days after execution of the Agreement between the Buyer and Seller or after receipt of Letter of Intent from the Owner.

Time required by Seller after receipt of approved Shop Drawings to deliver all goods: _____ consecutive calendar days.

Time required to complete all Special Services: within _____ consecutive calendar days after notification from Buyer to Seller to commence such Special Services.

5.02 Proposer agrees that the prices in Article 4 above are based on the condition that shipment of goods may be delayed by the Buyer until TBD.

ARTICLE 6 – PROPOSAL DOCUMENTS

6.01 The following documents are attached to and made a condition of this Proposal:

A. Proposer's supporting data

6.02 The following documents are incorporated by reference as included in the Request for Proposal and as amended by addenda, if any:

A. Specifications: See Attachment A.

B. Drawings: See Attachment A.

ARTICLE 7 - DEFINED TERMS

7.01 The terms used in this Proposal have the meanings indicated in the General Conditions and the Supplementary Conditions. The significance of terms with initial capital letters is described in the General Conditions.

ARTICLE 8 - PROPOSAL SUBMITTAL

8.01 This Proposal submitted by:

If Proposer is:

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____
_____

Phone: _____ Facsimile: _____

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: _____ Facsimile: _____

Date of Qualification to do business is _____.

8.02 This Proposal is submitted this _____ day of _____, 20__

ATTACHMENT A

Specifications

Section	Title
00 40 00	Proposal Form for Procurement Contracts
00 52 00	Agreement Between Buyer and Seller (to be completed after Proposal accepted)
00 70 00	General Conditions
01 21 26	Equipment Allowances
01 33 23	Shop Drawings, Product Data and Samples
01 42 00	Codes and Standards
01 43 33	Manufacturer Services
01 45 29	Testing Laboratory Services
01 61 16	General Equipment Stipulations
01 65 00	Transportation and Handling
01 66 00	Storage and Protection
01 74 00	Cleaning and Waste Management
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01 78 36	Warranties and Bonds
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26 05 86	Motors
26 24 19	Low Voltage Motor Control Centers
26 29 23.13	Adjustable Speed Drives
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40 91 00	Instrumentation Devices
40 94 43	Programmable Logic Controllers
40 95 00	Digital System Hardware
40 95 13	Control Panels
40 96 00	Digital System Software
43 00 00	Minimum Process Equipment Requirements

Drawings

Number	Title
Figure 01	Preliminary Water Treatment Plant Site Plan
Figure 02	Preliminary Process Flow Diagram
Figure 03	Preliminary Hydraulic Profile

AGREEMENT BETWEEN BUYER AND SELLER FOR PROCUREMENT CONTRACTS

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

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TABLE OF ARTICLES

AGREEMENT

THIS AGREEMENT is between_____ *[Insert Company Name of Contractor]* ("Buyer") and *[Insert from "Proposal Form for Procurement Contracts"]* ("Seller").

Buyer and Seller, in consideration of the mutual covenants set forth herein, agree as follows:

ARTICLE 1 - GOODS AND SPECIAL SERVICES

1.01 Seller shall furnish the Goods and Special Services as specified or indicated in the Contract Documents. The Goods and Special Services to be furnished are described in Article 10 of this Agreement.

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Goods and Special Services to be provided under the Contract Documents may be the whole or only a part is generally described as follows: *Membrane System*.

ARTICLE 3 - ENGINEER

3.01 The Contract Documents for the Goods and Special Services have been prepared by Jacobs Engineering Group, Inc. who is hereinafter called Engineer and who is to assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the furnishing of Goods and Special Services.

ARTICLE 4 - POINT OF DESTINATION

4.01 The place where the Goods are to be delivered is defined in the General Conditions as the Point of Destination and is designated as: *proposed City of Oak Ridge Membrane Water Treatment Plant, 100 Woodbury Lane, Oak Ridge, Tennessee, 37830.*

ARTICLE 5 - CONTRACT TIMES

5.01 *Time of the Essence*

A. All time limits for Milestones, if any, the delivery of Goods and the furnishing of Special Services as stated in the Contract Documents are of the essence of the Contract.

5.02 *Days for Submittal of Shop Drawings*

A. All Shop Drawings and Samples required by the Contract Documents shall be submitted to the Buyer for Buyer's and for Engineer's review and approval within *[Insert Days from "Proposal Form for Procurement Contracts"]* days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions.

B. Within 21 days of receipt from the Seller,

1. Buyer shall review, approve and forward the Shop Drawings to the Engineer for review, or

2. Buyer shall review, disapprove and return the Shop Drawings to the Seller for resubmittal.

C. Buyer shall return Shop Drawings to the Seller within 7 days of receipt of reviewed Shop Drawings from the Engineer.

D. The time stated in paragraph 5.02.A. shall be the cumulative amount of time allowed the Seller for the preparation of approvable shop drawings, as a part of the initial submittal preparation plus resubmittal preparations, if any.

5.03 *Date for Delivery of Goods*

A. The Goods are to be delivered to the Point of Destination and ready for Buyer's receipt of delivery within a period of no more than *[Insert Days from "Proposal Form for Procurement Contracts"]* days after the date on which approved Shop Drawings are delivered to the Seller.

B. The cumulative amount of time allowed to the Seller for the preparation of approval Shop Drawings and Delivery of Goods is the sum of the days in paragraph 5.02 and paragraph 5.03.A. above. Unused time under one paragraph may be used to supplement the allowable time under the other paragraph.

C. Buyer may delay shipment of Goods until TBD.

5.04 *Days for Furnishing Special Services*

A. The furnishing of Special Services to Buyer will commence within 7 days after Buyer's written notice to Seller that Buyer is ready for such Special Services, and shall be completed within *[Insert Days from "Proposal Form for Procurement Contracts"]* days thereafter.

5.05 *Liquidated Damages*

A. Buyer and Seller recognize that time is of the essence of this Agreement and that Buyer may suffer financial loss if the Goods are not delivered at the Point of Destination and ready for receipt of delivery by Buyer within the times specified in Paragraph 5.03 above, plus any extensions thereof allowed in accordance with Article 7 of the General Conditions. The parties also recognize that the timely performance of services by others involved in the Project may be dependent upon Seller's specific compliance with the requirements of Paragraph 5.03. Further, they recognize the delays, expense and difficulties involved in proving the actual loss suffered by Buyer if complete acceptable Goods are not delivered on time. Accordingly, instead of requiring such proof, Buyer and Seller agree that as liquidated damages for delay (but not as a penalty) Seller shall pay Buyer __$2,000.00 for each day that expires after the time specified in Paragraph 5.03.B. for delivery of acceptable Goods (plus any extensions thereof). No liquidated damages can be assessed unless the cumulative time has been exceeded by the Seller. Such liquidated damages shall be the sole remedy in damages available to Buyer for any delay by Seller. The total amount of liquidated damages that can be assessed is the total Contract Price.

ARTICLE 6 - CONTRACT PRICE

6.01 Buyer shall pay Seller for furnishing the Goods and Special Services in accordance with the Contract Documents in current funds as follows:

6.02 Proposer will furnish the Goods and Special Services in accordance with these Contract Documents for the following price(s), which do not include sales tax:

$_____ Shop Drawing Preparation
$_____ Manufacturing of Goods
$_____ Special Services
$_____ TOTAL Lump Sum

6.03 Additional Costs:

A. $ _____ The Seller's monthly fee for storage of Goods at Seller's facilities in the event that Buyer desires to delay shipment beyond the agreed to shipment date. Such fee shall include interest on money due Seller

B. $ _____ The Seller's monthly fee for Buyer delaying the initiation of manufacturing of Goods or for not executing the Procurement Agreement within the time specified in 6.04 below

The amount of payment of Additional Costs in this Article 6.03 shall be prorated for the actual time impact.

6.04 Seller and Buyer shall execute this Procurement Agreement within 90 days after the Contractor's/Buyer's Notice to Proceed from the Owner. Should the Procurement Agreement not be executed within said 90 days due to the fault of the Buyer, the Buyer shall be subject to the additional costs identified in Article 6.03, Paragraph B above. Should the Procurement Agreement not be executed within the said 90 days due to the fault of the Seller, Seller shall be subject to the liquidated damages provisions in Article 5.05 above. The issue of fault will be determined by the Engineer.

6.05 Seller agrees that the prices in this Article 6 are based on the condition that shipment of goods may be delayed by the Buyer until the date stated in Article 5.03, Paragraph C above.

ARTICLE 7 - PAYMENT PROCEDURES

7.01 *Submittal and Processing of Payments.*

A. Seller shall submit Applications for Payment in accordance with Article 10 of the General Conditions. Applications for Payment will be processed by the Buyer and Engineer as provided in the General Conditions.

7.02 *Progress Payment; Retainage.*

A. Buyer shall make progress payments on account of the Contract Price on the basis of Seller's Applications for Payment as follows:

1. Upon receipt of the first Application for Payment submitted in accordance with Paragraph 10.01.A.1 of the General Conditions an amount equal to the cost of Shop Drawing preparation and cost of manufacturing of Goods, less any amounts retained by the Owner from the Buyer and less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

2. Upon receipt of the second and subsequent such Application for Payment in accordance with Paragraph 10.01.A.2 of the General Conditions, an amount sufficient to increase total payments to Seller by the amount of the costs for Special Services performed to date, less any amounts retained by the Owner from the Buyer and less such amounts as Engineer may determine in accordance with Paragraph 10.02.A.3 of the General Conditions.

3. No payment for Goods or Special Services shall be made until Goods are delivered to the Project Site.

7.03 *Final Payment*

A. Upon final completion of the delivery of the Goods and performance of all Special Services and upon receipt of the final Application for Payment in accordance with Paragraph 10.06 of the General Conditions, Buyer shall pay the remainder of the Contract Price, including retainage.

ARTICLE 8 - INTEREST

8.01 All monies not paid when due as provided in Article 10 of the General Conditions shall bear interest at the rate of six percent per annum.

ARTICLE 9 - SELLER'S REPRESENTATIONS

9.01 In order to induce Buyer to enter into this Agreement, Seller makes the following representations:

A. Seller has examined and carefully studied the Contract Documents and the other related data.

B. If specified or if, in Seller's judgment, any local condition may affect cost, progress or the furnishing of the Goods and Special Services, Seller has visited the Point of Destination and become familiar with and is satisfied as to the local conditions that may affect cost, progress or the furnishing of the Goods and Special Services.

C. Seller is familiar with and is satisfied as to all local federal, state and local Laws and Regulations that may affect cost, progress and the furnishing of the Goods and Special Services.

D. Seller has carefully studied and correlated the information known to Seller, and information and observations obtained from Seller's visits, if any, to the Point of Destination, with the Contract Documents.

E. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Seller.

F. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Special Services.

ARTICLE 10 - CONTRACT DOCUMENTS

10.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement;

2. General Conditions;

3. Specifications bearing the title of *City of Oak Ridge Membrane Water Treatment Plant* (not attached, see Attachment A for list of applicable sections);

4. Drawings bearing the title of *City of Oak Ridge Membrane Water Treatment Plant* (not attached, see Attachment A for list of applicable sheets);

5. Addenda (Numbers ____ to ____, inclusive)

6. Exhibits to this Agreement (enumerated as follows):

a. Seller's Proposal (pages ___ to ___, inclusive);

- (date) Letter (n pages)
- Proposal Form (n pages)
- Attachment B (n pages)

b. Documentation submitted by Seller prior to Notice of Award (pages __ to __, inclusive);

c. _____;

7. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

a. Written Amendment(s);

b. Change Order(s);

c. Field Order(s);

d. Engineer's Written Interpretation(s).

B. The documents listed in paragraph 10.01.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 10.

D. The Contract Documents may only be amended, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 11 - MISCELLANEOUS

11.01 *Defined Terms*

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

11.02 *Assignment*

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 Engineer and the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys 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.

11.03 *Successors and Assigns*

A. Buyer and Seller 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.

11.04 *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 Buyer and Seller. 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.

11.05 *Bonds*

A. Performance Bonds and Payment Bonds are not required.

IN WITNESS WHEREOF, Buyer and Seller have signed this Agreement in duplicate. One counterpart each has been delivered to Buyer and Seller. All portions of the Contract Documents have been signed or identified by Buyer and Seller or on their behalf.

This Agreement will be effective on _____ *[insert date]*.

Buyer: _____	Seller: _____
By: _____	By: _____
[Corporate Seal]	[Corporate Seal]
Attest: _____	Attest: _____
Address for giving notice:	Address for giving notice:
_____	_____
_____	_____
_____	_____
(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.)	Agent for service of process:
	_____
	_____
	_____
	(If Seller is a corporation or a partnership, attach evidence of authority to sign.)
Designated Representative:	Designated Representative:
Name: _____	Name: _____
Title: _____	Title: _____
Address: _____	Address: _____
Phone: _____	Phone: _____
Facsimile: _____	Facsimile: _____

ATTACHMENT A

Specifications

Section	Title
00 40 00	Proposal Form for Procurement Contracts
00 52 00	Agreement Between Buyer and Seller (to be completed after Proposal accepted)
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Number	Title
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Figure 02	Preliminary Process Flow Diagram
Figure 03	Preliminary Hydraulic Profile

STANDARD GENERAL CONDITIONS FOR PROCUREMENT CONTRACTS

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE
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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Whenever used in the Proposal Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to the singular or plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Those written or graphic instruments issued prior to the opening of Proposals in accordance with the Proposal Requirements which clarify or change the Proposal Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument signed by both Buyer and Seller covering the Goods and Special Services and which lists the Contract Documents in existence on the Effective Date of the Agreement.

3. *Application for Payment*--The form acceptable to Buyer which is used by Seller in requesting progress and final payments and which is accompanied by such supporting documentation as is required by the Contract Documents.

4. *Proposal*--An offer submitted on the prescribed form setting forth the prices for the Goods and Special Services to be provided.

5. *Proposer*--A person who submits a Proposal directly to Buyer.

6. *Proposal Documents*--The Request for Proposal and the proposed Contract Documents (including all Addenda).

7. *Proposal Requirements*--The Request for Proposals, Proposal Form, and any supplements.

8. *Buyer*--The person, public entity, or successful Bidder for the general construction Project purchasing the Goods and Special Services.

9. *Change Order*--A document recommended by Engineer which is signed by Seller and Buyer and authorizes an addition, deletion, or revision to the Contract Documents or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A written demand or assertion by Buyer or Seller seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract.

11. *Contract*--The entire and integrated written agreement between Buyer and Seller concerning the Goods and Special Services. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--Those items listed in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Unless specifically stated to the contrary in the Agreement, files in electronic media format of text, data, graphics, and the like are not Contract Documents, and may not be relied on by Buyer or Seller. Approved Shop Drawings and other Seller's submittals are not Contract Documents.

13. *Contract Price*--The moneys payable by Buyer to Seller for furnishing the Goods and Special Services in accordance with the Contract Documents as stated in the Agreement.

14. *Contract Times*--The times stated in the Agreement by which the Goods must be delivered and Special Services must be furnished.

15. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, intent, and character of the Goods and Special Services to be furnished by Seller.

16. *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.

17. *Engineer*--The person designated as such in the Agreement.

18. *Field Order*--A written order issued by Engineer which requires minor changes in the Goods or Special Services but which does not involve a change in the Contract Price or Contract Times.

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

20. *Goods*--The tangible and movable personal property that is described in the Contract Documents,

regardless of whether the property is to be later attached to realty.

21. *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.

22. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to the Contract Times.

23. *Point of Destination*--The specific address of the location where delivery of the Goods shall be made as stated in the Agreement.

24. *Project*--The total undertaking of which the Goods and Special Services to be provided under the Contract are a part.

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

26. *Seller*--The person furnishing the Goods and Special Services.

27. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods or Special Services.

28. *Special Services*--Services associated with the Goods to be furnished by Seller as required by the Contract Documents.

29. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the furnishing of the Goods and Special Services, and certain administrative details applicable thereto.

30. *Successful Proposer*--The responsible Proposer submitting a responsive Proposal which is in the best interest of the Owner as determined by the Owner, to whom Buyer makes an award.

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

35. *Written Amendment*--A written statement modifying the Contract Documents, signed by Buyer and Seller on or after the Effective Date of the Agreement and normally dealing with the administrative aspects of the Contract Documents.

1.02 *Terminology*

A. Intent of Certain Terms or Adjectives

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, 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 Goods or Special Services. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Goods or Special Services 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 furnishing of Goods or Special Services or any duty or authority to undertake responsibility contrary to any other provision of the Contract Documents.

2. 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.

3. The word "non-conforming" when modifying the words "Goods" or "Special Services", refers to Goods or Special Services that fail to conform to the Contract Documents.

4. The word "receipt" when referring to the Goods, shall mean the physical taking and possession by the Buyer under the conditions specified in Paragraph 8.01.B.3.

B. Day

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

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When Seller delivers the executed Agreements to Buyer, Seller also shall deliver such bonds as Seller may be required to furnish. Bonds, if any, will be identified in the Agreement.

2.02 *Copies of Documents*

A. Engineer shall furnish Seller up to one copy 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 Effective Date of the Agreement

2.04 *Designated Representatives*

A. Buyer and Seller shall each designate its representative at the time the Agreement is signed. Each representative shall have full authority to act on behalf of and make binding decisions in any matter arising out of or relating to the Contract.

2.05 *Before Starting Fabrication/Assembly of Goods*

A. *Seller's Review of Contract Documents:* Before commencing performance of the Contract, Seller shall carefully study and compare the Contract Documents and check and verify pertinent requirements therein and, if specified, all applicable field measurements. Seller shall promptly report in writing to Buyer and Engineer any conflict, error, ambiguity or discrepancy which Seller may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any work affected thereby.

2.06 *Progress Schedule*

A. Within 10 days after the Contract Times start to run, Seller shall submit to Buyer and Engineer an acceptable progress schedule of activities, including at a minimum, milestones, Contract Times, stages of the work, Shop Drawing and Sample submittal dates, review times, and fabrication times, tests, and deliveries as required by the Contract Documents.

B. The progress schedule will be acceptable to Buyer and Engineer if it provides an orderly progression of the submittals, tests, deliveries to completion within the specified Milestones and the Contract Times and it allows adequate review times for submittals (including resubmittals). Such acceptance will not impose on Buyer or Engineer responsibility for the progress schedule, for sequencing, scheduling, or progress of the work nor interfere with or relieve Seller from Seller's full responsibility therefor. Such acceptance shall not be deemed to acknowledge the reasonableness and attainability of the schedule.

2.07 *Preliminary Conference*

A. Within 20 days after the Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Paragraph 2.06.A., procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING

3.01 *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. In resolving inconsistencies among two or more components of the Contract Documents, precedence shall be given in the following order:

3.01.A.1. Written Amendments
3.01.A.2. Change Orders
3.01.A.3. Work Change Directives
3.01.A.4. ENGINEER's written interpretations and clarifications
3.01.A.5. Addenda
3.01.A.7. Agreement
3.01.A.8. General Conditions
3.01.A.9. Specifications Division 01
3.01.A.10. Specifications Division 02 – 17
3.01.A.11. Drawings
3.01.A.12. Proposal

Figure dimensions on Drawings will take precedence over scale dimensions. Detailed Drawings will take precedence over general Drawings.

B. 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 Buyer.

C. Clarifications and interpretations of, or notifications of minor variations and deviations in, the Contract Documents, will be issued by Engineer as provided in Article 9.

3.02 *Laws and Regulations, Standards, Specifications and Codes*

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

B. 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 Buyer 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 Buyer or Engineer, or any of their consultants, agents, or employees any duty or authority to supervise or direct the performance of Seller's obligations 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: If, during the performance of the Contract, Seller 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 Contract or of any standard, specification, manual or code, or of any instruction of any supplier, Seller shall promptly report it to Buyer in writing for Engineer's review. Seller shall not proceed with the furnishing of the Goods or Special Services affected thereby until an amendment to or clarification of the Contract Documents has been issued. Seller shall not be liable to Buyer or Engineer for failure to report any such conflict, error, ambiguity, or discrepancy unless Seller knew or reasonably should have known thereof.

B. Resolving Discrepancies: 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:

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

2. the provisions of any Laws or Regulations applicable to the furnishing of the Goods and Special Services (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Clarifying Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions to the Goods or Special Services or to modify the terms and conditions thereof by a Written Amendment or a Change Order.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Goods or Special Services not affecting Contract Price or Contract Times may be authorized, by a Field Order or Engineer's written interpretation or clarification.

ARTICLE 4 - BONDS AND INSURANCE

4.01 *Insurance*

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated here within.

B. Seller shall purchase and maintain such liability and other insurance as is appropriate for the furnishing of Goods and Special Services and as will provide protection from claims set forth below which may arise out of or result from Seller's furnishing of the Goods or Special Services and Seller's other obligations under the Contract Documents, whether the furnishing of Goods or Special Service, or other obligations are to be performed by Seller, any subcontractor or supplier, or by anyone directly or indirectly employed by any of them to furnish the Goods or Special Services, 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 Seller's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Seller'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 Seller, or (ii) by any other person for any other reason;

5. claims for damages, other than to the Goods, 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.

C. The policies of insurance so required by this Paragraph 4.02 to be purchased and maintained shall:

1. with respect to insurance required by Paragraphs 4.02.B.3 through 4.02.B.6.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) Buyer, Owner, Engineer, their consultants 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 coverages and be written for not less than the limits of liability provided below 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 5.09 and 12.02.

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 Buyer and Seller and to each other additional insured identified in these Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Seller pursuant to Paragraph 4.02.E will so provide);

6. remain in effect at least until final payment and at all times thereafter when Seller may be correcting, removing, or replacing non-conforming Goods in accordance with Paragraph 8.03; 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 Seller shall furnish Buyer and each other additional insured identified in these Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Buyer and any such additional insured of continuation of such insurance at final payment and one year thereafter).

D. The limits of liability for the insurance required by Paragraph 4.02.B shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers Compensation: Statutory

2. Seller's General Liability under Paragraphs 4.02.B.3 through B.6 which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Seller:

a. General Aggregate	$1,000,000.00
b. Products – Completed Operations Aggregate	$1,000,000.00
c. Personal and Advertising Injury	$1,000,000.00
d. Each Occurrence (Bodily Injury and Property Damage)	$1,000,000.00

3. Automobile Liabilities:

a. Bodily Injury:	
Each person	$1,000,000.00
Each Accident	$1,000,000.00
b. Property Damage:	
Each Accident	$1,000,000.00
c. Combined Single Limit of	$1,000,000.00

4. The Contractual Liability coverage shall provide coverage for not less than the following amounts:

a. Bodily Injury:	
Each Accident	$1,000,000.00
Annual Aggregate	$1,000,000.00
b. Property Damage:	
Each Accident	$1,000,000.00
Annual Aggregate	$1,000,000.00

E. Seller shall deliver to Buyer, with copies to each additional insured identified in these Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Buyer or any other additional insured) which Seller is required to purchase and maintain.

F. If Buyer has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained on the basis of non-conformance with the Contract Documents, Buyer shall notify Seller in writing within 10 days after receipt of the certificates or other evidence required by Paragraph 4.02.E. Seller shall provide such additional insurance.

ARTICLE 5 - SELLER'S RESPONSIBILITIES

5.01 *Supervision and Superintendence*

A. Seller shall be solely responsible for the means, methods, techniques, sequences, and procedures used in performing its obligations. Seller shall be responsible to see that the completed Goods and Special Services conform to the Contract Documents.

5.02 *Labor, Materials and Equipment*

A. Seller shall provide competent, qualified and trained personnel in all aspects of its performance of the Contract.

B. All equipment, products and material incorporated into the Goods shall be as specified, or if not specified, shall be new, of good quality and protected, assembled, used, connected, applied, cleaned and conditioned in accordance with the original manufacturer's instructions, except as otherwise may be provided in the Contract Documents.

5.03 *Compliance with Laws and Regulations, Standards, Specifications and Codes*

A. Seller shall comply with all Laws and Regulations applicable to the furnishing of the Goods and Special Services.

5.04 *Taxes*

A. Buyer shall be responsible for all sales and use taxes arising out of the purchase of the Goods and the furnishing of Special Services.

5.05 *Shop Drawings and Samples*

A. Seller shall submit Shop Drawings and Samples to Buyer for Buyer's and Engineer's review and approval in accordance with the schedule required in Paragraph 2.06.A. All submittals will be identified as required and furnished in the number of copies specified in the Contract Documents. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Buyer and Engineer the services, materials, and equipment Seller proposes to provide.

B. Where a Shop Drawing or Sample is required by the Contract Documents, any related work performed prior to Buyer's and Engineer's approval of the pertinent submittal will be at the sole expense and responsibility of Seller.

C. Submittal Procedures

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

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

b. that all materials are suitable with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the furnishing of Goods and Special Services.

2. Seller shall also have reviewed and coordinated each Shop Drawing or Sample with the Contract Documents.

3. Each submittal shall include a written certification from Seller that Seller has reviewed the subject submittal and confirmed that it is in compliance with the requirements of the Contract Documents. Both Buyer and Engineer shall be entitled to rely on such certification from Seller.

4. With each submittal, Seller shall give Buyer and Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both in a written communication separate from the submittal and by specific notation on each Shop Drawing or Sample.

D. Engineer's Review

1. Engineer will review and approve or disapprove Shop Drawings and Samples ENGINEER's review and approval or disapproval 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 approval or disapproval of Shop Drawings or Samples will be subject to the standard of Paragraph 1.02.A.1. Engineer's approval or disapproval will not relieve Seller from responsibility for any variation from the requirements of the Contract Documents unless Seller has in writing called Engineer's

attention to each such variation at the time of each submittal as required by Paragraph 5.06.C.1. 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.

E. Resubmittal Procedures

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

5.06 *Continuing Performance*

A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.06.A. and the Goods shall be delivered and the Special Services furnished within the Contract Times specified in the Agreement.

B. Seller shall carry on the work and adhere to the progress schedule during all disputes or disagreements with Buyer. No work shall be delayed or postponed pending resolution of any disputes or disagreements.

5.07 *Seller's Warranties and Guarantees*

A. Seller warrants and guarantees to Buyer that the title to the Goods conveyed shall be proper, its transfer rightful, and free from any security interest, lien, or other encumbrance.

B. Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Contract Documents, including any Samples approved by Buyer and Engineer, and the Goods will be of merchantable quality. Buyer and Engineer shall be entitled to rely on representation of Seller's written warranty and guarantee.

C. Seller's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, improper modification or improper maintenance or operation by persons other than Seller, or

2. normal wear and tear under normal usage.

D. Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Goods or Special Services that are non-conforming, or a release of Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents:

1. observations by Buyer or Engineer;

2. recommendation by Engineer or payment by Buyer of any progress or final payment;

3. use of the Goods by Buyer;

4. any acceptance by Buyer (subject to the provisions of Paragraph 8.02.D.1) or any failure to do so;

5. the issuance of a notice of acceptance by Buyer pursuant to the provisions of Article 8;

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

7. any correction of non-conforming Goods or Special Services by Buyer.

E. Buyer shall within a reasonable time notify Seller of any breach of Seller's warranties or guarantees. If Buyer receives notice of a suit or claim as a result of such breach, Buyer also may give Seller notice in writing to defend such suit or claim. If Seller fails to defend such suit or claim, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit.

5.08 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, shareholders, partners, employees, agents, consultants, contractors and subcontractors from any and all claims, costs, losses, and demands or judgments for damages for claims (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or relating to a negligent act or omission or the breach of any obligation under this Contract by Seller, or its officers, directors, shareholders, partners, employees, agents, consultants, contractors or subcontractors, or anyone for whom Seller is responsible, but only to the extent 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 Goods or Special Services themselves), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of Seller or any individual or entity directly or indirectly employed to furnish any of the Goods or Special Services or anyone for whose acts Seller 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. The indemnification obligations of Seller under paragraph 5.09.A shall not extend to the liability of Buyer, 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.

C. Not withstanding anything to the contrary in these contract Documents, Seller shall not be liable to the Buyer for any economic consequential damages, including but not limited to loss of profits, lost production, or lost business opportunity.

ARTICLE 6 - SHIPPING AND DELIVERY

6.01 *Shipping*

A. Seller shall select the carrier and bear all costs of packaging, transportation, insurance, special handling and any other costs associated with shipment and delivery.

6.02 *Delivery*

A. Seller shall deliver the Goods F.O.B. the Point of Destination in accordance with the Contract Times set forth in the Agreement, or other date agreed to by Buyer and Seller.

B. Seller shall provide written notice to Buyer at least 15 days before shipment of the manner of shipment and the anticipated delivery date. The notice shall also include any instructions concerning special equipment or services required at the Point of Destination to unload and care for the Goods. Seller shall also require the carrier to give Buyer at least 24 hours notice by telephone prior to the anticipated hour of delivery.

C. Buyer will be responsible and bear all costs for unloading the Goods from carrier.

D. Buyer will assure that adequate facilities are available to receive delivery of the Goods during the Contract Times set forth in the Agreement, or another date agreed by Buyer and Seller.

E. No partial deliveries shall be allowed, unless permitted or required by the Contract Documents or agreed to in writing by Buyer.

6.03 *Risk of Loss*

A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer's receipt of the Goods.

B. Notwithstanding the provisions of Paragraph 6.03.A, if Buyer rejects the Goods as non-conforming, the risk of loss on such Goods shall remain with Seller until Seller corrects the non-conformity or Buyer accepts the Goods.

ARTICLE 7 - CHANGES: SCHEDULE AND DELAY

7.01 *Changes in the Goods and Special Services*

A. Buyer may at any time, without notice to any surety, make changes in the Contract Documents within the general scope of the Contract.

B. If any such change or action by Buyer affects the Contract Price or Contract Times, Seller shall notify Buyer within 15 days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to Buyer within 30 days after such occurrence. If Seller fails to do so, Seller waives any Claim for such adjustment.

C. Seller shall not suspend performance while Buyer and Seller are in the process of making such changes and any related adjustments.

7.02 *Changes in Laws and Regulations*

A. Changes in Laws or Regulations which are not in effect and which are not known at the time of opening of Proposals (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of furnishing the Goods and Special Services shall be the subject of an adjustment in Contract Price or Contract Times. If Buyer and Seller 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 9.06.A.

B. Neither Buyer nor Seller shall be entitled to any damages arising from delays which are beyond the control of both Buyer and Seller, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, acts of war, acts of terrorism, direction by government authority, and other like matters.

7.03 *Changing Contract Price or Contract Times*

A. The Contract Price or Contract Times may only be changed by:

1. a Change Order;

2. a Written Amendment; or

3. a written unilateral order of Buyer, in which case Seller shall be entitled to an equitable adjustment in Contract Price or Contract Times for any reasonable and necessary costs or delays incurred by Seller to accommodate such a change.

B. If Seller is prevented from delivering the Goods or performing the Special Services within the Contract Times for any unforeseen reason beyond its control and not attributable to its actions or inactions, then Seller shall be entitled to an adjustment of the Contract Times to the extent attributable to such reason. Such reasons include fire, floods, epidemics, abnormal weather conditions, acts of God, acts of war, acts of terrorism, directions by government authority, and other like matters. If such an event occurs and delays Seller's performance, Seller shall notify Buyer in writing within 15 days of the beginning of the event causing the delay, stating the reason therefor.

C. Contract Times will not be modified for delays within the control of Seller, including transportation shortages or delays at Seller's facilities. Delays attributable to and within the control of Seller's subcontractors or suppliers shall be deemed to be delays within the control of Seller.

D. If Seller is prevented from delivering the Goods or furnishing the Special Services within the Contract Times due to the actions or inactions of Buyer, Seller shall be entitled to any reasonable and necessary additional costs arising out of such delay to the extent directly attributable to Buyer.

ARTICLE 8 - BUYER'S RIGHTS

8.01 *Inspections and Testing*

A. General

1. Buyer shall have the right to perform, or cause to be performed, reasonable inspections and require reasonable tests of the Goods at Seller's facility, and at the Point of Destination. Seller shall allow Buyer a reasonable time to perform such inspections or tests.

2. Seller shall bear all expenses, except for travel, lodging and subsistence expenses of Buyer's representatives, for inspections and tests at Seller's facility, but Buyer shall be entitled to reimbursement from Seller of travel, lodging and subsistence expenses of Buyer's representatives if the Goods are non-conforming.

3. Buyer shall bear all expenses, except for travel, lodging and subsistence expenses of Seller's representatives, for inspections and tests at the Point of Destination, but Buyer shall be entitled to reimbursement from Seller for Buyer's expenses for reinspection or retesting if, on the basis of an initial inspection or testing, the Goods are determined to be non-conforming.

4. Seller shall provide Buyer 30 days written notice of the readiness of the Goods for all inspections, tests, or approvals which the Contract Documents specify are to be observed by Buyer prior to shipment.

5. Buyer will give Seller timely notice of all specified tests, inspections and approvals of the Goods which are to be conducted at the Point of Destination.

6. If, on the basis of any inspections or testing, the Goods appear to be conforming, Buyer will give Seller prompt notice thereof. If on the basis of said inspections or testing, the Goods appear to be non-conforming, Buyer will give Seller prompt notice thereof and will advise Seller of the remedy Buyer elects under the provisions of Paragraph 8.02.

7. Neither payments made by Buyer to Seller prior to any tests or inspections, nor any tests or inspections shall constitute acceptance of non-conforming Goods, or prejudice Buyer's rights under the Contract.

B. Inspection on Delivery

1. Buyer will inspect the Goods upon delivery solely for purposes of identifying the Goods and general verification of quantities and observation of apparent condition in order to provide a basis for a progress payment. Such inspection will not be construed as final or as receipt of any Goods and Special Services that, as a result of subsequent inspections and tests, are determined to be non-conforming.

2. Within ten days of such inspection, Buyer shall provide Seller with written notice of Buyer's determination regarding conformity of the Goods. In the event Buyer does not provide such notice, it will be presumed that the Goods appear to be conforming.

3. If, on the basis of the inspection specified in Paragraph 8.01.B.1, the Goods appear to be conforming, Buyer's notice thereof to Seller will acknowledge receipt of the Goods.

C. Final Inspection

1. After all of the Goods have been incorporated into the Project, tested in accordance with such testing requirements as are specified, are functioning as intended, all Special Services are performed, the Project has completed all testing and is ready for final inspection, Buyer and Engineer will make a final inspection.

2. If, on the basis of the final inspection, the Goods are conforming, Buyer's notice thereof will constitute Buyer's acceptance of the Goods.

3. If, on the basis of the final inspection, the Goods are non-conforming, Buyer will identify the non-conformity in writing.

8.02 *Non-Conforming Goods or Special Services*

A. If, on the basis of inspections and testing prior to delivery, the Goods appear to be non-conforming, or if at any time after Buyer has acknowledged receipt of delivery and before the expiration of the correction period described in Paragraph 8.03, the Goods are non-conforming, Seller shall promptly, without cost to Buyer and in response to written instructions from Buyer, either correct such non-conforming Goods, or, if rejected by Buyer, remove and replace the non-conforming Goods with conforming Goods, including all work required for reinstallation.

B. Buyer's Rejection of Non-Conforming Goods

1. If Buyer elects to reject the Goods in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Goods. If Goods have been delivered to Buyer, Seller shall promptly, and within the Contract Times, remove and replace the rejected Goods.

2. Seller shall bear all costs, losses and damages attributable to the removal and replacement of the non-conforming Goods as provided in Paragraph 8.02.E.

3. Upon rejection of the Goods, Buyer retains a security interest in the Goods or to the extent of any payments made and expenses incurred in their testing and inspection.

C. Remedying Non-Conforming Goods or Special Services

1. If Buyer elects to permit the Seller to modify the Goods to remove the non-conformance, Seller shall promptly provide a schedule for such modifications and shall make the Goods conforming within a reasonable time.

2. If Buyer notifies Seller in writing that any of the Special Services are non-conforming, Seller shall promptly provide conforming services acceptable to Buyer. If Seller fails to do so, Buyer may delete the Special Services and reduce the Contract Price a commensurate amount.

D. Buyer's Acceptance of Non-Conforming Goods

1. Instead of requiring correction or removal and replacement of non-conforming Goods discovered either before or after final payment, Buyer may accept the non-conforming Goods. Seller shall bear all costs, losses, and damages attributable to Buyer's evaluation of and determination to accept such non-conforming Goods as provided in Paragraph 8.02.E.

E. Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, retesting and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods or Special Services, including the correction or removal and replacement of the non-conforming Goods and the replacement of property of Buyer and others destroyed by the correction or removal and replacement of the non-conforming Goods, or the obtaining of conforming Special Services from others.

8.03 *Correction Period*

A. Seller's responsibility for correcting all non-conformities in the Goods will extend for a period of one year after final acceptance of the Project or 18 months after delivery of Goods, whichever is sooner, or for such longer period of time as may be prescribed by Laws or Regulations or by the terms of any specific provisions of the Contract Documents.

ARTICLE 9 - ROLE OF ENGINEER

9.01 *Duties and Responsibilities*

A. The duties and responsibilities and the limitations of authority of Engineer are set forth in the Contract Documents.

9.02 *Clarifications and Interpretations*

A. Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents as Engineer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be binding on Buyer and Seller. If either Buyer or Seller believes that a written

clarification or interpretation justifies an adjustment in the Contract Price or Contract Times, either may make a Claim therefor.

9.03 *Authorized Variations*

A. Engineer may authorize minor deviations or variations in the Contract Documents by a Field Order.

9.04 *Rejecting Non-Conforming Goods and Special Services*

A. Engineer will have the authority to disapprove or reject Goods or Special Services which Engineer believes to be non-conforming.

9.05 *Decisions on Requirements of Contract Documents*

A. Engineer will be the initial interpreter of the Contract Documents and judge of the acceptability of the Goods and Special Services. Claims, disputes and other matters relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance will be referred initially to Engineer in writing with a request for a formal decision in accordance with this paragraph.

B. When functioning as interpreter and judge under this Paragraph 9.05, Engineer will not show partiality to Buyer or Seller 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 9.05 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 10.07) will be a condition precedent to any exercise by Buyer or Seller 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.

9.06 *Claims and Disputes*

A. Notice: Written notice of each Claim, dispute or other matter relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance shall be delivered by the claimant to Engineer and the other party to the Agreement within 15 days after the occurrence of the event giving rise thereto, and written supporting data will be submitted to Engineer and the other party within 30 days after such occurrence unless Engineer allows an additional period of time to ascertain more accurate data. Any opposing data shall be submitted by the other party to ENGINEER within 30 days after receipt of the claimant's written notice unless ENGINEER allows an additional period of time.

B. Engineer's Decision: Engineer will render a 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, or dispute, or other matter will be final and binding upon Buyer and Seller unless:

1. an appeal from Engineer's decision is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13; or

2. if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by Buyer or Seller 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 (unless otherwise agreed to in writing by Buyer and Seller), 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 9.06.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.

ARTICLE 10 - PAYMENT

10.01 *Applications for Progress Payments*

A. Seller shall submit to Buyer Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require. The timing and amounts of progress payments shall be as stipulated in the Agreement.

1. The first Application for Payment may be submitted only after receipt of the Goods has been acknowledged in accordance with Paragraph 8.01.B and will be accompanied by a bill of sale, invoice or other documentation satisfactory to Buyer warranting that Buyer has rightfully received good title to the Goods from Seller and that the Goods are free and clear of all liens. In the case of multiple deliveries of Goods, additional Applications for Payment accompanied by the required documentation will be submitted as Buyer acknowledges receipt of additional items of the Goods.

2. Subsequent Applications for Payment may be submitted after subsequent portions of the work have been completed, such as submission of Operations and Maintenance Manuals, Installation of Goods, testing, and placement into operation.

10.02 *Amount and Timing of Progress Payments*

A. The amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after receipt of each Application for Payment pay Seller the amount recommended; but, in the case of the Application for Payment upon Buyer's acknowledgment of receipt of the Goods, said 30-day period may be extended for so long as is necessary (but in no event more than 60 days) for Buyer to examine the bill of sale and other documentation submitted therewith. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

10.03 *Suspension of or Reduction in Payment*

A. Buyer may suspend or reduce the amount of progress payments, under the following circumstances:

1. Buyer has reasonable grounds to conclude that Seller will not furnish the Goods or the Special Services in accordance with the Contract Documents

Buyer has requested in writing assurances from Seller that the Goods or Special Services will be delivered or furnished in accordance with the Contract Documents, and Seller has failed to provide adequate assurances within ten days of Buyer's written request.

B. If Buyer refuses to make payment of the full amount requested, Buyer will provide Seller immediate written notice stating the reason for such action and promptly pay Seller any amount remaining after deduction of the amount withheld. Within 10 days after receipt of Buyer's written notice, Engineer shall advise Buyer and Seller in writing whether Engineer agrees with Buyer's state reason for withholding payment. If Engineer rejects Buyer's stated reason, Buyer shall immediately pay Seller the amount withheld. If Engineer agrees Buyer's Stated reason, Buyer shall promptly pay Seller the withheld amount upon Seller correcting the reason for such action, to Buyer's satisfaction. Buyer shall promptly pay Seller the amount withheld when Seller corrects the reason for such action to Buyer's satisfaction.

10.04 *Final Application for Payment*

A. After Seller has corrected all non-conformities, if any, to the satisfaction of Buyer and Engineer, furnished all Special Services, and delivered all documents required by the Contract Documents, Engineer will issue to Buyer a notice of acceptability. Seller may then make application for final payment following the procedure for progress payments. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents, a list of all unsettled claims and such other data and information as Buyer or Engineer may reasonably require.

10.05 *Final Payment*

A. If, on the basis of the review of the final Application for Payment and accompanying documentation, Engineer is satisfied that the Goods and Special Services have been furnished in accordance with the Contract Documents, and that Seller's other obligations under the Contract Documents have been fulfilled, Seller will present the Application to Buyer. If the Application and accompanying documentation are appropriate as to form and substance, Buyer shall, within 30 days after receipt thereof, pay Seller the amount due

10.06 *Waiver of Claims*

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

1. a waiver of all Claims by Buyer against Seller, except Claims arising from unsettled liens and Claims, arising from non-conformities in the Goods or Special Services appearing after final payment, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Seller's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Seller against Buyer other than those previously made in accordance with the requirements herein and expressly noted in writing by Seller as still unsettled in its final Application for Payment.

ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION

11.01 *Cancellation*

A. Buyer has the right to cancel the Contract, without cause, at any time prior to delivery of the Goods by written notice. Cancellation pursuant to the terms of this paragraph shall not constitute a breach of contract by Buyer. Upon cancellation:

1. Buyer shall pay Seller for Goods, specially manufactured for the Project, plus any documented reasonable direct and indirect costs incurred by Seller in

producing such Goods not recovered by payment for the reasonable value of the Goods.

2. For Goods which are not specially manufactured for the Project, Seller shall be entitled to a restocking charge of 10 percent of the unpaid Contract Price of such Goods.

11.02 *Suspension of Performance by Buyer*

A. Buyer has the right to suspend performance of the Contract, without cause, by written notice. Upon suspension under this paragraph, Seller shall be entitled to an increase in the Contract Times and Contract Price caused by the suspension, provided that performance would not have been suspended or delayed for causes attributable to Seller.

11.03 *Suspension of Performance by Seller*

A. Subject to the provisions of Paragraph 5.07.B, Seller may suspend the furnishing of the Goods and Special Services only under the following circumstance:

1. Seller has reasonable grounds to conclude that Buyer will not perform its future payment obligations under the Contract. ("Reasonable grounds" shall not include a pending dispute or disagreement with Buyer) and,

2. Seller has requested in writing assurances from Buyer that future payments will be made in accordance with the Contract, and Buyer has failed to provide such assurances within ten days of Seller's written request.

11.04 *Breach and Termination*

A. Buyer's Breach

1. Buyer shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including but not limited to:

a. wrongful rejection or revocation of Buyer's acceptance of the Goods,

b. failure to make payments in accordance with the Contract Documents, or

c. wrongful repudiation of the Contract.

2. Seller shall have the right to terminate the Contract for cause by declaring a breach should Buyer fail to comply with any material provisions of the Contract. Upon termination, Seller shall be entitled to all remedies provided by Laws and Regulations.

a. In the event Seller believes Buyer is in breach of its obligations under the Contract, Seller shall provide Buyer and Engineer with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Buyer shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Seller may grant in writing) within which to cure the alleged breach.

B. Seller's Breach

1. Seller shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including, but not limited to:

a. failure to deliver the Goods or perform the Special Services in accordance with the Contract Documents,

b. wrongful repudiation of the Contract, or

c. delivery or furnishing of non-conforming Goods or Special Services.

2. Buyer may terminate Seller's right to perform the Contract for cause by declaring a breach should Seller fail to comply with any material provision of the Contract Documents. Upon termination, Buyer shall be entitled to all remedies provided by Laws and Regulations.

a. In the event Buyer believes Seller is in breach of its obligations under the Contract, and except as provided in Paragraph 11.04.B.2.b, Buyer shall provide Seller and Engineer with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Seller shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure the alleged breach.

ARTICLE 12 - LICENSES AND FEES

12.01 *Intellectual Property and License Fees*

A. Unless specifically stated elsewhere in the Contract Documents, Seller is not transferring any intellectual property rights, patent rights, or licenses for the Goods delivered. However, in the event the Seller is manufacturing to Engineer's design, Engineer retains all intellectual property rights in such design.

B. Seller shall pay all license fees and royalties and assume all costs incident to the use or the furnishing of the

Goods, unless specified otherwise by the Contract Documents.

12.02 *Seller's Infringement*

A. Subject to Paragraph 12.01.A, Seller shall indemnify and hold harmless Buyer, Engineer, Owner and their officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (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 or alleged infringement of any United States or foreign patent or copyright by any of the Goods delivered hereunder.

B. In the event of suit or threat of suit for intellectual property infringement, Buyer will notify Seller within a reasonable time of receiving notice thereof.

C. Upon written demand from Buyer, Seller shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Seller shall have control over such claim or suit, provided that Seller agrees to bear all expenses and to satisfy any adverse judgment thereof.

1. If Seller fails to defend such suit or claim after written demand by Buyer, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit or claim.

2. If Buyer fails to provide Seller the opportunity to defend such suit or claim after written demand by Seller, Buyer shall be barred from any remedy against Seller for such suit or claim.

D. If a determination is made that Seller has infringed upon intellectual property rights of another, Seller may obtain the necessary licenses for Buyer's benefit, or replace the Goods and provide related design and construction as necessary to avoid the infringement at Seller's own expense.

12.03 *Buyer's Infringement*

A. Buyer shall indemnify and hold harmless Seller, and its officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (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 or alleged infringement of any United States or foreign patent or copyright caused by Seller's compliance with Buyer's design of the Goods or Buyer's use of the Goods in combination with other materials or equipment in any process (unless intent of such use was known to Seller and Seller had reason to know such infringement would result).

B. In the event of suit or threat of suit for intellectual property infringement, Seller must within a reasonable time after receiving notice thereof notify Buyer.

C. Upon written demand from Seller, Buyer shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Buyer shall have control over such claim or suit, provided that Buyer agrees to bear all expenses and to satisfy any adverse judgment thereof.

1. If Buyer fails to defend such suit or claim after written demand by Seller, Buyer will be bound in any subsequent suit or claim against Buyer by Seller by any factual determination in the prior suit or claim.

2. If Seller fails to provide Buyer the opportunity to defend such suit or claim after written demand by Buyer, Seller shall be barred from any remedy against Buyer for such suit or claim.

12.04 *Reuse of Documents*

A. Neither Seller nor any other person furnishing any of the Goods or Special Services under a direct or indirect contract with Seller shall: (1) 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 its consultants, including electronic media versions; or (2) reuse any of such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Buyer and Engineer and specific written verification or adaptation by Engineer. This prohibition will survive termination or completion of the Contract. Nothing herein shall preclude Seller from retaining copies of the Contract Documents for record purposes.

ARTICLE 13 - DISPUTE RESOLUTION

13.01 *Dispute Resolution Method*

A. Disputes between Buyer and Seller will be resolved as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of Paragraphs 9.05 and 9.06, Buyer and Seller may exercise such rights or remedies as they have under Controlling Law.

ARTICLE 14 - MISCELLANEOUS

14.01 *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.

14.02 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Point of Destination is located.

14.03 *Computation* of Time

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 shall be omitted from the computation.

14.04 *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.

14.05 *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 Goods or Special Services and termination or completion of the Agreement.

Part 1 General

1.01 Scope

A. The Contractor shall furnish and install the equipment identified in the Equipment Allowances. Equipment identified in the Equipment Allowances shall be subject to all provisions of these Specifications.

B. The Contractor, as Buyer, and the manufacturer, as Seller, shall both be bound by the scope of work for Goods and Special Services, schedules for performance, and the terms and conditions for the amounts included in the document entitled “Equipment Allowance Scope of Work”.

C. The Contractor and System Manufacturer (Seller) shall execute, without further negotiation, the Procurement Agreement between Buyer and Seller contained in the “Equipment Allowance Scope of Work”. Such execution shall occur within the time limits specified in said Procurement Agreement. Should the Contractor not execute the Procurement Agreement within the time limits specified due to the fault of the Contractor, the Contractor shall be subject to the prorated additional costs identified in the Procurement Agreement Article 6.03. Should the Procurement Agreement not be executed within the time limits specified due to the fault of the Seller, Seller shall be subject to the liquidated damages provisions in the Procurement Agreement Article 5.05. The issue of fault will be determined by the Engineer.

D. In the event of failure of manufacturer to perform, whether Goods, Special Services or schedule for such, the Contractor’s sole remedy shall be against the manufacturer under the terms and conditions of its procurement agreement with the manufacturer. The Owner and Engineer do not warrant the performance of the manufacturer.

1.02 Costs

A. The Contractor shall include, in the Bid Total, the Equipment Allowances specified in the Bid for the purchase of equipment which has been pre-selected by the Owner. These allowances shall cover the cost of the equipment and services, as specified in the indicated Specification Sections, and Freight-on-Board (FOB) Job Site.

B. The Contractor's applicable taxes, unloading, storage, handling, labor, installation, and overhead costs, plus profit and other expenses contemplated for the allowances shall be included in Item 1 of the Bid and not in the allowances.

C. If the terms and conditions of purchase of equipment and services differ from those given in these Contract Documents, then the Contractor shall include the cost of the differences in Item 1 of the Bid.

1.03 Adjustment of Costs

A. Should the final invoice amount from the equipment manufacturer be more or less than the specified amount of the allowance, the Contract will be adjusted by a change order.

Such adjustment shall be limited to the cost directly attributable to changes authorized by the Engineer and Owner for a change in scope, schedule or terms and conditions.

B. The amount of change order will not recognize any changes in unloading, storage, handling, labor, installation, and overhead costs, nor profit and other expenses caused by the adjustment of the final invoice amount. The change order will recognize changes in applicable taxes.

1.04 Documentation

Submit copies of new invoices from the equipment manufacturer with each periodic payment request.

1.05 Schedule of Equipment Allowances

Membrane System: Allow the amount specified in the Bid for equipment and services provided by [Insert the Name of the Manufacturer, not the local representative] as identified in the Equipment Scope of Work.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes submittal to the Engineer of shop drawings, product data and samples required by the various Sections of these Specifications.

B. Submittal Contents: The submittal contents required are specified in each Section.

C. Definitions: Submittals are categorized as follows:

1. Shop Drawings:

a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.

b. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note dimensions that are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final “Action” markings by the Engineer.

c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, Specification Section, schedule or room numbers shown on the Contract Drawings.

d. Minimum assembly drawings sheet size shall be 22 x 34-inches.

e. Minimum detail sheet size shall be 8-1/2 x 11-inches.

f. Minimum Scale:

i. Assembly Drawings Sheet, Scale: 1-inch = 30 feet.

ii. Detail Sheet, Scale: 1/4-inch = 1 foot.

2. Product Data:

a. Product data includes standard printed information on materials, products and systems, not specially prepared for this Project, other than the designation of selections from among available choices printed therein.

b. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.

3. Samples:

a. Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.

b. Provide units identical with final condition of proposed materials or products for the work. Include “range” samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and “kind” by the Engineer. Engineer will note “test” samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.

4. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work but not processed as shop drawings, product data or samples.

1.02 Specific Category Requirements

A. General: Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal. Submittals shall contain:

1. The date of submittal and the dates of any previous submittals.

2. The Project title.

3. Numerical submittal numbers, starting with 1.0, 2.0, etc. Revisions to be numbered 1.1, 1.2, etc.

4. The Names of:

    a. Contractor

    b. Supplier

    c. Manufacturer

5. Identification of the product, with the Specification Section number, permanent equipment tag numbers and applicable Drawing No.

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the work or materials.

8. Applicable standards, such as ASTM or Federal Specification numbers.

9. Notification to the Engineer in writing, at time of submissions, of any deviations on the submittals from requirements of the Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8 x 3-inch blank space for Contractor and Engineer stamps.

12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the work and of Contract Documents.

13. Submittal sheets or Drawings showing more than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out.

1.03 Routing of Submittals

A. Submittals and routine correspondence shall be routed as follows:

1. Supplier to Contractor (through representative if applicable)

2. Contractor to Engineer

3. Engineer to Contractor and Owner

4. Contractor to Supplier

Part 2 Products

2.01 Shop Drawings

A. Unless otherwise specifically directed by the Engineer, make all shop drawings

accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

B. Submit all shop assembly drawings, larger than 11 x 17-inches, in the form of one reproducible transparency with two opaque prints or bluelines.

C. Submit all shop drawings, 11 x 17-inches and smaller, in the form of six opaque prints or bluelines.

D. One reproducible for all submittals larger than 11 x 17-inches and no more than three prints of other submittals will be returned to the Contractor.

2.02 Manufacturer's Literature

A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Engineer's review.

B. Submit the number of copies which are required to be returned (not to exceed three) plus three copies which will be retained by the Engineer.

2.03 Samples

A. Samples shall illustrate materials, equipment or workmanship and established standards by which completed work is judged.

B. Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article proposed to be furnished.

C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Engineer.

2.04 Colors

A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.

B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

Part 3 Execution

3.01 Contractor's Coordination of Submittals

A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:

1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.

2. Coordinate as required with all trades and all public agencies involved.

3. Submit a written statement of review and compliance with the requirements of all applicable technical Specifications as well as the requirements of this Section.

4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.

B. Each and every copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.

C. The Owner may backcharge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a “No Exceptions Taken” mark.

D. Grouping of Submittals:

1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items.

2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Engineer along with Contractor's comments as to compliance, non-compliance or features requiring special attention.

E. Schedule of Submittals:

1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and some time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.02 Timing of Submittals

A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.

B. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal.

3.03 Reviewed Shop Drawings

A. Engineer Review:

1. Allow a minimum of 30 days for the Engineer's initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the work, and therefore the work would be expedited if processing time could be foreshortened.

2. Acceptable submittals will be marked “No Exceptions Taken”. A minimum of three copies will be retained by the Engineer for Engineer's and the Owner's use and the remaining copies will be returned to the Contractor.

3. Submittals requiring minor corrections before the product is acceptable will be marked “Make Corrections Noted”. The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked “No Exceptions Taken” prior to installation or use of products.

4. Submittals marked “Amend and Resubmit” must be revised to reflect required changes and the initial review procedure repeated.

5. The “Rejected - See Remarks” notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.

6. Only two copies of items marked “Amend and Resubmit” and “Rejected - See Remarks” will be reviewed and marked. One copy will be retained by the Engineer and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.

B. No work or products shall be installed without a drawing or submittal bearing the “No Exceptions Taken” notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer's stamp.

C. Substitutions: In the event the Contractor obtains the Engineer's approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.

D. Use of the “No Exceptions Taken” notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for

errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.04 Resubmission Requirements

A. Shop Drawings:

1. Revise initial Drawings as required and resubmit as specified for initial submittal, with the resubmittal number shown.

2. Indicate on Drawings all changes which have been made other than those requested by the Engineer.

B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with the resubmittal number shown.

END OF SECTION

Part 1 General

1.01 Description

A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.

B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.

C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.

D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.

E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.02.

1.02 Standard Organizations

A. Piping and Valves

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute
MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
Uni-Bell	PVC Pipe Association

B. Materials

AASHTO	American Association of State Highway and Transportation Officials

ANSI American National Standards Institute
ASTM American Society for Testing and Materials

C. Painting and Surface Preparation

NACE National Association of Corrosion Engineers
SSPC Steel Structures Painting Council

D. Electrical and Instrumentation

AEIC Association of Edison Illuminating Companies
AIEE American Institute of Electrical Engineers
EIA Electronic Industries Association
ICEA Insulated Cable Engineers Association
IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronic Engineers
IES Illuminating Engineering Society
IPC Institute of Printed Circuits
IPCEA Insulated Power Cable Engineers Association
ISA ISA – The Instrumentation, Systems, and Automation Society
NEC National Electric Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
REA Rural Electrification Administration
TIA Telecommunications Industries Association
UL Underwriter's Laboratories
VRCI Variable Resistive Components Institute

E. Aluminum

AA Aluminum Association
AAMA American Architectural Manufacturers Association

F. Steel and Concrete

ACI American Concrete Institute
AISC American Institute of Steel Construction, Inc.
AISI American Iron and Steel Institute
CRSI Concrete Reinforcing Steel Institute
NRMA National Ready-Mix Association
PCA Portland Cement Association
PCI Prestressed Concrete Institute

G. Welding

ASME American Society of Mechanical Engineers
AWS American Welding Society

H. Government and Technical Organizations

AIA American Institute of Architects

APHA	American Public Health Association
APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
CFR	Code of Federal Regulations
CSI	Construction Specifications Institute
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FmHA	Farmers Home Administration
FS	Federal Specifications
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

I. General Building Construction

AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AITC	American Institute of Timber Construction
APA	American Parquet Association, Inc.
APA	American Plywood Association
BHMA	Builders Hardware Manufacturers Association
BIFMA	Business and Institutional Furniture Manufacturers Association
DHI	Door and Hardware Institute
FM	Factory Mutual Fire Insurance Company
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
IME	Institute of Makers of Explosives
ISANTA	International Staple, Nail and Tool Association
ISDSI	Insulated Steel Door Systems Institute
IWS	Insect Screening Weavers Association
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAGDM	National Association of Garage Door Manufacturers
NCCLS	National Committee for Clinical Laboratory Standards
NFPA	National Fire Protection Association
NFSA	National Fertilizer Solutions Association

NKCA	National Kitchen Cabinet Association
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
RMA	Rubber Manufacturers Association
SBC	SBCC Standard Building Code
SDI	Steel Door Institute
SIA	Scaffold Industry Association
SMA	Screen Manufacturers Association
SPRI	Single-Ply Roofing Institute
TCA	Tile Council of America
UBC	Uniform Building Code

J. Roadways

AREA	American Railway Engineering Association
DOT	Department of Transportation

K. Plumbing

AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

L. Refrigeration, Heating, and Air Conditioning

AMCA	Air Movement and Control Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
HEI	Heat Exchange Institute
IIAR	International Institute of Ammonia Refrigeration
NB	National Board of Boilers and Pressure Vessel Inspectors
PFMA	Power Fan Manufacturers Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMC	SBCC Standard Mechanical Code
TEMA	Tubular Exchangers Manufacturers Association

M. Equipment

AFBMA	Anti-Friction Bearing Manufacturers Association, Inc.
AGMA	American Gear Manufacturers Association
ALI	Automotive Lift Institute
CEMA	Conveyor Equipment Manufacturers Association
CMAA	Crane Manufacturers Association of America
DEMA	Diesel Engine Manufacturers Association
MMA	Monorail Manufacturers Association

OPEI	Outdoor Power Equipment Institute, Inc.
PTI	Power Tool Institute, Inc.
RIA	Robotic Industries Association
SAMA	Scientific Apparatus Makers Association

1.03 Symbols

Symbols and material legends shall be as scheduled on the Drawings.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section defines the minimum scope of services to be provided by the Contractor during installation, start-up, operating test period, and operator training using factory representatives of the manufacturers of the equipment provided.

B. Furnish all labor, materials, tools, equipment, and services for the cleaning up or preparation of all equipment which is required in conjunction with the instruction work to be performed for the Owner's personnel.

C. Perform additional instruction of the Owner's personnel for any and all items of work that are incomplete at the time initial instruction sessions are scheduled.

D. Although such work may not be explicitly specifically indicated elsewhere, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, and to provide instructions upon the functions of that installation.

E. Provide instruction for all equipment and systems for which operating and maintenance data is required.

F. Instruction sessions may be combined to some extent between several pieces of similar equipment within the same training session, but only if that combination is defined in the Contractor's instruction program submittal and approved by the Engineer.

G. One instruction session for each major type of equipment will be required. The Contractor shall anticipate that up to ten of the Owner's employees will participate in any particular instruction session, and shall be prepared to provide the required number of handouts, manuals, and tools for each session.

1.02 Qualification

A. Qualification of the manufacturer's representatives for installation, start-up, and operator training purposes shall be appropriate for the equipment being installed. Manufacturer's representatives shall be subject to the approval of the Engineer. Where equipment has significant process complexity, furnish the services of an engineering personnel, knowledgeable in the process involved and the function of the equipment.

B. References in various equipment sections of the terms "factory representative" or "field representative" shall mean an employee of the equipment manufacturer who is completely knowledgeable of the manufacturing, installation, operation and maintenance of the equipment. A sales representative does not qualify, unless it is documented that they have been specifically trained by the Manufacturer. Any field or factory representative not an active employee of the manufacturer must provide

documentation from the manufacturer stating that the individual, by name, has been formally trained in the installation, operation and maintenance of the equipment and is authorized to make the required certification to perform the required services.

1.03 Submittals

A. No later than ninety days prior to scheduled Substantial Completion of the Work, the Contractor shall submit a list of proposed instruction sessions for the entire Project. This list shall be organized by Specification Section and its contents will be subject to the approval of the Engineer and Owner.

B. After approval of the list of the proposed instruction sessions and no later than sixty days prior to the scheduled Substantial Completion of the Work, submit course outlines and training material for each of the approved instruction sessions. Outlines shall be organized by Specification Section, and their contents shall be subject to the approval of the Engineer.

C. After approval of the program content, the Contractor shall submit a proposed schedule for each of the approved instruction sessions which are to be organized by Specification Section, and the scheduled dates will be subject to the approval of the Engineer.

D. Submit a separate instruction request/report (form attached) for each system or type of equipment, subject to the Owner's approval of availability of personnel.

1. Submit request/report with preliminary information indicated, to the Engineer at least two weeks prior to first instruction period.

2. After each instruction session, submit three copies of the completed report to the Engineer.

1.04 Coordination

A. Do not begin instructions until component assembly or system has been tested as specified in Section 01 75 16 and is in satisfactory operating condition.

B. Prior to instruction sessions, assemble instructional aids, tools, test equipment, and any necessary copies of Operations and Maintenance Manuals.

C. All instruction sessions shall be planned and scheduled such that the Owner's participants will utilize copies of the Project Operations and Maintenance Manuals which will have been previously provided. These copies are in addition to the quantities which have to be provided to the Owner under Section 01 78 23. The use of draft copies of these manuals will be acceptable.

D. The Contractor shall schedule and coordinate the visits of factory representatives during installation, start-up and operator training in accordance with the requirements of Section 01 75 16 of these Specifications.

E. The Contractor shall notify the Engineer 72 hours prior to any impending visit by factory representatives so that the Engineer can be present.

1.05 Installation, Start-Up, and Testing Services

The Contractor shall furnish the services of a factory representative to provide the Pre-Start-Up Maintenance, Installation, Inspection, Functional Testing, and Operational Testing in accordance with Section 01 75 16 and the equipment sections of these Specifications.

1.06 Operator Training Services

A. Provide all instruction as required to ensure understanding of all operating and maintenance procedures by the Owner designated personnel.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems. Provide all necessary instruction to satisfaction of the Owner.

C. Explain use of Operating and Maintenance Manuals.

D. Tour building areas involved and identify:

1. Maintenance and access points.

2. Control locations and control equipment.

E. Explain operating sequences:

1. Identify location and show operation of switches, valves, etc., used to start, stop, and adjust systems.

2. Explain use of flow diagrams, operating sequences, diagrams, etc.

3. Demonstrate operation through complete cycle(s) and full range of operation in all modes, including testing and adjusting relevant to operation.

F. Explain use of control equipment, including temperature settings, switch modes, available adjustments, reading of gauges, and functions that must be serviced only by authorized factory representative.

G. Explain trouble shooting procedures:

1. Demonstrate commonly occurring problems.

2. Note procedures which must be performed by factory personnel.

H. Explain maintenance procedures and requirements:

1. Point out items requiring periodic maintenance.

2. Demonstrate typical preventive maintenance procedures and recommend typical maintenance intervals.

3. Demonstrate other commonly occurring maintenance procedures not part of preventive maintenance program.

4. Identify maintenance materials to be used.

I. Furnish all tools and/or test equipment required for proper instruction of the Owner's personnel. Tools and/or test equipment shall be distributed in "sets" with each two participants having a "set" to work with and retain upon completion of the instruction. Each participant shall sign for their tools at the start of the instruction session, and copies of the assignment documents shall be provided to the Construction Manager by the Contractor.

J. Thirty-day operating period after start-up: The manufacturers' representative for each piece of equipment shall return to the Project site 30 days after successful completion of the operating test to review the equipment performance, correct any equipment problems, and conduct follow-up operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of manufacturer's representative prior to and during equipment start-up. At this time, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the certification is accepted by the Engineer and Owner, the warranty period for that piece of equipment shall be considered to have begun as of the start-up date. If the equipment is operating incorrectly, the factory representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful 30 days operating period. At the conclusion of that period, the warranty start date will be decided upon by the Owner.

K. Six month operating period after start-up: The manufacturer's representative for each piece of equipment shall return to the Project site six months after the successful completion of the operating test to review the equipment performance, correct any equipment problems, and conduct follow-up operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of manufacturer's representative prior to and during equipment start-up. At the time of this trip, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the service representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful 30-day operating period after problems are corrected.

1.07 Documentation

A. The Contractor shall provide for the services of an experienced professional audio-visual firm to record all operators instruction(s), training sessions, and seminar(s), both initial and follow-up sessions. The Contractor shall fully inform all subcontractors, suppliers, and manufacturers of the requirement prior to award of any subcontracts. To the greatest extent possible, the training sessions and corresponding videos shall

be conducted and documented individually by equipment type.

B. Contractor shall submit a draft copy of the DVD and log to the Engineer for review prior to making copies of the training sessions. DVD will be reviewed for sound, lighting, and tape quality.

C. Once approved, Contractor shall provide the Owner eight copies of the DVD for each occasion and/or each piece of equipment. The DVDs shall be properly labeled and logged as per its contents.

D. Copies shall be in the DVD(-R) format.

END OF SECTION

EQUIPMENT AND SYSTEMS INSTRUCTION REPORT

PROJECT: ____________________

SYSTEM OR EQUIPMENT: ____

CONTRACTOR NAME: ______________ CONTRACT NO. ______

SPECIFICATION SECTION

NOTE: The Contractor's Representative must maintain and complete this report during instruction.

____

PRELIMINARY INFORMATION

1. To be completed by the Contractor:

   A. Proposed dates for instruction period: From ______________________ To __________________

   B. Name of Representative Instructor: ____

   C. Approximate number of hours of training required: _____________________________________

2. To be completed by the Owner:

   A. Owner's Designated Personnel to receive instruction: (Identify supervisor, if required).

   1) ______________________________ 6) ______________________________
   2) ______________________________ 7) ______________________________
   3) ______________________________ 8) ______________________________
   4) ______________________________ 9) ______________________________
   5) ______________________________ 10) ______________________________

   B. Training Session Location: ____
   ____

- -

RECORD INFORMATION (To be Completed after Instruction Session)

Instructor's Signature: ________________________________ Date Instruction Completed: _______________

Construction Managers Signature: ____________________________

Owners Signature: ____

SPECIAL CONSIDERATIONS/NOTES:

____
____
____
____

Part 1 General

1.01 Scope

A. This Section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.

B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these Specifications, i.e., concrete strength and slump testing, soil compaction, etc.

C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer, e.g., testing of pipe.

D. The testing laboratory or laboratories will be selected by the Owner. The testing laboratory or laboratories will work for the Owner.

1.02 Payment for Testing Services

A. The cost of testing services required by the Contract to be provided by the Contractor shall be paid for by the Owner through the CASH ALLOWANCE, i.e., concrete testing, soil compaction, and asphalt testing.

B. The cost of additional testing services not specifically required in the Specifications, but requested by the Owner or Engineer, shall be paid for by the Owner through the CASH ALLOWANCE.

C. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.

D. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.03 Laboratory Duties

A. Cooperate with the Owner, Engineer, and Contractor.

B. Provide qualified personnel promptly on notice.

C. Perform specified inspections, sampling and testing of materials.

1. Comply with specified standards, ASTM, other recognized authorities, and as specified.

2. Ascertain compliance with requirements of the Contract Documents.

D. Promptly notify the Engineer and Contractor of irregularity or deficiency of work which are observed during performance of services.

E. Promptly submit three copies (two copies to the Engineer and one copy to the Contractor) of report of inspections and tests in addition to those additional copies required by the Contractor with the following information included:

1. Date issued

2. Project title and number

3. Testing laboratory name and address

4. Name and signature of inspector

5. Date of inspection or sampling

6. Record of temperature and weather

7. Date of test

8. Identification of product and Specification section

9. Location of Project

10. Type of inspection or test

11. Results of test

12. Observations regarding compliance with the Contract Documents

F. Perform additional services as required.

G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the work.

1.04 Contractor Responsibilities

A. Cooperate with laboratory personnel, provide access to work and/or manufacturer's requirements.

B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.

C. Furnish copies of mill test reports.

D. Furnish required labor and facilities to:

1. Provide access to work to be tested;

2. Obtain and handle samples at the site;

3. Facilitate inspections and tests;

4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.

E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.

F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.

G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.05 Quality Assurance

Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.06 Product Handling

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the work.

1.07 Furnishing Materials

The Contractor shall be responsible for furnishing all materials necessary for testing.

1.08 Code Compliance Testing

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.09 Contractor's Convenience Testing

Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 Schedules for Testing

A. Establishing Schedule:

1. The Contractor shall, by advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.

2. Provide all required time within the construction schedule.

B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner.

1.11 Taking Specimens

Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 Transporting Samples

The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

END OF SECTION

Part 1 General

1.01 Scope

These general equipment stipulations apply, in general, to all equipment and piping. They supplement the detailed equipment Specifications, but in case of conflict, the detailed equipment Specifications shall govern.

1.02 Coordination

The Contractor shall assume full responsibility for the coordination of the installation of all equipment, materials and products furnished under these Contract Documents. The Contractor shall be completely responsible for verification that all structures, piping and equipment components furnished by the Contractor and/or subcontractors and suppliers are compatible. The Contractor shall start-up each equipment system and shall make all necessary alterations. All such alterations shall be made at the Contractor's expense.

1.03 Unit Responsibility

Equipment manufacturers assigned unit responsibility for systems comprised of several components shall be responsible for furnishing a complete system in accordance with the requirements of these Specifications. The manufacturer shall be responsible for all coordination between component manufacturers and shall provide all submittals, installation and start-up services and certifications on the system as a unit.

1.04 Adaptation and Location of Equipment

A. No responsibility for alteration of a planned structure to accommodate other types of equipment will be assumed by the Owner. Equipment which requires alteration of the structures will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. All such alterations shall be made at the Contractor's expense.

B. The Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork and appurtenances be as neatly installed with adequate space for maintenance and passage of personnel.

1.05 Equipment Warranty

The Contractor shall warrant all equipment against faulty or inadequate design, improper assembly or erection, defective materials, breakage or other failure. The warranty period shall be defined in Section 01 78 36 of these Specifications.

1.06 Workmanship and Materials

A. All equipment shall be designed, fabricated and assembled in accordance with the most modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall be new and shall not have been in service at any time prior to delivery, except as required by tests.

B. Materials shall be suitable for service conditions. Iron castings shall be tough, close grained, gray iron free from blowholes, flaws or excessive shrinkage and shall conform to ASTM A 48, Class 30 minimum. Plugging of defective castings shall not be permitted. Castings shall be annealed to remove internal stresses prior to machining and shall have the mark number and heat number cast on them.

C. Except where otherwise specified, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction. All structural members shall be considered as subject to shock or vibratory loads.

D. All replaceable or expendable elements such as filters, screens, drive belts, fuses and lamps shall be easily accessible and replaceable without need of dismantling equipment or piping. All such items shall be of a standard type that is readily available from multiple suppliers.

E. Threaded openings for drains or vents in pump volutes, compressor or fan scrolls, air receivers, and heat exchangers which are plugged during normal operation shall be provided with stainless steel plugs.

F. All equipment delivered to the Project site shall include detailed installation instructions and a parts list.

1.07 Equipment Specifications

The use of singular or plural terminology in the Specifications is not intended to define the number of units required to fulfill Contract requirements. Bidders must consult the Drawings and Specifications to determine how many units of a particular piece of equipment are required. This does not relieve the Contractor of the responsibility to provide all equipment specified when multiple units are specifically required in the Specifications.

1.08 Seal Water Requirements

Where seal water is provided for flushing of mechanical shaft sleeves or sealing of shaft seal packing, provide equipment with drip pans fitted with drains to contain the leakage and convey it to the nearest suitable floor drain. Route drain piping to minimize obstructions to the movement of personnel.

1.09 Operating Fluids and Gases

All operating fluids and gases recommended by the manufacturer and required for operation of the equipment shall be provided in sufficient quantity by the Contractor to fill all equipment and to replace all fluids and gases consumed during testing and start-up.

1.10 Lubrication and Lubrication Fittings

A. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during start-up or shutdown and shall not waste lubricants.

B. Lubricants of the type recommended by the equipment manufacturer shall be provided in sufficient quantity by the Contractor to fill all lubricant reservoirs and to replace all lubricants consumed during testing, start-up and initial operation. The Contractor shall provide sufficient quantities of manufacturer-approved lubricants to lubricate all equipment for one year of normal service before final acceptance of the equipment will be made by the Owner.

C. Where special run-in oil or storage lubricants are used, they shall be flushed out and replaced with the required service lubricant by the Contractor.

D. Tag each piece of equipment with a cloth tag showing proper type lubricant, period between lubrications, date of lubrication and worker's initials. Have space for 10 lubrication notations.

E. Except for rotating shaft couplings, all lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings or guards. Fittings shall be accessible from safe, permanent platforms or walk areas. Fittings shall be of the bull-neck, check type for use with a portable high pressure grease gun. Connection from a remote fitting to the point of use shall be with minimum 3/16-inch stainless steel tubing, securely mounted parallel to equipment lines and protected where exposed to damage.

1.11 Safety Guards

All belt or chain drives, fan blades, couplings and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gauge or heavier galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal. Expanded metal safety guards shall be banded to eliminate sharp edges. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water. All safety guards shall comply with OSHA General Industry Standards, Part 1910, Subpart O, Machinery and Machine Guarding. Provide tachometer access on shaft ends.

1.12 Equipment Bases

A. Where shown on the Drawings, equipment shall be installed on a raised, reinforced concrete base. The base shall be a minimum of 4-inches in height and shall extend beyond the equipment baseplate approximately 2-inches on all sides.

B. The Engineer shall be consulted concerning electrical conduit locations prior to pouring the concrete base.

C. Unless otherwise specified, a cast iron or welded steel baseplate shall be provided for each pump, compressor and any other item of equipment which is to be installed on a concrete base. Each unit and drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a raised lip all around and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with epoxy or non-shrink grout as specified in the grouting section.

D. Centrifugal blower bases shall be installed in accordance with manufacturer's recommendations. Unless manufacturer instructions direct otherwise, blower bases shall be set on resilient pads and not hard bolted to the concrete pad. Where anchor bolts are utilized, threaded embedments or adhesive or expansion anchor studs shall be used with two nuts locked with a minimum 1/8-inch gap between nut and base frame.

E. On direct coupled equipment, motor and driven equipment shall be doweled to a common base with a minimum of two dowels each.

1.13 Alignment of Motors and Equipment

A. In every case where a drive motor is connected to a driven piece of equipment by a flexible coupling, the coupling halves shall be disconnected and the alignment between the motor and the equipment checked and corrected. Machinery shall first be properly aligned and leveled by means of steel wedges and shims or jacking screws near anchor bolts. Anchor bolts shall be tightened against the shims on wedges or jacking screws and the equipment shall again be checked for level and alignment before placing grout. Wedges shall not be placed between machined surfaces.

B. In general, checking and correcting the alignment shall follow the procedures published in the manufacturer's Operation and Maintenance Manual. In addition, pumps shall be set up in accordance with the Standards of the Hydraulic Institute, Instructions for Installation, Operation, and Maintenance of Centrifugal Pumps, unless manufacturer's direction is contradictory. Equipment shall be properly leveled and brought into angular and parallel alignment.

C. Equipment shall be installed in such a way that no strain is transmitted to the equipment by piping systems or adjacent equipment.

1.14 Grouting

A special epoxy, non-shrink, or sand-cement grout shall be used in the placement of all pump, motor and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates and other grouting applications as shown on the Drawings.

1.15 Welding and Brazing

A. All welds shall be sound and free from embedded scale and slag. All butt welds shall be continuous, and where exposed to view, shall be ground smooth. All continuous welds shall be gas and liquid-tight. Welds in piping shall have full penetration and shall be smooth on the inside of the pipe. Intermittent welds shall have an effective length of at least 2-inches and shall be spaced not more than 6-inches apart.

B. All welding of steel and aluminum, including materials, welding techniques, general safety practices, appearance and quality of welds, and methods of correcting defective work, shall conform to the latest requirements of AWS Specifications. Structural steel welding shall conform to the requirements of the AWS Structural Welding Code. The general recommendations and requirements of the AWS Structural Welding Code shall also apply to welded aluminum structures. The welding process and welding operators shall meet qualification tests and welding performance tests in accordance with the latest provisions of ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications. Welding process and qualification procedures for welding of pipe shall conform to the latest requirements of ANSI B31.1, Section 327, Welding, and Section 328, Brazing and Soldering. All welding qualification tests shall be witnessed by the Engineer, except as provided herein. All costs associated with the qualification or testing of welders and welding operators shall be borne by the Contractor.

C. Welding of stainless steels shall be performed by the MIG or TIG process, in accordance with ASME and AWS recommendations. After welding is completed, the welds shall be ground smooth, where required, and all welds shall be pickled and passivated such that the weld will be no less corrosion resistant than the base metal welded.

D. Reports certifying that the welding procedures, welders and welding operators that the Contractor intends to use meet the requirements specified above. These reports shall be submitted to the Engineer prior to beginning the work. In the case of welder qualifications for shop welding and for carbon steel field welding, welders presenting certified qualification papers validated within the preceding 6-month period will not be required to take the qualification tests. In the case of field welding of stainless steel or aluminum, all welders shall be required to take the qualification tests regardless of past experience or availability of certified qualification papers.

E. Field welding practices shall conform to OSHA construction standards, Part 1926, Subpart J, Welding and Cutting. Shop welding practices shall conform to OSHA General Industry Standards, Part 1910, Subpart Q, Welding, Cutting, and Brazing.

F. Welding electrodes for structural steel shall conform to the standard recommendations of the AISC. Welding electrodes for stainless steel shall conform to applicable AWS Specifications and shall be as recommended by “Welded Austenitic Chromium-Nickel

Stainless Steels, Techniques and Properties", published by the International Nickel Company, New York, New York. Welding electrodes for aluminum shall conform to applicable AWS Specifications.

G. Each welder and welding operator must identify all welds with welder's assigned symbol.

H. Welders performing unsatisfactory work shall be removed from the welding process.

I. The Owner may inspect any weld by radiographic or other means. Welds not in accordance with the requirements specified herein shall be repaired or replaced at the Contractor's expense. Excessive porosity, nonmetallic inclusions, lack of fusion, incomplete penetration and cracking shall constitute grounds for rejection of welds.

1.16 Erection and Setting

A. In the erection and setting of all fabricated equipment, the Contractor shall exercise care to ensure that each item of equipment is adequately supported so as not to bend or distort under its own weight until adequate foundation support and anchorage are provided. Where lifting lugs, angles or clips are provided on equipment, they shall be used in erecting and setting the equipment. Erection and setting of equipment and structural steel shall conform to the requirements of OSHA Construction Standards, Part 1926, Subpart R, Steel Erection, Subpart H, Material Handling, Storage, Use, and Disposal, and Subpart N, Cranes, Derricks, Hoists, and Conveyors. Erection of structural steel shall conform to the latest requirements of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

B. During placement and prior to any grouting or connection of adjacent piping, the equipment shall be leveled and aligned true to level, plumb, alignment and grade with all parts bearing or fitting the structure or equipment accurately and securely. It shall not be permitted to cock out of alignment, nor shall the Contractor redrill, reshape or force fit any fabricated items. Connections of process piping to mechanical equipment nozzles/fittings shall be brought into alignment, one to the other. When joints are made up, there shall be no force exerted on the equipment connection.

C. The Contractor shall take all measurements necessary to properly fit Contractor's work in the field, and Contractor shall be governed by and responsible for these measurements and the proper working out of all details. The Contractor shall be responsible for the correct fitting of all work in the field and the accurate placement of all anchor bolts installed by Contractor.

D. The Contractor shall bring all parts to be erected or assembled into close contact. Before assembly, all surfaces to be in contact with each other shall be thoroughly cleaned. Drift pins may be used only for bringing members into position, never to enlarge or distort holes. Torching or burning of holes or cutting of fabricated items to correct misalignment or shop errors shall not be permitted. Enlargement of holes necessary to make field connections shall be done only with the Engineer's approval by reaming with twist drills and in a manner acceptable to Engineer.

E. All equipment shall be furnished with suitable eyebolt lifting lugs or lifting angles to facilitate handling.

F. All flanged piping connections shall be “Two-Holed” such that the two upper-most flange bolt holes are horizontal.

1.17 Special Tools and Accessories

Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments and accessories required for proper maintenance. Special tools and accessories shall include those tools and accessories not normally available in an industrial hardware or mill supply house. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

1.18 Galvanizing

A. All galvanizing shall be done by the hot-dip process after fabrication in conformity with requirements of ASTM A 123, Grade 100; ASTM A 153, ASTM A 384 and ASTM A 385. Articles to be galvanized shall be pickled before galvanizing. Articles to be painted shall not be quenched.

B. Where galvanized bolts are specified or required by the Drawings, zinc plated bolts will be acceptable provided zinc plating conforms to ASTM B 633, Type II.

C. Areas of galvanizing damaged at the factory by welding or burning or otherwise damaged shall be thoroughly stripped and cleaned and recoated with zinc to the required thickness by the hot dip process. Areas of galvanizing damaged in the field during transportation, handling or installation shall be stripped, cleaned, and recoated with zinc to the required thickness in accordance with ASTM A 780, Annex A3.

D. Galvanized articles shall be free from uncoated spots, blisters, flux, black spots, dross, projections and other defects not consistent with acceptable galvanizing practice.

E. Zinc and cadmium plating shall be subject to visual examination to determine uniformity of coating. The Engineer may require that the coating uniformity be tested in accordance with ASTM A 239 or ASTM E 376.

1.19 Vibration Testing

A. Unless specified otherwise in the Specifications, each pump or blower having a rated power of 50 HP, or greater, shall be tested in the field for acceptable vibration levels. Vibration testing shall be performed by an experienced, factory-trained and authorized vibration analysis expert (not a sales representative) retained by the Contractor for this work. Each unit shall be tested separately without duplicate equipment running. All field testing shall be done in the presence of the Engineer. The Engineer shall be furnished with four certified copies of vibration test data for each test performed.

B. Where specified in the Specifications, equipment which is assembled and tested on the manufacturer's floor shall also be checked triaxially for vibration by the manufacturer. The results of these tests, along with location of vibration check points, shall be

submitted to the Engineer. All readings shall be made on an X-Y recorder with appropriate scales indicated and an explanation thereon of any recordings exceeding specified limits. The field tests shall include substantiation of the manufacturer's test data.

C. For systems with variable speed drives, tests shall be conducted at various speeds between maximum and minimum. For systems with two-speed drives, tests shall be conducted at both speeds. For systems with constant-speed drives, tests shall be conducted under various loading conditions as determined by the Engineer.

D. Rotating equipment shall be tested for vibration in the field after installation by the following method. Equipment, complete with drive systems, in place at the job site, shall not vibrate more than the values allowed herein, unless otherwise specified in the detailed equipment specifications. All field tests shall be running tests with the equipment operating on the product for which it is intended or a substitute acceptable to the Engineer. The term displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity shall mean the peak velocity or speed of the vibrating equipment, in inches per second; acceleration shall mean the maximum acceleration which occurs during the vibration cycle, measured in Gs. Displacement and velocity shall be measured by a meter equal to IRD Balancing Vibration Analyzer Model 258, or Bently-Nevada Model TK-8. Acceleration shall be measured by suitable equipment equal to IRD Mechanalysis, Bently-Nevada, subject to approval of the Engineer. Frequency of vibration, in cycles per minute (cpm), shall be determined when vibration exceeds specified levels or as otherwise necessary. Vibration shall be measured on the bearing housing, unless other locations are deemed necessary by the vibration analysis expert and Engineer.

E. For all equipment tested, vibration shall be checked in the radial and axial directions. For pumps, vibration shall not exceed that permitted by the Hydraulic Institute.

F. Critical speeds of all rotating equipment shall meet the following:

1. For stiff shaft designs, the first critical speed of the rotating equipment shall be at least 25 percent above the maximum design operating speed.

2. For flexible shaft designs, critical speeds shall be at least 2 percent above or below normal design operating speeds.

G. The Contractor shall be responsible for unit and system assembly vibration testing and their results, which shall be within the specified limits. Copies of test results shall be submitted to the Engineer for review. Should the vibration field test results exceed shop test results or the limits specified herein, the Contractor shall correct the deficiencies within 30 days. After corrections have been completed, the vibration testing shall be rerun and the results resubmitted to the Engineer for review.

1.20 Hydraulic Systems

A. All pipes, tubes and hoses for hydraulic fluid shall be securely restrained against movement. All tubing and hoses shall be routed, shielded and supported such that rubbing or abrasion of the jacket shall not occur.

B. All hydraulic fluid reservoirs for hydraulic power packs shall be equipped with a low level shut-off mechanism which shall stop operation of the power pack when the level of fluid in the reservoir reaches a predetermined low level. Reservoirs shall have a sight glass or tube allowing visual inspection of level and lubricant appearance.

C. All hydraulic systems shall be equipped with an alarm to notify the operator of system malfunction.

1.21 Noise Criteria

A. Unless otherwise specified, noise levels for all operating equipment shall not exceed 90 dB at 5 feet from the equipment when measured on the A scale of a calibrated sound level meter at slow response.

B. Noise criteria shall be met without the use of special external barriers or enclosures.

1.22 Identification of Piping and Equipment

A. General: All equipment and piping specified to be painted shall be color coded as specified in Section 09 91 00 of these Specifications.

B. Equipment: All major items of equipment shall have an identification nameplate and dataplate.

1. Nameplates: The Contractor shall submit a suitable list of all items of major equipment to the Engineer, who will furnish the Contractor with an identification numbering system. The nameplates shall be of Type 304 stainless steel, No. 6 finish, and not less than No. 16 gauge with indented stamped lettering. Nameplates shall be attached to equipment bases in easily visible and accessible locations. Nameplates shall be fastened in a permanent manner, arranged not to damage the equipment, with not less than four stainless steel fasteners.

2. Dataplates: Each item of mechanical equipment shall be provided with a stainless steel dataplate. Separate dataplates shall be provided for motors, engines and driven equipment. Dataplates shall include the following minimum information:

   a. Name of equipment (from equipment specifications)

   b. Manufacturer

   c. Model designation

   d. Serial number

   e. Rated horsepower

   f. Service factor

g. Electrical and insulation data

h. Speed (rpm)

i. Capacity and head (discharge pressure)

j. Net weight

k. Lettering shall be upper case, block style in size and spacing to suit the nameplate. The identification nameplates shall not be painted.

C. Valves: All valves shall be identified with a round stainless steel disc, approximately 1-1/2-inches in diameter and not less than No. 14 gauge, coated with a clear lacquer. Discs shall be fastened to valves in a permanent manner; attachment by chain to handwheels or other operators shall not be acceptable. Discs shall be stamped using indented numerals and/or letters with a valve number corresponding to its identification number in the valve schedule to be included in the operation and maintenance manual.

D. All pushbutton stations, switches, motor controllers, transmitters and other control equipment shall have identification nameplates of the engraved, laminated plastic type affixed to or adjacent to the switch, pushbutton station, etc.

E. All manufacturer's nameplates, identification nameplates and ASME code plates located on areas of equipment to be insulated shall be removed and reattached on uninsulated areas in a manner acceptable to the Engineer.

1.23 Safety Signs

A. Permanent safety signs shall be furnished and installed on all mechanical and electrical equipment where a hazard may exist. Signs shall be made in accordance with current OSHA requirements and shall be suitable for exterior use. Mounting details shall be in accordance with manufacturer's recommendations; location in accordance with governing agency regulations. Fasteners shall be stainless steel.

B. Safety signs shall be approximately 10-inches high by 14-inches wide, colored yellow and black on minimum 0.080-inch aluminum stock.

C. Safety signs shall be furnished and will include, but not be limited to, the following:

1. The following sign shall be affixed to all equipment which may be started automatically from a remote location:

CAUTION
THIS EQUIPMENT MAY START AUTOMATICALLY BY REMOTE CONTROL

2. The following sign shall be affixed to all electrical equipment or instrument panels, as applicable:

CAUTION - SHOCK HAZARD
THIS EQUIPMENT IS POWERED BY MULTIPLE SOURCES
CONTACTS MAY BE ENERGIZED AFTER LOCAL POWER IS DISCONNECTED

3. The following sign shall be provided at all areas where oxygen or flammable materials are stored or used (colored red, white and black):

DANGER
NO SMOKING, MATCHES, OR OPEN FLAMES

4. The following sign shall be affixed to all entrance hatches or access manways on covered tanks and vessels:

CAUTION
OXYGEN DEFICIENT OR TOXIC CONDITIONS MAY EXIST
FOLLOW PRESCRIBED PROCEDURES BEFORE ENTRY

5. The following sign shall be provided at all compressor vents and equipment blowoffs:

CAUTION
LOUD BLOWDOWN MAY OCCUR WITHOUT WARNING

6. The following signs shall be applied to all chemical storage tanks, or tanks storing hazardous materials, including flammable, toxic, reactive and otherwise unstable materials or materials representing a personnel safety hazard. Comply with NFPA 704 signage requirements on the tank exterior at all 4 architectural elevations (N, S, E & W) as well as the filling station. The NFPA signs shall have the color coded diamonds and shall indicate the actual chemical name and emergency response info.

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall provide transportation of all equipment, materials and products furnished under these Contract Documents to the work site. In addition, the Contractor shall provide preparation for shipment, loading, unloading, handling and preparation for installation and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the work.

B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the work.

1.02 Transportation

A. All equipment shall be suitably boxed, crated or otherwise protected during transportation.

B. Where equipment will be installed using existing cranes or hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment.

C. Small items and appurtenances such as gauges, valves, switches, instruments and probes which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.03 Handling

A. All equipment, materials and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.

B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.

C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.

D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

END OF SECTION

Part 1 General

1.01 Scope

The work under this Section includes, but is not necessarily limited to, the furnishing of all labor, tools and materials necessary to properly store and protect all materials, equipment, products and the like, as necessary for the proper and complete performance of the work.

1.02 Storage and Protection

A. Storage:

1. Maintain ample way for foot traffic at all times, except as otherwise approved by the Engineer.

2. All property damaged by reason of storing of material shall be properly replaced at no additional cost to the Owner.

3. Packaged materials shall be delivered in original unopened containers and so stored until ready for use.

4. All materials shall meet the requirements of these Specifications at the time that they are used in the work.

5. Store products in accordance with manufacturer's instructions.

B. Protection:

1. Use all means necessary to protect the materials, equipment and products of every section before, during and after installation and to protect the installed work and materials of all other trades.

2. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage or other causes.

3. Substantially constructed weathertight storage sheds with raised floors shall be provided and maintained as may be required to protect adequately those materials and products stored on the site which may require protection from damage by the elements.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Engineer and at no additional cost to the Owner.

D. All equipment shall be boxed, crated or otherwise completely enclosed and protected during shipment, handling and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times. Compressors, blowers,

pumps, motors, valves, control panels, instrumentation, electrical equipment and other equipment having antifriction or sleeve bearings shall be stored in weathertight warehouses which are maintained at a temperature of at least 60 degrees

E. Other equipment may be stored outside under cover. All equipment shall be stored above ground level and adequately supported on wood blocking or other approved support material. Printed storage instructions of the manufacturers shall be strictly adhered to.

F. Painted, anodized or otherwise coated surfaces shall be protected against impact, abrasion, discoloration and other damage. All coated surfaces which are damaged prior to acceptance of equipment shall be cleaned and coated to the satisfaction of the Engineer with the same or equivalent coating used in the original application.

G. Electrical equipment, motors, controls, and insulation shall be protected against moisture or water damage. All space heaters provided in the equipment shall be kept connected and operating at all times until equipment is placed in service. Electrical equipment stored without space heaters shall be provided with desiccants to protect against moisture damage. Desiccant shall be silica gel in porous bags at not less than 1 ounce per cubic foot of volume. Desiccant shall be replaced periodically.

H. Electrical equipment and instrumentation shall be stored in a location that is free from excessive or injurious amounts of vibration.

I. Rotating equipment such as pumps, motors, fans and compressors shall be rotated periodically. In the absence of specific exercising instructions by the equipment manufacturers, each item of rotating equipment shall be rotated a minimum of 10 revolutions at intervals not to exceed 20 days. When shafts are too difficult to rotate by hand, nonmetallic grips shall be used to turn the shafts.

J. Vehicles such as trucks, forklifts, tractors, lawn mowers and other engine-powered equipment shall be started up and operated at intervals not to exceed 15 days. Equipment shall be run until engine temperatures and pressures are in normal operating ranges. All lifting, lowering, tilting, loading and unloading accessories shall be operated at least once during the exercise period. Equipment shall be moved under power from the parked position and run a sufficient distance so as to ensure proper lubrication of drive train and suspension components. All operators employed to exercise the vehicles shall be qualified and thoroughly familiar with the proper operation of the equipment. Forklifts, tractors, lawn mowers and other small engine-powered equipment shall be stored indoors in garages or other suitable structures. Trucks stored outdoors shall be washed using approved materials at intervals not to exceed 15 days. All exercising and storage of vehicular equipment shall be conducted in a manner acceptable to the Engineer.

K. Interiors of gear and bearing cases housing oil-lubricated gears and bearings shall be filled with a rust inhibiting oil prior to storage or, if extended storage is anticipated, coated periodically with a rust inhibiting oil mist at intervals of time acceptable to the Engineer. Interiors of large pumps and compressors shall be protected using vapor phase inhibitor paper or porous bags of rust inhibiting, vapor emitting crystals. Exposed shafts shall be coated with rust preventative compound, then wrapped with oil-impregnated paper and polyethylene film and sealed with waterproof tape prior to

shipment.

L. Individually packaged, unpainted steel parts shall be protected by a wrapping of vapor phase inhibiting or oil-impregnated paper and polyethylene film prior to shipment.

M. Parts and equipment not requiring periodic inspection or maintenance shall be stored unopened in their original packaging until used.

N. Parts, instruments, controls and small items of equipment shall be stored above ground or floor level on suitable shelves or racks in a heated, watertight warehouse.

O. Flanged openings on equipment shall be covered with suitable solid wooden or metal blanks securely bolted to the flange using a minimum of four bolts and a suitable rubber gasket. Ends of threaded pipe and fittings shall be sealed watertight with metal or plastic caps. Threaded openings shall be sealed watertight with metal or plastic plugs. Other openings shall be sealed with two layers of 6 mil polyethylene securely taped in place with waterproof tape.

P. A maintenance log on each item of mechanical and electrical equipment requiring periodic attention in storage shall be maintained by the Contractor. Oil and grease changes, exercising, desiccant replacement, nitrogen purge checks, heater checks, insulation checks and other periodic maintenance shall be entered in the log. The maintenance log shall be made available to the Engineer on request.

Q. A resistance test shall be performed on all motor windings and heater elements following storage and prior to installation as a check for insulation deterioration or moisture damage during storage.

R. Immediately prior to installation, equipment shall be cleaned of any protective coatings used during storage and any rust, dirt, grit or other foreign material shall be removed.

S. After installation and prior to start-up, all grease-lubricated joints, shaft couplings and bearings shall be flushed out and regreased. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. Screens and filters shall be checked for contamination and replaced if necessary. The equipment shall then be tagged, signed and dated, indicating that the equipment has been properly lubricated for start-up.

T. After storage, rubber parts such as valve seats, diaphragms, expansion joints, gaskets, hoses and shaft couplings shall be checked for hardening or cracking. Deteriorated parts shall be replaced prior to start-up by the Contractor at Contractor's own expense.

U. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, gypsum board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block and structural tile may be stored outdoors under a properly secured waterproof covering.

V. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation.

Tarps and covers shall be arranged to prevent ponding of water.

1.03 Extended Storage

In the event that certain items of major equipment such as air compressors, pumps and mechanical aerators have to be stored for an extended period of time, the Contractor shall provide satisfactory long-term storage facilities which are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, lubricants and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

END OF SECTION

Part 1 General

1.01 Scope

This Section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the Project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.02 Quality Assurance

A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.

B. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.03 Cleaning Materials and Equipment

A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

B. Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

1.04 Progress Cleaning

A. General:

1. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this work.

2. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.

3. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

2. Restack materials stored on site weekly.

3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

C. Structures:

1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

2. Weekly, and more often if necessary, sweep all interior spaces clean. “Clean”, for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by using a hand-held broom.

3. As required preparatory to installation of successive materials, clean the structures or pertinent portions as recommended by the manufacturer of the successive material.

4. Following the installation of finish floor materials, clean the finish floor daily. “Clean”, for the purpose of this Paragraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Engineer, may be injurious to the finish floor material.

5. Schedule cleaning operation so that dust and other contaminants resulting from cleaning operations will not fall on wet, recently painted surfaces.

1.05 Final Cleaning

A. Definitions: Unless otherwise specifically specified, “clean” for the purpose of this Article shall be interpreted as the level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.

B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in 1.04 above.

C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.

D. Structures:

1. Remove all traces of soil, waste material, splashed material, and other foreign matter to provide a uniform degree of exterior cleanliness. Visually inspect all exterior surfaces and remove all traces of soil, waste material, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all paint droppings, spots, stains and

dirt from finished surfaces.

3. Clean all glass inside and outside.

4. Polish all surfaces requiring the routine application of buffed polish. Provide and apply polish as recommended by the manufacturer of the material being polished.

E. Post-Construction Cleanup: All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, shall be removed as directed by the Engineer.

F. Restoration of Landscape Damage: Any landscape feature damaged by the Contractor shall be restored as nearly as possible to its original condition at the Contractor's expense. Restoration shall be performed to the satisfaction of the Engineer.

G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept the Project.

1.06 Cleaning During Owner's Occupancy

Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Engineer in accordance with the Supplementary Conditions of the Contract Documents.

1.07 Disposal of Waste

A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

B. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

C. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.

D. Burning: Do not burn waste materials on site.

E. Waste removed from the Project site shall be disposed of in sites permitted by the Tennessee Department of Environment and Conservation (TDEC) for the acceptance of type of waste being disposed. The acceptable types of permitted disposal facilities are as follows:

1. Inert Waste Landfills

2. Municipal Solid Waste Landfills

3. Municipal Solid Waste Landfills permitted to receive only construction and demolition wastes.

F. Exceptions to Paragraph F are as follows:

1. Hazardous waste shall be disposed of in accordance with TDEC.

2. Asbestos-containing waste shall also be handled and disposed of in accordance with TDEC.

3. Excess earth material and excess excavated rock material may be placed on sites for which the Contractor provides to the Owner a signed affidavit from the property owner that the placement of such material is acceptable to the property owner. The Contractor and property owner shall be responsible for all permitting of such disposal.

G. No waste shall be placed at a transfer station facility.

H. The Contractor shall maintain records related to all waste removed from the Project site so as to allow the Owner or the Engineer to readily determine the following:

1. Date waste removed from Project site.

2. Name of hauler (company and driver) transporting such waste.

3. General description of waste transported.

4. “Truck tickets” indicating the waste disposal site and amount of waste disposed therein.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes, but is not necessarily limited to, the provision of all labor and material required to perform installation inspection and start-up of all equipment and mechanical systems installed under this Contract.

B. The work defined under this Section includes providing the services of a trained factory representative in accordance with the requirements of Section 01 43 33 of these Specifications.

C. Certification of start-up and full testing shall be performed by the manufacturer using the services of a factory representative trained in this type service.

D. Unless otherwise specified, the Contractor shall furnish all labor, materials, water, air, oil, power, fuel, chemicals, test equipment and other items required to conduct the field tests, including any retests.

E. The cost of all field testing shall be included in the Contract Price and no separate payment will be made.

1.02 Coordination

The Contractor shall not proceed with any functional test or operating test until the operation and maintenance manuals for the equipment have been submitted and been designated “No Exceptions Taken”. The Contractor shall coordinate all activities required for starting of systems including the visits by the factory representatives, particularly where an equipment item's operation is dependent on the operation of other equipment. Prior to calling the factory representative, the Contractor shall ensure that all necessary related equipment, structures, piping and electrical work is complete. Any required revisits to the site by the factory representative shall be provided by the Contractor.

1.03 Pre Start-Up Maintenance

After installation and prior to start-up, all grease-lubricated joints, shaft couplings and bearings shall be flushed out and re-greased. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. All operating fluid and gas reservoirs shall be filled with the proper fluid and gases. Screens and filters shall be checked for contamination and replaced if necessary. Belt drives shall be checked and tension adjusted, as needed. The equipment shall then be tagged, signed and dated, indicating that the equipment has been properly lubricated and prepared for start-up.

1.04 Installation Inspection

A. Prior to energizing any piece of equipment or performing a functional test, a factory representative of the equipment manufacturer shall inspect the installation of the equipment. The factory representative shall determine if the equipment has been installed in accordance with the manufacturer's recommendations, pre-start-up maintenance has been performed, and is ready for start-up and the initiation of the functional test.

B. Should the installation inspection indicate that the equipment has been improperly installed or prepared for start-up; the Contractor shall provide such modifications or adjustments as required for the equipment to operate properly.

C. The factory representative shall certify that the equipment has been installed in accordance with the Drawings, Specifications, and the manufacturer's recommendations and that the equipment is ready for start-up and functional testing to be performed.

1.05 Functional Test

A. Following the installation inspection by factory representative, perform a functional test on each piece of equipment. The functional test shall consist of operation of the equipment on a normal duty cycle for a sufficient period of time to determine satisfactory operation. Time required for functional testing shall be as specified in the equipment specifications or a minimum one continuous eight-hour period, whichever is longer. To the maximum extent practical, exercise the full capabilities of all equipment including remote operation, instrumented control schemes, alternate modes of operation and emergency operation. Equipment shall be checked for any abnormal noise or vibration as part of the functional test, and any observed abnormal conditions corrected prior to certification.

B. Should the results of the functional test indicate that the equipment has failed to perform in accordance with the Specifications, the Contractor shall make, at no additional cost to the Owner, all modifications or adjustments as required for satisfactory operation, including replacement of any or all components, if necessary. Following the modifications or adjustments, the Contractor shall repeat the functional test. This procedure shall be repeated until the results of the test indicate that the equipment has satisfied the requirements of the applicable Specification Section.

C. After the functional test is completed, each manufacturer shall certify in writing in the Manufacturer’s Installation and Start-Up Report that (1) tests were performed in accordance with the Specifications and the manufacturer’s recommendations, (2) the functional tests and start-up operation have been satisfactory and (3) the equipment is fully operational and capable of meeting operating requirements.

1.06 Operating Test Period

A. Following the functional test, the Contractor shall place each system into service and undergo an operational test under normal service conditions. The minimum time for the operating test period for each system shall be 30 consecutive days, excluding time that the equipment is taken out of service.

B. Where required in the equipment specifications, process performance testing shall be performed during the operating test period in accordance with the requirements of the equipment specifications. The Contractor shall provide all materials and labor, including the services of a factory representative, necessary to perform the performance testing.

C. The test period shall commence upon the initiation of operation of all systems and shall end after the successful operation of the equipment for the minimum time required.

D. The Contractor shall repair and make all modifications required due to mechanical failure of the equipment during the operating test period. Should the equipment fail to meet the performance testing requirements, a factory representative shall evaluate the equipment and determine the cause of the process failure. The Contractor shall make all modifications recommended by the manufacturer.

1.07 Certification

Upon completion of start up, the Contractor shall provide written certification from all equipment manufacturers' factory representatives. Written certification shall indicate that tests were made in accordance with the manufacturer's recommendations, that the test and start-up operation has been satisfactory completed and that the equipment is fully operational under design requirements. Written certification shall be filed with the Engineer on the manufacturer's stationary.

Manufacturer's Installation and Start-up Report

GENERAL INFORMATION:

Owner: _____ Contractor: _____

Facility: _____ System: _____

Location: _____ Specification Number: _____

Tag: _____

MANUFACTURER:

Manufacturer Name: _____

Address: _____

City/State/Zip: _____

Phone Number: _____ Fax Number: _____

E-Mail: _____

Manufacturer's Representative: _____

1. Required safety equipment available?	Y☐	N☐	N/A☐
2. Are equipment tags correct and attached to equipment?	Y☐	N☐	N/A☐
3. Are rotating equipment safety guards in place and secure?	Y☐	N☐	N/A☐
4. Shaft and couplings aligned?	Y☐	N☐	N/A☐
5. Have belt drives been aligned?	Y☐	N☐	N/A☐
6. Bearings lubricated?	Y☐	N☐	N/A☐
7. Oil reservoirs filled with proper lubricant?	Y☐	N☐	N/A☐
8. Rotation verified?	Y☐	N☐	N/A☐
9. Is equipment level?	Y☐	N☐	N/A☐
10. Equipment anchored properly?	Y☐	N☐	N/A☐
11. Equipment grouted properly?	Y☐	N☐	N/A☐
12. Required utilities available?	Y☐	N☐	N/A☐
13. Nozzles free from loads?	Y☐	N☐	N/A☐
14. Are required pressure and temperature gauges and sensors installed?	Y☐	N☐	N/A☐
15. Have any shipping coatings/sealants been removed?	Y☐	N☐	N/A☐
16. Does any paint/coating damage need to be repaired?	Y☐	N☐	N/A☐
17. Have moving parts been checked for proper running clearance?	Y☐	N☐	N/A☐
18. Is there any observed leakage of lubricants or fluids from equipment?	Y☐	N☐	N/A☐
19. Are all electrical power connections made and properly torqued?	Y☐	N☐	N/A☐
20. Are electrical overloads properly set?	Y☐	N☐	N/A☐
21. Are current transformers properly wired for polarity?	Y☐	N☐	N/A☐
22. Are control enclosures per the specified NEMA classification and material?	Y☐	N☐	N/A☐

23. Are instrumentation connections terminated? Y☐ N☐ N/A☐
24. Are signal cable shield leads grounded in accordance with Manufacturer's recommendations? Y☐ N☐ N/A☐
25. Are required spare parts on-site, inventoried and properly stored? Y☐ N☐ N/A☐
26. Are Operations and Maintenance Manuals on-site and complete? Y☐ N☐ N/A☐
27. Are all installation requirements of the O&M Manuals performed? Y☐ N☐ N/A☐
28. Does equipment have a record of maintenance and exercise as recommended by the manufacturer during storage? Y☐ N☐ N/A☐
29. Are there any observed installation issues that impact the equipment warranty? Y☐ N☐ N/A☐

Additional items noted during installation inspection by Manufacturer's Start-up Representative:

_____
_____
_____
_____
_____

I certify as an authorized Factory Representative, that the equipment is installed in accordance with the Manufacturer's recommendations, and is ready for start-up and initial operation.

Factory Representative: _____ Date: _____
Representing: _____ (If employed by other than the Manufacturer)
Mailing Address: _____
_____
Phone Number: _____
E-mail Address: _____

START-UP REPORT:

1.	Does equipment operate and perform in accordance with the specification?	Y☐	N☐	N/A☐
2.	Have all specified modes of operation been tested and verified?	Y☐	N☐	N/A☐
3.	Do all system indicators, readouts, controls and operator interfaces operate?	Y☐	N☐	N/A☐
4.	Have variable speed units been tested throughout the available speed range?	Y☐	N☐	N/A☐
5.	Have multi-speed motors been tested on all available speeds?	Y☐	N☐	N/A☐
6.	Did equipment exhibit any abnormal vibration during operation?	Y☐	N☐	N/A☐
7.	Did equipment exhibit any abnormal noise during operation?	Y☐	N☐	N/A☐
8.	Are bearings operating at normal temperature?	Y☐	N☐	N/A☐
9.	Do bearings display any roughness in operation?	Y☐	N☐	N/A☐
10.	Prior to start-up, or during initial operation, was any leakage of lubricant observed?	Y☐	N☐	N/A☐
11.	Was any leakage of process fluids observed during start-up?	Y☐	N☐	N/A☐
12.	Has operation of equipment protective systems been verified?	Y☐	N☐	N/A☐
13.	Is the equipment ready to place into operation?	Y☐	N☐	N/A☐

Additional items noted during start-up by Manufacturer's Start-up Representative:

_____
_____
_____
_____
_____
_____
_____
_____

I certify as an authorized Factory Representative, that the equipment has been properly started up in accordance with the Manufacturer's recommendations, and is ready for initial operation.

Factory Representative:_____ Date: _____

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall provide five copies of a complete and comprehensive reference manual (Operating and Maintenance Manual) containing operating and maintenance data to enable operators and plant engineers to correctly operate, service and maintain all equipment and accessories covered by the Specifications and Drawings. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance procedures, calibration procedures and safety precautions and procedures for the equipment involved.

B. No separate payment will be made for the Operating and Maintenance Manuals and the cost of said manual shall be included in the Contract Price.

1.02 Submittal Schedule

A. The Contractor shall submit, for the Engineer's approval, two preliminary drafts of proposed formats and outlines of contents of manuals within 60 calendar days after the Notice to Proceed. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return one copy of the manual for completion and/or correction.

B. Submit two preliminary copies of manuals before the work covered by the Contract Documents is 35 percent complete. The Engineer will notify the Contractor, in writing, of any deficiencies in the manuals and will return one copy of the manual for completion and/or correction.

C. Before the work covered by the Contract Documents is 50 percent complete, the Contractor must submit five copies of the revised and completed manual, complete in detail as specified below. The Contractor shall also submit one copy of the manual in digital format as specified below.

D. Digital Copies of Manuals: Operations and Maintenance Manuals shall be provided by the Contractor in digital format. Materials available in digital format shall be furnished in accordance with the following:

1. All textual data shall be provided as an electronic file in searchable Adobe Acrobat Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. File(s) shall be identified by utilization of an “eight dot three” convention (XXXXX.YY.pdf) where X is the five digit number corresponding to the Specification Section, and YY is an identification number. All documents shall be scanned at 300dpi or greater utilizing optical character recognition (OCR) software. All text in the document must be text selectable with the exception of pages which are in their entirety Drawings or diagrams. Word searches of the PDF document must function successfully. PDF files that fail to comply with the indexing and searchable features described above will not be acceptable.

All Drawing data shall be provided in digital format compatible with the latest AutoCAD version.

2. Materials not available in original digital format (available only in paper format) shall be scanned as noted above into a PDF format and cleaned to remove smudges, fingerprints, artifacts, and other extraneous marks. All notes, version stamps, etc. shall be preserved. Color maps shall be scanned in not less than the number of colors of the document or 16 colors, whichever is greater. Color photographs shall be saved in not less than 256 colors. Black and white or monochrome scans (non-text) shall not be less than 16 gray scale levels. Color maps, color photographs, and black and white and gray scale photograph files shall be saved as GIF or JPG files, compatible with Adobe Photoshop. Documents shall be scanned in the existing color format of the document, i.e. color documents shall be scanned in color, and black and white or monochrome in gray scale.

3. After the documents are in correct digital format, they shall be furnished to the Engineer as a CD, DVD, or flash drive. All media transmittals shall be accompanied by a detailed paper printout of the files on the media. This printout shall consist of a file name, file size, date of creation, submittal number, and a brief but accurate description of the file. Files shall not be transmitted by modem. Two copies of the CD for each Operation and Maintenance Manual shall be provided to the Engineer.

1.03 Submittal Format

A. Each hard copy of the manual shall be assembled in one or more loose leaf binders, each with title page, typed table of contents, typed list of tables, typed list of figures, and heavy section dividers with reinforced holes and numbered plastic index tabs. Binders shall be uniform for all manuals and shall be 3-ring, hardback type, with transparent vinyl pocket front cover suitable for inserting identifying cover and with a transparent vinyl pocket on the spine for label. All data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the Project title, Specification Section number and title, and manual title printed thereon, all as approved by the Engineer.

B. All copies of shop drawings, figures and diagrams shall be reduced to either 8-1/2 x 11-inches or to 11-inches in the vertical dimension and as near as practical to 17-inches in the horizontal dimensions. Such sheets shall be folded to 8-1/2 x 11-inches. The manual and other data shall be printed on first quality paper, 8-1/2 x 11-inch size with standard 3-hole punching. Binders shall be labeled Vol. 1, Vol. 2, etc., where more than one is required. The table of contents for the entire set, identified by volume number, shall appear in each binder. Text, figures and Drawings shall be clearly legible and suitable for dry process reproductions.

C. Each submittal shall have a cover sheet that includes the following information:

1. The date of submittal and the dates of any previous submittals.

2. The Project title.

3. Submittal Project number

4. The names of:

   a. Contractor

   b. Supplier

   c. Manufacturer

5. Identification of the product, with the Specification Section number, permanent equipment tag numbers and applicable Drawing No.

D. The Engineer will not recommend final acceptance of the work until the Operating and Maintenance Manual is complete and satisfactory to Engineer.

1.04 Contents of Operating and Maintenance Manual

A. Each manual shall include a title page which includes all information specified in Article 1.03, Paragraph C of this Section. In addition, the title page shall include manufacturer's address, phone number, facsimile number, and contact; manufacturer's equipment name and model number; supplier's address, phone number, facsimile number, and contact.

B. Each manual shall include a table of contents identifying the location of each item listed below, for each component supplied. For items not applicable to a component, the table of contents shall list N/A for the page number.

C. For all equipment, the Contractor shall furnish a complete, detailed listing of all equipment, components and accessories showing component name, manufacturer, model number and quantity information shall be furnished for each component as outlined below:

1. A summary page shall be provided for each piece of equipment detailing the following information:

   a. Equipment Number

   b. Equipment Description

   c. Serial Number

   d. Model Number

   e. Manufacturer:

      i. Address

ii. Phone

iii. Representative

f. Supplier:

i. Address

ii. Phone

iii. Representative

g. Local Service Provider:

i. Address

ii. Phone

iii. Representative

h. Location of Equipment

i. Equipment Design Criteria:

i. HP

ii. Flow Rate, etc.

j. Performance Data

k. Normal Operating Characteristics

l. Limiting Conditions

2. Detailed disassembly, overhaul and reassembly, installation, alignment, adjustment and checking instructions.

3. Detailed operating instructions for start-up, calibration, routine and normal operation, regulation and control, safety, shutdown and emergency conditions. Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, rupture discs, etc.

4. Detailed preventative maintenance procedures and schedules, including detailed lubrication instructions and schedules, identification of required lubricants and operating fluids (description, specification and trade name of at least two manufacturers), and diagrams illustrating lubrication points.

5. Detailed guide to equipment and/or process “troubleshooting”.

6. Detailed parts lists identified by title, materials of construction, manufacturer's part number, list of recommended spare parts identified as specified above,

current cost list for recommended spare parts, predicted life of parts subject to wear, and an exploded or concise cut-away view of each equipment assembly.

7. Electrical and instrumentation schematics, including motor control centers, control panels, wiring diagrams, instrument panels and analyzer panels.

8. List of all special tools supplied and description of their use. Special tools include any tool not normally available in an industrial hardware or mill supply house.

9. List of names and addresses of nearest service centers for parts, overhaul and service.

10. Procedures for storing, handling and disposing of any chemicals or products used with the equipment or system.

11. For equipment and systems, also provide the following:

    a. Control and wiring diagrams provided by the controls manufacturer.

    b. Sequence of operations by the controls manufacturer.

    c. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

12. The supplier's operation and maintenance information will address the particular equipment furnished, with specific details on operation and maintenance practices. General data is not acceptable. Information contained in the manual which is not appropriate to the Project shall be marked out and noted as “N/A”.

END OF SECTION

Part 1 General

1.01 Project Warranty

A. The Contractor shall warrant, for a period of one year from the date of Owner's written acceptance of certain segments of the work and/or Owner's written final acceptance of the Project, that the completed work is free from all defects due to faulty products or workmanship.

B. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment and shall perform all work required to repair or replace work found to be defective or damaged as a result of defective work during the warranty period. The Contractor shall maintain the Performance Bond throughout the warranty period.

C. The warranty shall not cover the repair, replacement, or maintenance of items that become defective due to ordinary wear, improper operation or maintenance, or damage caused by another Contractor or by the Owner.

D. Equipment:

1. In the event of multiple equipment failures prior to the expiration of the warranty, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. Multiple equipment failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. The Contractor shall provide the Owner with a 12 month warranty from the manufacturer against defective design, workmanship, materials, that shall commence on the day the equipment is placed back into service.

2. The Owner shall notify the Contractor of defective work by registered letter. The Contractor shall have 15 days from the date of notification to proceed with corrective action. Should the Contractor fail to proceed within 15 days of notification, the Owner reserves the right to cause the required materials to be procured and the work to be performed. The Contractor and the sureties on Contractor's bond shall be held liable for the cost and expense of the work performed by the Owner covered by the warranty.

E. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

1.02 Extended Warranties

A. Where required in the Specifications, equipment or product manufacturers shall provide the Owner with an extended warranty to replace materials or equipment found to be defective beyond the standard one year warranty provided by the Contractor. The extended warranty shall not cover defects due to failure due to abnormal operating conditions, improper operation and maintenance, or damage caused by another

contractor or the Owner.

B. The extended warranty period shall commence at the end of the Contractor's one year period and shall have the term described in the equipment or product Specification.

C. In the event a product or equipment becomes defective within the extended warranty period, the Owner shall notify the manufacturer in the form of a registered letter, addressed to the manufacturer and the surety of the Performance Bond.

D. In the event the manufacturer fails to respond within 15 days of notification, the Owner reserves the right to cause the required materials to be procured and the work to be performed. The manufacturer and the sureties of the Bond shall be held liable for the cost and expense of the work performed.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes, but is not necessarily limited to, the compiling, maintaining, recording and submitting of Project record documents as herein specified.

B. Record documents include, but are not limited to:

1. Drawings;

2. Specifications;

3. Change orders and other modifications to the Contract;

4. Engineer field orders or written instructions, including Requests for Information (RFI) and Clarification Memorandums;

5. Reviewed shop drawings, product data and samples;

6. Test records.

C. The Contractor shall maintain on the Project site throughout the Contract Time an up to date set of Record Drawings.

1.02 Maintenance of Documents and Samples

A. Storage:

1. Store documents and samples in the Contractor's field office, apart from documents used for construction.

2. Provide files and racks for storage of documents.

3. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with format of these Specifications.

C. Maintenance:

1. Maintain documents in a clean, dry, legible condition and in good order.

2. Do not use record documents for construction purposes.

3. Maintain at the site for the Owner one copy of all record documents.

D. Make documents and samples available at all times for inspection by Engineer.

E. Failure to maintain the Record Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.03 Quality Assurance

A. Unless noted otherwise, Record Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.

B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.

1.04 Recording

A. Label each document “Project Record” in neat, large printed letters.

B. Recording:

1. Record information concurrently with construction progress.

2. Do not conceal any work until required information is recorded.

1.05 Record Drawings

A. Record Drawings shall be reproducible, shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.

B. Legibly mark drawings to record actual construction, including:

1. All Construction:

a. Changes of dimension and detail.

b. Changes made by Requests for Information (RFI), field order, clarification memorandums or by change order.

c. Details not on original Drawings.

2. Site Improvements, Including Underground Utilities:

a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced to permanent surface improvements.

b. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.

c. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.

d. The Record Drawings shall include the horizontal angle and distance between manhole covers.

3. Structures:

a. Depths of various elements of foundation in relation to finish first floor datum or top of wall.

b. Location of internal and buried utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. The Record Drawings shall also provide a field run topographic survey of the waste cell area upon completion of:

a. The base grading and prior to construction of the liner base

b. The liner base installation

c. The sand leachate collection blanket

1.06 Specifications

A. Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Requests for Information (RFI), field order, clarification memorandums, or by change order.

1.07 Submittal

A. At contract closeout, deliver Record Documents to the Engineer for the Owner.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date

2. Project title and number

3. Contractor's name and address

4. Title and number of each record document

5. Signature of Contractor or Contractor's authorized representative

END OF SECTION

Part 1 General

1.01 Scope

This Section includes, but is not necessarily limited to, standards for cleaning and painting structures and equipment described in the Drawings and Specifications. Furnish all materials, equipment and labor necessary to complete the work.

1.02 Substitutions

To the maximum extent possible, all coatings shall be the products of a single manufacturer. Contractors intending to furnish substitute materials or equipment are cautioned to read and strictly comply with these guidelines.

1.03 Submittals

A. All submittals shall be made in accordance with the requirements of Section 01 33 23 of these Specifications.

B. The Contractor shall submit to the Engineer, for review, the following information concerning the materials the Contractor proposes to use in work covered by this Section:

1. A list of all components (paints or other materials) to be used in each painting system required herein.

2. A complete descriptive specification, including manufacturer's data sheet, of each component.

3. Prior to completing the purchase and delivery of the coating material selected by the Contractor, the Contractor shall obtain a letter from the material supplier stating that the selected material is suitable and compatible for application and use as directed under these Specifications, and that if properly applied will provide metal protection and a pleasing appearance for five years or longer.

4. A color chart for each product to be applied.

1.04 Project Meeting

Prior to ordering any of the materials covered under this Section, the Contractor, Engineer, painting subcontractor and paint manufacturer’s representative shall attend a progress meeting, and review the work to be performed under this Section.

1.05 Painting Requirements

A. Finish paint all exposed surfaces except prefinished items, anodized or lacquered aluminum, stainless steel and copper surfaces. Exposures and surfaces are defined in 3.07 of this Section. Items to be left unfinished or to receive other types of finishes,

such as tile, are specifically shown on the Drawings or specified.

1. Unpainted Products: Full field cleaning and priming will be performed in accordance with specification requirements for unpainted products. Maintain adequate equipment on the site to assure proper cleaning.

2. Shop Primed Products

    a. Manufactured products may be shop cleaned and primed. Shop cleaning must equal or exceed cleaning specified in the Painting Schedule. Clean as specified and reprime all abrasions, weld splatter, excessive weathering and other defects in the shop prime coating.

    b. Manufacturers furnishing shop primed products shall certify that cleaning was performed in accordance with specification requirements and that the specified primer was used.

    c. Fully field clean and prime any shop primed products which the Engineer determines that were not cleaned in accordance with the Specifications prior to priming, that the wrong primer was applied, that the primer was applied improperly, or has excessively weathered, or that the product is otherwise unacceptable.

3. Finish Painted Products: Certain products such as electrical control panels and similar items may, with the approval of the Engineer, be furnished finish painted. Properly protect these products throughout the Project to maintain a bright and new appearance. If the finish surfaces are defaced, weathered or not of the selected color, repaint as necessary.

4. Existing Surfaces

    a. Properly protect existing finish painted items and surfaces from damage throughout the Project.

    b. Repair any damage to existing coatings repaired in accordance with the requirements of this Section, at no expense to the Owner.

5. Hardware: Remove all electrical plates, surface hardware, fittings and fastenings prior to painting operations. These items are to be carefully stored, cleaned and replaced upon completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

1.06 Quality Assurance

A. Only those systems and components which are judged acceptable by the Engineer shall be utilized in the work covered by this item. No materials shall be delivered to the job site until the Engineer has evaluated their acceptability.

B. The following information shall be included on the label of all containers of materials supplied under this item:

1. Manufacturer's name.

2. Type of paint or other generic identification.

3. Manufacturer's stock number.

4. Color (if any).

5. Instructions for mixing, thinning, or reducing (as applicable).

6. Manufacturer's application recommendations.

7. Safety and storage information.

C. All coating material used on this Project shall be purchased specifically for this Project and furnished in new, unopened containers.

D. The Contractor shall obtain the Engineer's review of the first finished room, space, area, item or portion of work of each surface type and color specified. The first room, space, area, item or portion of work which is acceptable to the Engineer shall serve as the Project standard for all surfaces of similar type and color. Where spray application is utilized, the area to be reviewed shall not be smaller than 100 square feet.

1.07 Manufacturer’s Representative During Painting Operations

An authorized representative of each coating manufacturer shall be present at the start-up and weekly during painting operations. Such representatives shall instruct and observe the Contractor’s workers on the manufacturer’s application recommendations.

1.08 Testing Equipment

A. The Contractor shall furnish and make available to the Engineer the following items of testing equipment for use in determining if the requirements of this Section are being satisfied. The specified items of equipment shall be available for the Engineer's use at all times when field painting or surface preparation is in progress:

1. Wet film gauge.

2. Surface thermometer.

3. "Surface Profile Comparator" as published by SSPC (with magnifier and three discs).

4. "Visual Standard for Abrasive Blast Cleaned Steel", as published by SSPC (SSPC-VIS 1-89).

5. "Visual Standard for Power- and Hand-Tool Cleaned Steel", as published by SSPC (SSPC-VIS 3).

6. Holiday (pin hole) detector (low voltage).

7. Sling-psychrometer or other on-site device used to calculate relative humidity and ambient air temperature.

8. Magnetic dry film gauge, meeting the requirements of SSPC-PA2, Type I or Type II, including calibration.

9. “Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting” as published by SSPC (SSPC-VIS 4).

1.09 Product Handling

A. Delivery:

1. Deliver materials in original, sealed containers of the manufacturer with labels legible and intact.

2. Each container shall be clearly marked or labeled to show paint identification, date of manufacture, batch number, analysis or contents, and special instructions. At all times a copy of every component’s MSDS shall be available.

B. Storage:

1. Store only acceptable Project materials on the Project site.

2. Store material in a suitable location and in such a manner as to comply with all safety requirements including any applicable federal, state and local rules and requirements. Storage shall also be in accordance with the instructions of the paint manufacturer and the requirements of the insurance underwriters.

3. Restrict storage area to paint materials and related equipment.

4. Place any material, which may constitute a fire hazard, in closed metal containers and remove daily from the Project site.

C. Material Safety Data Sheets: A copy of every component’s MSDS shall be available at all times on the Project site.

1.10 Material Schedules

Material Schedules at the end of this Section list prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for the particular substrate. Maintain the unity of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

Part 2 Products

2.01 Abrasive Material

A. The abrasive used in the abrasive cleaning shall be a material acceptable to the regulatory agencies of the State of Tennessee for use in the described work. The material shall be of a shape and size to produce a uniform surface of acceptable profile to properly bond the prime coat.

B. The abrasive may be a combination of materials, including additives such as dust inhibitors and Blastox®.

C. If Blastox® is used, it shall be blended with the blasting abrasive by a blending facility authorized by the TDJ Group, Inc.

2.02 Coating Materials

A. Acceptable Manufacturers: The only acceptable manufacturers and products shall be those listed in the Material Schedules at the end of this Section.

B. All applicable data currently published by the paint manufacturer relating to surface preparation, coverages, film thickness, application technique, drying and overcoating times is included by reference as a part of this Section. It is the responsibility of the Contractor to obtain and fully understand the appropriate data sheets for the coatings specified.

C. Products:

1. Paints shall be factory mixed and delivered to the site in unbroken original packages bearing the manufacturer's name and brand designation and shall be applied in strict accordance with the manufacturer's printed specifications. Two-component coatings shall be mixed in accordance with manufacturer's instructions. All two-component coatings, once mixed, shall be applied within the pot-life recommended by the manufacturer.

2. Unless otherwise specified, paints shall be of the best grade. All thinners, driers, varnish, etc., shall be of the best grade and shall be furnished by the coating manufacturer for use with the specified paints.

D. Colors: The Owner will select the colors to be used on the various portions of the work. Provide color cards for the coatings proposed. Where more than one coat of paint is required, job tint off-shade the paint for each undercoat to show complete coverage.

2.03 Mixing and Tinting

A. When possible, all paints and other materials shall be mixed and tinted by the paint manufacturer prior to delivery to the job site.

B. When job site mixing and/or tinting is required, the manufacturer's recommendations shall be strictly adhered to. The Contractor shall be solely responsible for the proper conduct of all on-site mixing and/or tinting.

2.04 Pipe and Equipment Identification

Different colors will be used on pumps, motors, valves, piping systems and other surfaces as shown in Table 1.

2.05 OSHA Safety Color Usage Guide

A. OSHA Safety colors, in accordance with ANSI Z3.1, shall be used for marking physical hazards and safety equipment and locations. The following OSHA Safety Color Usage Guide will be used in determining the coating color and type of marking required.

Safety Red	Safety Orange	Safety Yellow	Safety Green
		Physical Hazard CAUTION (Generally used with Black in checks or stripes)	Safety Equipment and Locations
Fire protection equipment	Exposed box housings	Unguarded edges of platforms	First aid kits and stretchers
Fire boxes	Exposed edges of pulleys, gears, etc.	Elevator door edges	First aid signs, dispensaries and drinking water stations
Extinguishers	Exposed box housings	Bollards	
Exit signs	Safety starting buttons	Pulley Blocks	
Sprinkler piping		Material handling equipment	
Portable containers of flammable liquids			
Emergency stop bars			

Part 3 Execution

3.01 General

A. Protect other surfaces from paint and damage. Furnish sufficient shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted. Repair damage as a result of inadequate or unsuitable protection.

B. The Contractor's on-site representative shall keep a record of work performed each day and shall submit it to the Engineer weekly. The forms for this record will be furnished by the Engineer.

C. No coat of paint shall be applied until the surface has been inspected and accepted by the Engineer. The Contractor shall give at least 24 hours notice to the Engineer when cleaning is to be performed to prevent inspection delays. The Contractor shall provide

the necessary access for inspection by the Engineer.

D. Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched-up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle, distance from surface, shielding and masking. If damage is too extensive or uneconomical to touch-up, then the item shall be re-cleaned and coated or painted as directed by the Engineer.

3.02 Cleaning Area

Construct a temporary shed no smaller than 40 feet wide and 60 feet long for field cleaning, including blasting and priming operations. Maintain this area for all painting operations until all such work has been completed and approved. Provide all fixtures and appurtenances required to perform the work, including fixtures to support the work off the ground and proper storage facilities.

3.03 Environmental Conditions

A. Environmental conditions which affect coating application include, but are not necessarily limited to, ambient air temperature, surface temperature, humidity, dew point and environmental cleanliness. Comply with the manufacturer's recommendations regarding environmental conditions under which coatings may be applied.

B. Surface preparation and cleaning of the exterior surfaces must be performed during periods of still air or only a slight breeze so that fallout of the dust produced does not drift onto adjacent property. The Owner reserves the right to temporarily stop the Contractor from exterior blasting (or painting) when by observation it is apparent that the wind direction or velocity prevents compliance with this requirement. Any clean-up of fall-out on adjacent property shall be the responsibility of the Contractor.

C. All blast residue from the tank shall be properly disposed of off-site by the Contractor.

D. No paint shall be applied upon damp or frosty surfaces, or in wet or foggy weather. No paint shall be applied in temperatures below 40 degrees F, when freezing (32 degrees F) is predicted within 24 hours of application, or under temperature or humidity conditions not recommended by the manufacturer. However, in no case shall coatings be applied when the surface temperature is within 5 degrees F of dew point, and in no cases shall coating be applied over a damp surface.

3.04 Safety

A. General:

1. The Contractor is responsible for the safety of all workers and subcontractors and suppliers performing work on this Project.

2. The Contractor shall protect the Owner, their agents, and the General Public from harm attributable to the Contractor's performance, or non-performance, of the work on this Project. The protection shall include, but not be limited to, providing the necessary safety equipment and instructions for its use by the Owner, and their agents.

3. The Contractor shall protect the existing structures and environment from damage attributable to the Contractor's performance, or non-performance, of the work on this Project.

4. The Contractor shall comply with the applicable standards of 29 CFR Part 1910 and 29 CFR Part 1926.

5. The listing of the following potential hazards shall in no way relieve the Contractor's responsibility for safety on this Project.

B. The interior of tanks may be considered a confined space hazard. The Contractor shall confirm to the Owner in writing, prior to the start of the Project that the Contractor has training programs, trained personnel, and is otherwise in compliance with CFR 1910.146.

3.05 Surface Preparation

A. General: All surfaces shall be thoroughly clean, dry, and free from oil, grease or dust. All concrete shall have cured a minimum of 21 days before painting. All fabricated metal products shall have all weld flux and weld spatter removed and sharp peaks in welds ground smooth. The Engineer will inspect the surface preparation prior to the application of coatings. If the preparation is found to be satisfactory, a written order will be given to proceed with coatings.

B. Ferrous Metals: Standards for the surface preparation of ferrous metals required in the Material Schedules are the standards of the SSPC – The Society for Protective Coatings (SSPC, SP-1 through SP-10). Inspection of these surfaces will be evaluated by field comparison with visual comparator panels. These panels shall be securely wrapped in clear plastic and sealed to protect them from deterioration and marring.

C. Concrete Surfaces: For all concrete surfaces, the following surface preparation shall be employed:

1. CC-1 - Wash: Wash and scrub all surfaces with a solution of 1-1/2 ounces of soap chips and 1-1/2 ounces of trisodium phosphate in each gallon of water used. Flush away all soap and dirt with clean water. After this washing the surface will be re-checked and any rough areas not suitable for painting shall be

sandblasted smooth.

2. CC-2 - Acid Etch: Surface preparation for painting shall not commence until 7 days after the concrete has been pronounced cured. Wash and scrub all surfaces with a solution of 1-1/2 ounces of soap chips and 1-1/2 ounces of trisodium phosphate in each gallon of water used. Flush away all soap and dirt with clean water and then etch the surface with a 15 percent or stronger solution of muriatic acid until an openfaced granular texture, similar to fine sandpaper, is obtained. Any areas that remain smooth are to be re-etched until the desired texture is achieved. Flush and scrub away with clear water all acid and loosened particles.

3. CC-3 - Blast Cleaning: Remove all form oil and dirt by washing the surface with a solution of 1-1/2 ounces of soap chips and 1-1/2 ounces of trisodium phosphate in each gallon of water used. Blast clean all laitance and other foreign material from the surface of the concrete until an openfaced granular texture similar to fine sandpaper is achieved. These results should be accomplished with blast cleaning similar to "brush blasting" steel surfaces.

4. Prior to the surface preparation noted in Paragraphs 1, 2, and 3 above, all concrete surfaces to be painted shall have a rubbed stone finish.

D. Wood Surfaces: All wood surfaces shall be clean, dry and adequately protected from dampness. Sandpaper to a smooth, even surface, then dust off. After priming coat has dried, apply shellac to all knots, pitch and resinous sapwood. Putty all nail holes, cracks, open joints and other defects; color putty to match finish paint or stain.

3.06 Application

A. Surface Preparation: After specified surface preparation, all surfaces shall be brushed free of dust or foreign matter. Surfaces shall be completely dry before any paint is applied. All voids, open or hollow places in masonry shall be repaired with an epoxy patching compound.

B. Application: Paint shall be evenly spread in the proper thickness, so that there shall be no drops, runs or saggings of the coating. Where runs and drops do occur, they shall be removed and the surface re-coated to the satisfaction of the Engineer. Sufficient time, as directed by the manufacturer, shall be allowed for the paint to dry before the application of succeeding coats.

C. Protection of Work Area: Use drop cloths or other suitable means to protect other surfaces of the structure or equipment in place. Upon completion of the work, remove all paint spots from surfaces as directed by the Engineer.

D. Inspection: The Engineer will inspect each coat prior to the application of subsequent coats. If the work is found to be satisfactory, a written order will be given to proceed.

E. Defective Work: Remove and replace, at the direction of the Engineer, any painting work found to be defective or applied under adverse conditions.

3.07 Painting Schedule

A. General: The Painting Schedule summarizes the painting systems to be applied to the various surfaces. Items which appear in the Painting Schedule are defined in following Paragraphs.

B. Exposure terms refer to the environmental conditions to which different surfaces may be exposed. A surface may exist in more than one exposure, e.g. an exterior wall can be categorized not only as "above grade", but also as "below grade", where the exposure is delimited by the grade line.

1. Interior: All surfaces within the confines of a building or other enclosure not constantly exposed to weather, including concealed surfaces subject to trapped moisture, heat or other deteriorating conditions and all surfaces exposed to view.

2. Exterior:

a. Above Grade: All surfaces above finished grade and exposed to weather.

b. Below Grade: All surfaces below the finished grade line. Building surfaces with this exposure shall only be painted when they are structurally common with an interior surface, e.g. exterior walls of a dry pit, not the exterior wall of a below grade tank.

3. Submerged: All surfaces below a water surface or exposed to spray. Surfaces exposed to spray include all areas within 6-inches of maximum water surface in quiescent tanks and within 18-inches of maximum water surface in mixed or agitated tanks. Building surfaces with this exposure shall only be painted when surfaces above water level have an interior exposure.

C. Surfaces:

1. Floors: Interior surfaces subject to foot or roller traffic.

2. Building Surfaces: All structural and architectural surfaces except floors. Building surfaces include, but are not limited to, doors and frames, windows and frames, floor doors and walls.

3. Piping: All plumbing and process piping and accessories including valves, fittings, pipe supports, electrical conduit and similar related items.

4. Equipment: All mechanical, electrical, and architectural equipment, items, and accessories installed in the work and not defined above. Equipment includes, but is not limited to: pumps, motors, cabinets, ducts, tanks and process equipment.

3.08 Material Schedules

Material Schedules list pretreatment coats, wash coats, seal coats, prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for the particular substrate. Maintain the unity

of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

3.09 Maintenance Materials

Furnish the Owner at least one gallon of each type and color of paint used for finish coats and one gallon of each type of thinner required. Containers shall be tightly sealed and clearly labeled.

3.10 Coating Repair

Where coatings have been damaged, the surfaces shall be cleaned and repainted. Surface preparation shall conform to SSPC-SP 11, and feathered into undamaged areas. Painting shall be performed as specified for the damaged surface.

Painting Schedule

Exposures	Surfaces	System Schedules				
		Concrete & Concrete Block Substrate	Non-Ferrous Metals Substrate	Ferrous Metals Substrate	Wood Substrate	Drywall Substrate
Interior	Floors	-	-	-	-	-
	Building Surfaces**	134	-	144	221	160
	Equipment*	-	157	144	-	-
	Piping*	-	157	144	-	-
Exterior Above Grade	Building Surfaces**	234	257	247	221	-
	Equipment*	-	257	247	-	-
	Piping*	-	257	247	-	-
Exterior Below Grade	Piping*	-	257	247	-	-
Submerged Water	Piping*	-		344W	-	-
	Equipment*	-		344W	-	-
Submerged Wastewater	Piping*			544		
	Equipment*			544		

* See coating, lining, and/or painting paragraphs in individual piping or equipment Specification Sections.

** See finish schedule for where each type shall be used.

Schedule Numbering Guide

First Number - Exposure		Second Number - Substrate		Third Number – Coating Type		Final Letter	
1	Interior and Weather Protected	1	Non-Ferrous Metals	1	Alkyd	S	Sewage
2	Exterior Weather Exposure	2	Wood	2	Asphaltic	W	Potable Water
3	Submerged in Potable Water but Protected from Sunlight	3	Concrete, Concrete Block, Masonry	4	Epoxy	F	Floors
4	Submerged in Potable Water and Exposed to Sunlight	4	Ferrous Metals	5	Vinyl	C	Severe Chemical Exposure
5	Submerged in Wastewater	5	Galvanized Ferrous Metals	6	Coal Tar		
		6	Drywall	7	Polyurethane		
		7	PVC Pipe	8	Acrylic		
				9	Zinc		
				0	Latex		

Material Schedules

System: 134
Type: Epoxy
Use: Interior Concrete and Masonry
Surface Preparation: CC-1

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st		Sanitile 600/600 TG	Series 130 Envirofill	Polyfill Block Filler	Amerlock 400 BF	Kem Cati-Coat HS Epoxy Filler
2nd	4.0	Sanitile 655	Series 66 Hi-Build Epoxoline	PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy
3rd	4.0	Sanitile 655	Series 66 Hi-Build Epoxoline	PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy
System	8.0					

System: 144
Type: Epoxy
Use: Interior Ferrous Metal
Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	3.0 – 5.0	Carboguard 893 SG	Series N69 Hi-Epoxoline Primer	PermaClean II Primer	Amerlock 2/400	Macropoxy 646 FC Epoxy, Dura-Plate 235
2nd	4.0 – 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline	PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy, Dura-Plate 235
3rd	4.0 – 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline	PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy, Dura-Plate 235
System	12.0					

System: 147
Type: Polyurethane
Use: Interior Ferrous Metal
Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	3.0	Carboguard 893 SG	Series N69-Color Epoxoline Primer	PermaClean II Primer	Amerlock 2/400	Macropoxy 646 FC Epoxy
2nd	4.0 – 6.0	Carboguard 893 SG	Series N69-Color Hi-Build Epoxoline	PermaClean II Epoxy	Amercoat 2/400	Macropoxy 646 FC Epoxy
3rd	2.0 - 4.0	Carbothane 134 HG	Series 72-Color Endura-Shield	Indurethane 6600 Plus	Amercoat 450H	Sherthane 2K Urethane, Hi-Solids Polyurethane
System	10.0					

System: 157
Type: Polyurethane
Use: Galvanized Metals
Surface Preparation: SP-1 With Manufacturer's Recommended Pre-Treatment

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	5.0	Carboguard 893 SG	Series 66 Hi-Build Epoxoline	Pretreat using Vinyl Wash Primer PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy
2nd	2.0	Carbothane 134 HG	Series 72 Endura-Shield	Indurethane 6600 Plus	Amercoat 450H	Sherthane 2K Urethane, Hi-Solids Polyurethane
System	7.0					

System: 160
Type: Latex
Use: Interior Drywall
Surface Preparation: Clean and Dry

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	1.0	Sanitile 120	Self-Priming	AC-210	SpeedHide 6-2	Prep Rite 200 Interior Latex Primer
2nd	1.5 – 3.0	Carbocrylic 3359	Series 1029	AC-230	Ultra-Hide 250 Latex Flat	Prep Rite 200 Interior Latex Flat
3rd	2.0	Carbocrylic 3359	Series 1029	AC-230	Ultra-Hide 250 Latex Flat	Prep Rite 200 Interior Latex Flat
System	5.0					

System: 168
Type: Acrylic Epoxy
Use: Interior Drywall
Surface Preparation: Clean & Dry

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	1.0	Sanitile 120	51-792 PVA Sealer	AC-303	SpeedHide 6-2	Prep Rite 200 Interior Latex Primer
2nd	2.0 – 4.0	Carbocrylic 255	Series 113-Color H.B. Tneme-Tufcoat	Ac-303	Aquapon WB 98-1	Waterbased Catalyzed Epoxy
3rd	2.0 - 4.0	Carbocrylic 255	Series 113-Color H.B. Tneme-Tufcoat		Aquapon WB 98-1	Waterbased Catalyzed Epoxy
System	5.0					

System: 221
Type: Alkyd
Use: Exterior Wood

Surface Preparation: As Specified For Wood

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	2.0	Sanitile 120	Series 36-603 Undercoater	AC301	Multi-Prime 97-680	A-100 Alkyd Primer
2nd	1.5 – 2.0	Carbocoat 45	Series 2H-Color Enduratone	Amorlux 2500 Enamel	7-Line Series	Industrial Enamel B-54
3rd	1.5 – 2.0	Carbocoat 45	Series 2H-Color Enduratone	Armorlux 2500 Enamel	7-Line Series	Industrial Enamel B-54
System	5.0					

System: 234
Type: Epoxy
Use: Exterior Concrete and Masonry

Surface Preparation: CC-3
Note: Concrete shall be at least 28 days old before any of these coatings are applied.

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	8.0 – 10.0	Sanitile 600/600 TG	Series 156 Enviro-Crete	AC-403	Perma Crete 4-22	Loxon XP
2nd	5.0 – 7.0	Carboguard 890	Series 156 Enviro-Crete	AC-403	Perma Crete 4-22	Loxon XP
3rd	As Needed	-			- - -	
System	13.0					

System: 245 Surface Preparation: SP-5
Type: Vinyl Ester
Use: Ferrous Metal

Coat	Minimum Dry Film Thickness (Mils)	Tnemec	Sauereisen	Carboline	PPG	Sherwin Williams
1st	12.0 – 18.0	Series 120-5002 Vinester Beige Primer	Fibercrete	Plasite 4007 Off-White	PolySpec PE-310 Primer	Magnalux 304 FF Flake Filled Vinyl Ester
2nd	12.0 – 18.0	Series 120-5001 Vinester Gray Finish	Fibercrete	Plasite 4007 Gray	PolySpec VE-803 Flake Filled	Magnalux 304 FF Flake Filled Vinyl Ester
System	24.0					

System: 247 Surface Preparation: SP-10
Type: Polyurethane
Use: Exterior Ferrous Metal

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	3.0	Carboguard 893 SG	Series N69 Epoxoline	PermaClean II Primer	Amerlock 2/400	Macropoxy 646 FC Epoxy
2nd	4.0 - 6.0	Carboguard 893 SG	Series N69 Color Epoxoline	PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy
3rd	2.0 - 3.0	Carbothane 134 HG	Series 72 Endura-Shield	Indurethane 6600 Plus	Amercoat 450H	Sherthane 2K Urethane, Hi-Solids Polyurethane, Acrolon 218 HS
System	11.0					

System: 257 Surface Preparation: SP-1
Type: Polyurethane
Use: Exterior Non-Ferrous Metals

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	4.0 - 6.0	Carboguard 893 SG	Series 66-Color Hi-Build Epoxoline	PermaClean II Epoxy	Amerlock 2/400	Macropoxy 646 FC Epoxy
2nd	2.0 - 3.0	Carbothane 134 HG	Series 72-Color Endura-Shield	Indurethane 6600 Plus	Amercoat 450H	Sherthane 2K Urethane, Hi-Solids Polyurethane
System	8.0					

System: 333W Surface Preparation: CC-3
Type: Epoxy
Use: Submerged Concrete – Potable Water

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	4.0 - 6.0	Carboguard 61 Epoxy	Series N140-1255 Pota-Pox Beige	AquaClean Epoxy	Amerlock 2	Macropoxy 646 NSF Epoxy
2nd	4.0 - 6.0	Carboguard 61 Epoxy	Series N140 Pota-Pox OOWH White	AquaClean Epoxy	Amerlock 2	Macropoxy 646 NSF Epoxy
3rd	2/0 – 3.0	Carboguard 61 Epoxy	Series N140 Pota-Pox OOWH White	AquaClean Epoxy	-	Macropoxy 646 NSF Epoxy
System	10.0					

System: 344W
Type: Epoxy
Use: Submerged Ferrous Metal-Potable Water

Surface Preparation: SP-10
All coatings provided under this system shall be NSF 61 approved

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	3.0	Carboguard 61 Epoxy	Series N140 1211 Pota-Pox Red	AquaClean Epoxy	Amerlock 2	Macropoxy 646 NSF Epoxy
2nd	4.0 - 6.0	Carboguard 61 Epoxy	Series N140-1255 Pota-Pox Beige	AquaClean Epoxy	Amerlock 2	Macropoxy 646 NSF Epoxy
3rd	4.0 – 6.0	Carboguard 61 Epoxy	Series N140-15BL Pota-Pox Tank White	AquaClean Epoxy	Amerlock 2	Macropoxy 646 NSF Epoxy
System	12.0					

System: 444
Type: Epoxy
Use: Submerged Ferrous Metal

Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	4.0 - 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline	AquaClean Epoxy	Amerlock 2	Macropoxy NSF Epoxy
2nd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline	AquaClean Epoxy	Amerlock 2	Macropoxy NSFEpoxy
3rd	4.0 – 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline	AquaClean Epoxy	Amerlock 2	Macropoxy 646 FC Epoxy
System	12.0					

System: 542
Type: Asphaltic
Use: Below Grade Piping
Surface Preparation: SP-2 or SP-3

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	8.0 – 12.0	Bitumastic 300 M	46-465 H.B. Tnemecol	Ruff Stuff 2100	78HB	Targuard
2nd	As Needed					
System	10.0					

System: 544
Type: Epoxy
Use: Submerged Ferrous Metal
Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	PPG	Sherwin Williams
1st	4.0 - 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline	Perma-Clean II Epoxy	Amerlock 2	Macropoxy 646 Epoxy, Dura-Plate 235
2nd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline	Perma-Clean II Epoxy	Amerlock 2	Macropoxy 646 Epoxy, Dura-Plate 235
3rd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline	Perma-Clean II Epoxy	Amerlock 2	Macropoxy 646 Epoxy, Dura-Plate 235
System	12.0					

Pipe Identification and Color Coding

	Paint Colors		
Pipe System	Pipe	Letters and Arrows	Stencil Text
Air (Compressed)	Light Green	Black	Air
Air (Process)	Light Green w/Black Bands	Black	Air Proce4ss
Air, Instrument	Light Purple	Black	Air Instrument
Alum	Dark Blue/w Light Brown Bands	Light Brown	Alum
Ammonia Gas	Yellow w/Dark Green Bands	Dark Green	Ammonia Gas
Ammonia Solution	Yellow w/Light Blue Bands	Light Blue	Ammoniation Solution
Backwash Water	Light Grey w/Light Green Bands	Light Green	Backwash Water
Chlorine Gas	Yellow w/Red Bands	Red	Chlorine Gas
Chlorine Solution	Yellow	Black	Chlorine Solution
Dewatering	Black w/Orange Bands	Orange	Dewatering
Digested Sludge	Dark Brown w/Red Bands	Red	Digested Sludge
Drains (Plant)	Black w/White Bands	White	Drain
Effluent, Secondary	Light Grey w/Black & White Bands	Black	Secondary Effluent
Filter Effluent	Light Grey w/White Bands	White	Filter Effluent
Filtrate	Black w/Yellow Bands	Yellow	Filtrate
Foam Spray Water	Dark Green	White	Foam Spray Water
Gasoline	Orange	White	Gasoline
Hydraulic Fluid	Purple	White	Hydraulic Fluid
Injector Water	Light Grey w/Purple Bands	Light Purple	-
Lubricating Oil/Grease	Dark Blue w/Red Bands	Red	Lubricant Oil/Grease
Mixed Liquor (Aeration Tank Effluent)	Light Grey w/Pink Bands	Pink	Mixed Liquor
Polymer	Pink w/Dark Green Bands	Dark Green	Polymer
Potable Water	Light Blue	White	Potable Water (Cold) (Hot)
Raw Sewage (Wastewater)	Dark Grey	Orange	Sewage
Return Activated Sludge	Light Brown	White	Return Sludge
Scrubber Water	Light Green w/Dark Brown Bands	Dark Brown	-

	Paint Colors		
Pipe System	Pipe	Letters and Arrows	Stencil Text
Scum	Light Brown w/Pink Bands	Pink	Scum
Scum Decant	Light Brown w/Red Bands	Red	Scum Decant
Sump Drains (Plant)	Light Grey w/Orange Bands	Orange	Sump
Thickener Filtrate (Supematant)	Light Grey w/Dark Brown & Light Brown Bands	Light Brown	Thickener Filtrate (Supermatant)
Thickened Sludge	Light Brown w/Light Green Bands	Light Green	Thickened Sludge
Utility Water	Dark Green w/Yellow Bands	Yellow	Utility Water (Non-Potable)
Vents (Plant)	Black	White	Vent (Plant)
Waste Activated Sludge	Light Brown w/Black Bands	Black	Waste Sludge

Color Coding General Notes

1. All banding to be 2-inches wide and four feet on center.

2. Sample, drain, vent, metering, blowoff, decant, and hot lines shall be painted the same color combination as the piping system from which the line originates unless specified otherwise above. The additional pertinent text shall be applied to the pipe.

3. Insulated pipe, jacketed with canvas, shall be painted with the color combination specified above.

4. Insulated pipe, jacketed with aluminum and/or stainless steel shall have the jacket unpainted. When valves and fittings for such lines are not insulated, the valves and fittings shall be color coded.

5. Building service lines such as plumbing lines, HVAC lines, and electrical conduit, shall not be color coded but shall be painted the same color as the background construction.

6. All sludge lines not otherwise specified above shall be painted dark brown and stenciled as directed by the Engineer.

7. All polymer lines not otherwise specified above shall be painted pink and stenciled as directed by the Engineer.

8. All lettering shall be done in capital letters of approved size and type.

9. Legend symbols shall be applied on piping on every run and spaced not greater than 8 feet apart.

10. Text shall be applied on piping in the middle of pipe runs for runs under 50 feet or in one room, whichever is the least distance. On runs greater than 50 feet, text shall be applied at third points in the run and no more than 35 feet apart.

11. Pumps, chemical tanks and other items of equipment to be painted shall be painted a color corresponding to their service, in accordance with the above schedule.

END OF SECTION

Part 1 General

1.01 Scope

A. Nameplates.

B. Wire and cable markers.

1.02 Submittals

A. Submit product data.

B. Include schedule for nameplates and tape labels.

Part 2 Products

2.01 Materials

A. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.

B. Wire and Cable Markers: Permanent PVC, yellow or white, with legible machine-printed black markings. Do not provide vinyl cloth type.

1. Split sleeve, equal to T&B Type SM or Brady Dura Sleeve.

2. Heat-shrinkable sleeves, equal to Raychem TMS or T&B WHT Shur-Code.

3. Self-laminating, printed equal to Brady XC.

Part 3 Execution

3.01 Installation

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations. Exception: Two-part epoxy glue may be used for NEMA 4/4X enclosures.

3.02 Wire Identification

Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic

and interconnection diagrams for control wiring.

A. Provide wire/cable markers for all conductors and cables at each end and at intermediate pull points. Where conductors are bundled together and pulled straight through a box and in manholes/handholes tag each bundle with a TO/FROM label in lieu of individually labeling each wire. Where wires are spliced or tapped provide an individual label for each wire, except for neutrals (which are identified by color coding).

B. Label analog cables with a marker that describes INSTRUMENT TAG / DESTINATION PANEL. Label each conductor in the cable with INSTRUMENT TERMINAL NO. / DESTINATION TERMINAL NO.

C. Label digital communication cables and fiber optic cables with a TO/FROM marker.

D. Label the conductors of discrete signals from instruments and devices with the signal's LOOP NUMBER / DESTINATION TERMINAL NO.

E. Label the conductors of power feeders and branch circuits with the equipment designation of the source equipment plus a suffix that includes the bucket number, the compartment number, or the panelboard circuit identifier.

3.03 Nameplate Engraving Schedule

A. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter height: 1/8-inch for individual switches and loads served, 1/4-inch for distribution and control equipment identification.

B. Panelboards, Switchboards and Motor Control Centers: 1/4-inch; identify equipment designation; 1/8-inch; identify voltage rating and source.

C. Transformers: 1/4-inch; identify equipment designation; 1/8-inch; identify primary and secondary voltages, primary source, and secondary load and location.

D. Switches and Receptacles: Where indicated provide nameplates with 1/8-inch letters.

END OF SECTION

Part 1 General

1.01 Scope

Squirrel cage induction motors.

1.02 Related Work

All motor driven equipment sections except hermetic refrigerant motor-compressors and submersible motors.

1.03 Work Specified Elsewhere

Except as noted, equipment specified in this Section is provided under other Divisions. Include, under this Section, receiving, storage, handling and wiring.

1.04 Quality Assurance

A. Equipment Standards: NEMA MG-1.

B. Efficiency: Premium design; guaranteed minimum values determined in accordance with IEEE Standard 112, Test Method B including stray load loss as follows:

HP	Synchronous RPM			
	3,600	1,800	1,200	900 & Less
20 - 49	91%	92.4%	92.4%	90.2%
50 - 99	92.4%	93.6%	93%	93%
100 & Above	94.1%	95%	94.1%	93%

C. For motors rated 1 to 19 HP, provide efficiency in accordance with ASHRAE Standard 90.1 - 2004, Table 10.8.

1.05 Submittals

A. Submit shop drawings showing certified dimensions and nameplate data.

B. Submit expected and guaranteed minimum efficiency values for operation at 100, 75, 50 and 25 percent load.

C. Submit bearing type, lubrication, and bearing life.

D. Submit space heater voltage and wattage.

E. Submit description and rating of motor thermal protection.

F. Submit hot and cold thermal damage curves; locked rotor stall time when hot and cold; and running and stopped cooling times.

G. Submit factory test results.

H. Submit field test results.

Part 2 Products

2.01 Acceptable Manufacturers

Motors shall be manufactured by General Electric, Reliance, Toshiba, Siemens, Teco-Westinghouse or WEG.

2.02 Ratings

A. Horsepower (HP): As noted. Where no value is noted, match the requirements of the driven equipment.

B. Phase:

1. Less than 1/2 HP: Single phase.

2. 1/2 HP and Larger: Three phase.

C. Voltage:

1. Single Phase Motors: 115/200/230 volt reconnectable. Exception: Single voltage motors will be permitted if the voltage matches the supply characteristics shown on the Electrical Drawings.

2. Three-Phase Motors: 200/230/460 volt reconnectable. Exception: Single voltage motors will be permitted if the voltage matches the supply characteristics shown on the Electrical Drawings.

D. Speed, Revolutions Per Minute (RPM): As noted. Where no value is noted, match the requirements of the driven equipment.

E. Torque and Starting Current: NEMA design B unless otherwise noted. Exceptions: Provide NEMA design C or D where required by the driven equipment. Unless specifically noted NEMA design A motors are not acceptable.

F. Service Factor: 1.15.

G. Insulation and Temperature Rise: Except as noted, Class B or Class F insulation with temperature rise, measured by resistance, corresponding to the insulation class in accordance with NEMA standards for operation in a 40 degree C ambient.

2.03 Construction

A. Enclosure: Totally enclosed fan cooled (TEFC) unless otherwise noted.

B. Windings: Copper. Exception: Aluminum windings are acceptable where the aluminum to copper transition is done by the manufacturer with copper leads brought out to the motor conduit box.

C. Bearings: Minimum 100,000 hours for direct coupled and 40,000 hours for belted applications B-10 life rating per AFBMA standards.

D. Multispeed Motors: Two-winding type.

E. Starting: Suitable for full voltage starting.

2.04 Accessories

A. Provide lifting eyes for 182 and larger frame size. Provide oversized conduit box for 250 and larger frame size.

B. Where noted provide normally closed thermostat for winding protection.

C Nameplate: Permanently affixed and stamped so as to permit recovery of the nameplate data in the event the nameplate is painted over.

D. CTs: ANSI C57.13; window type; provide as noted; mounted in terminal box and arranged for differential protection with main and neutral leads of each phase passing through their own CT.

2.05 Inverter-Fed Motors

A. Equipment Standards: Inverter duty and in accordance with NEMA MG-1, Part 31, "Definite-Purpose Inverter-Fed Motors". Usual service conditions per MG-1 31.10.2 apply unless otherwise noted.

B. Service Factor: 1.0.

C. Insulation and Temperature Rise: Class F insulation with temperature rise in accordance with Class B limits.

D. Peak Voltage and Rise Time: In accordance with MG-1 31.40.4.2.

E. Provide shaft grounding or insulated bearings for motors larger than 320 frame size. If insulated bearings are used, provide insulated coupling if the driven equipment bearings are susceptible to damage by current flow.

Part 3 Execution

3.01 Installation

A. Verify clearances and alignment prior to operation.

B. Lubricate in accordance with the manufacturer's instructions.

C. Check rotation and correct as necessary. Make correction to preserve conductor color coding.

END OF SECTION

Part 1 General

1.01 Scope

Low voltage motor control centers.

1.02 Related Work

Section 26 29 23.13 – Adjustable Speed Drives.

1.03 Quality Assurance

A. Provide motor control centers manufactured and tested in accordance with NEMA ICS-2 and UL 845.

B. Provide a UL label where applicable, on each unit and each vertical section. If a unit or section cannot be UL labeled so note on submittals along with reasons for same.

C. NEMA Classification: Class IS, Type B.

1.04 Submittals

A. Submit shop drawings in accordance with NEMA classification as noted above and additional information as noted in the following paragraphs.

B. Elementary Diagrams: Provide a separate elementary diagram for each starter unit following the format shown on the Drawings and showing numbered terminal points and interconnections to the first level of remote devices.

C. Reference Data: Submit one set of full size (11 x 14-inch) time current curves on log-log transparency paper for all overcurrent protective devices. Exception: A tabulation of heater sizes or elements versus motor current rating may be submitted in lieu of time current curves for overload relays.

D. Protective Device Trip Settings: Provide tabulation of each adjustable trip device indicating “As Found” and “As Set” conditions.

E. Prior to start-up, provide tabulation/report of all field tests.

1.05 Record Drawings

A. Shop drawings; as listed in Article 1.04 corrected to reflect the equipment as-built.

B. Operation and maintenance data including recommended maintenance procedures and intervals, spare parts listing, and instruction books for the equipment and components.

1.06 Delivery, Storage, and Handling

A. Arrange shipping splits as required for installation. Individually wrap each section and mount on shipping skids.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris and traffic.

C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure and finish.

1.07 Spare Parts

A. Starter Contacts: One set for each NEMA size furnished.

B. Starter Coils: One for each NEMA size furnished.

C. Control Circuit Fuses: Three for each rating furnished. Provide one fuse puller.

D. Pilot Light Lamps: Standard lot cartons equal to 10 percent of the number of lights furnished, one carton minimum.

E. Touch-Up Paint: One can.

Part 2 Products

2.01 Acceptable Manufacturers

Rockwell Automation (Allen-Bradley), Schneider Electric (Square D), Eaton Electric (Cutler-Hammer), General Electric, or Siemens.

2.02 Ratings

A. Service: 480 Volt, 3 Phase, 3 Wire, 60 Hz.

B. Short Circuit: Unless otherwise indicated device interrupting rating and bus bracing is 65,000 amperes rms symmetrical. Provide fully rated devices; series ratings are not acceptable.

C. Ampacity: 300 amps minimum for vertical bus, as indicated for horizontal bus. Rating to be in accordance with UL standards for temperature rise.

2.03 Construction

A. Equipment consists of the required number of vertical sections to accommodate all devices indicated and specified herein, each nominally 90-inches high and 20-inches deep. Sections are bolted together to form a rigid free standing, front accessible, dead

front assembly.

B. Provide each section with isolated horizontal wireways at the top and bottom and isolated vertical wireways with hinged door and cable tie supports. Unused spaces are to have bussing for future units and blank door covers.

C. Indoor enclosures are NEMA 1A gasketed painted in the manufacturer's standard grey over a rust inhibitor treatment.

D. Outdoor enclosures are NEMA 3 walk-in type equipped with light, switch, convenience outlet, thermostatically controlled exhaust fan, and space heaters to prevent condensation inside the equipment. Paint in the manufacturer's standard grey over a rust inhibitor treatment.

E. Provide surge protection device on MCC mains.

2.04 Incoming Mains

A. Provide incoming main circuit breaker as indicated. Main breaker is molded case type meeting UL 489 and NEMA AB-1. Equip with solid state trips with adjustable pickup and time delay settings for long time, short time, and ground fault, and high-set instantaneous pickup. For circuit breakers rated 1200A or higher, provide with arc flash reduction maintenance switch.

B. Arrange main breaker for top or bottom cable entry as indicated without requiring 90 degree bends in the incoming conductors.

C. Where motor control centers serve as service entrance equipment provide a UL service entrance label on the incoming section.

2.05 Starter Units

A. Starters: Circuit breaker combination type rated in accordance with NEMA size designations. Fractional sizes and ratings per IEC recommendations are not acceptable.

B. Breakers: Adjustable magnetic trip only. Equip with current limiters as required for the interrupting rating noted.

C. Contactors: NEMA ICS-2; NEMA Size 1 minimum; magnetically held; field replaceable coil and contacts; auxiliary contacts field installable and removable. Terminal temperature rise is not to exceed 50 degrees C per NEMA standards.

D. Overload Relays: Class 20 solid state, heaterless design, self-powered, front dial adjustable, ± two percent repeat trip accuracy with pressure type terminals normally open, isolated auxiliary contact; manually reset by means of an external reset button.

E. Control Power Transformer: Two winding, 120-volt secondary with two primary, current-limiting fuses and one secondary fuse. Provide transformer capacity for all loads served plus 50 VA spare capacity.

F. Coil Suppressor: Provide suppressors to reduce transients by operating coils.

G. Units: Constructed to fully compartmentalize the starter and arranged to permit access to starter, control power transformer, fuses and other components without requiring disassembly. NEMA size 1 thru 4 are plug in, size 5 and larger are bolt on. Equip unit door with a defeatable interlock to prevent opening unless the disconnect is open. Use red color to clearly indicate on position; either uncovered when disconnect handle is moved to the on position or disconnect handle itself colored red on the side showing in on position.

H. Terminal Blocks: Pull apart type for power and control to allow unit withdrawal without disconnecting wiring. Use screw type terminals suitable for ring and tongue lugs for control wiring and box lug type for power wiring.

I. Reduced Voltage Starters: Solid state type with adjustable acceleration ramp. Equip with isolation and bypass contactors.

J. Two-Speed Starters: Two-winding; variable torque.

2.06 Feeder Units

A. Breakers: Molded case type, thermal-magnetic trips meeting UL 489 and NEMA AB-1. Ampere rating and interrupting ratings as noted.

B. Units: Individually compartmentalized with not more than one breaker per unit unless otherwise indicated. Use red color to indicate on position as described above for starter units.

2.07 VFD Units

See section 26 29 23.13.

2.08 Bus

A. Material: Copper, tin or silver plated at all joints.

B. Isolation: Locate main bus at the top or center, completely compartmentalized with sliding or removable barriers for access to joints. Provide phase isolation for vertical bus by polyester barriers enclosing each phase bar or providing adequate creepage to restrict fault propagation. Plug all holes not used to stab in units.

C. Provide ground bus rated 600 amps minimum extending the full length of the lineup. Where three phase, four wire control centers are indicated provide full length neutral bus rated a minimum of 50 percent of the main bus. Where three phase three wire control centers are used as service entrance equipment provide neutral bus in the incoming main section only.

2.09 Surge Protective Devices

A. Surge protective devices (SPD) and all components shall be designed, manufactured, tested and listed in accordance with the latest edition of ANSI/UL 1449 3rd Edition.

B. UL designation: Type 2.

C. Electrical Requirements:

1. Maximum Continuous Operating Voltage (MCOV): Not less than 115% of the nominal system voltage.

2. Protection Modes: Protect all modes (L-L, L-N, etc.), of the electrical system being utilized with a minimum of seven mode protection.

3. Nominal Discharge Current (I_n): 20kA.

4. Voltage Protection Rating (VPR) shall not exceed the following:

Voltage Rating	L-N	L-G	N-G	L-L
208Y	700	700	600	1000
480Y	1000	1200	900	1800
240Δ	N/A	1000	N/A	1000
480Δ	N/A	1800	N/A	1800

5. Surge Current Capacity: ANSI/IEEE C62.41 Category C; 160kA per phase, 80kA per mode.

6. EMI/RFI noise suppression: -50db attenuation at 100 kHz tested per MIL-STD 220B.

D. SPD Design:

1. Unit shall incorporate thermally protected metal-oxide varistors (MOVs).

2. All internal components shall be hardwired and soldered; no plug-in modules will be permitted.

3. Provide LED status for each protected phase, a form C dry contact for remote status, and a surge event counter.

4. SPD shall be mounted integral to the electrical distribution equipment.

2.10 Metering, Relaying, and Control Devices

A. Current Transformers: ANSI C57.13; 5 ampere secondary; bar or window type; with single secondary winding and secondary shorting device; ratio as required; burden and accuracy consistent with connected metering and relay devices; 60 Hertz.

B. Circuit Monitor: Microprocessor based unit for measuring multiphase variables including amps, volts, VARS, watts, volt-amps, power factor, demand values and harmonic distortion indication. Communications: ModBus RTU protocol; digital and analog inputs and outputs; RS232 port on front; RS485 ports on rear. Equal to General Electric Power Quality Meter.

C. Elapsed Time Indicators: Six digit, non reset, 3.5-inch square case; equal to GE Type 236.

D. Indicating Lights and Selectors: Heavy duty, oiltight, industrial grade with octagonal ring. Pilot lights are transformer type; LED for amber, red, and green and incandescent for other colors. Equal to Allen-Bradley, Bulletin 800T.

E. Control Relays: Heavy duty, 600 volt, industrial grade, 10 amp contact rating. Equal to Allen-Bradley, Bulletin 700, Type P.

Part 3 Execution

3.01 Installation

A. Install motor control center on concrete pad in locations shown on Drawings in accordance with manufacturer's written instructions and NEMA PB-2-1. Anchor to concrete pads in accordance with Sections 01 35 13 and 03 15 19 of these Specifications. Drilling into reinforcing steel or pre-stressed tendons is not permitted. Therefore, when drilling into any concrete for anchorage, Contractor shall locate reinforcing steel and/or pre-stressed tendons using concrete imaging equipment such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide minimum spacing of 3 inches between anchors and reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors will not allow 3-inch spacing to reinforcing steel/pre-stressed tendons. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.

B. Tighten accessible bus connections and mechanical fasteners after placing motor control center.

C. Adjust trip and time delay settings to values established by coordination study.

3.02 Field Quality Control

A. Inspect completed installation for physical damage, proper alignment, anchorage and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1,000 volts, and minimum acceptable value for insulation resistance is 2 megohms.

C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

D. Test ground fault systems for all possible ground fault paths by primary injection. Insure system does not trip on phase imbalance.

E. Touch up scratched or marred surfaces to match original finish

F. Physically test key interlock systems to insure proper function.

END OF SECTION

Part 1 General

1.01 Scope

Adjustable speed drives, 600 volts and below.

1.02 Work Specified Elsewhere

Except as noted, equipment specified in this section is provided under other divisions. Include, under this division, receiving, storage and handling; wall or floor mounting of drive control panels (including equipment pads); and wiring.

1.03 Submittals

A. Submit shop drawings. Shop drawings to include enclosure dimensions and weight, enclosure exterior and interior details, bill of materials keyed to enclosure details, heat rejection, schematics and wiring diagrams

B. Submit installation instructions.

C. At completion of start-up, submit a tabulation of all drive parameter settings.

Part 2 Products

2.01 Acceptable Manufacturers

Rockwell Automation (Allen-Bradley), Schneider Electric (Square D), Eaton Electric (Cutler-Hammer), General Electric.

2.02 AC Drive Controllers

A. Type: Adjustable frequency consisting of an input full wave rectifier and output inverter capable of producing a constant volts per hertz output suitable for operating a standard squirrel cage induction motor. Drives are pulse width modulated (PWM) two circuit board design with power components on one board and control components on another board.

1. Drives 50 horsepower and smaller shall have a 6-pulse bridge rectifier with a 3% input line reactor.

2. Drives larger than 50 horsepower shall have an 18-pulse design using a multiple bridge rectifier with integral reactor and phase shifting transformer.

3. As an alternative, drives larger than 50 horsepower may utilize a 6-pulse design with an active front end (AFE) in combination with a DC link reactor. If AFE is utilized, circuitry must be provided to prevent drive from operating at a power factor greater than unity due to on-site standby diesel generators. Equip drive

with internal filters to prevent damage to motor or bearings due to common mode noise.

B. Input: Drives larger than 50 horsepower shall meet the requirements of IEEE Standard 519, "Requirements for Harmonic Control in Electrical Power Systems" at the input terminals to the drive.

C. Output: Output load reactor.

D. Ratings:

1. Speed Range: 6 to 60 Hertz with a constant or variable torque load as noted.

2. Efficiency: Greater than 95 percent at 100 percent load and speed.

3. Displacement Power Factor: Not less than 0.96 lagging.

4. One Minute Overload Rating: 110% for variable torque load, 150% for constant torque loads.

5. Speed Regulation: 3 percent.

E. Equip drive with adjustments for minimum speed, maximum speed, frequency lock-out points, acceleration-deceleration rate and current limit.

F. Protective Features:

1. Input circuit breaker or fused disconnect switch to disconnect drive and control circuits. The variable speed drive package (VFD, circuit breaker, bypass and output contactors, controls and any other equipment associated with the drive or internal to the drive enclosure) shall have a withstand rating of 65,000 amps. This withstand rating shall be stamped on a UL 508C nameplate attached to the VFD enclosure.

2. Solid state protective circuits with diagnostic capabilities for over/under voltage, loss of voltage, inverse time and instantaneous overcurrent, phase loss, phase unbalance, and thermal overload. Activation of all protective functions shall be accomplished without damage to the drive and without need to replace any components. Over/under voltage and loss of voltage are to reset automatically when voltage returns to normal; all other conditions are to be manually reset.

3. Provide protective circuitry, if not inherent in the drive design, to shut down without damage to the drive if an out of synch condition occurs, i.e., running drive connected to a stopped motor, plug reversal or motor stall.

4. Where motor temperature switches are specified, provide circuitry to shut down the drive if the switch opens.

G. Input Voltage and Phase:

1. Less than 3 HP: 208 volt, single phase unless otherwise noted.

2. 3 HP and Above: 480 volt, three phase unless otherwise noted.

H. Enclosures:

1. Indoor Enclosures for Conditioned Spaces: Individual wall-mounted, free standing or group assembly as noted. Enclosure shall meet NEMA 1A ventilated (filtered and gasketed) requirements. Provide filters on supply and exhaust openings. Openings should be in the top and bottom of the enclosure door.

2. Indoor Enclosures for Non-conditioned Spaces: Individual wall-mounted or free standing as noted. Enclosure shall meet NEMA 12 requirements. Oversize the drive and/or provide heat sinks on the drive and enclosure to allow operation in a 50 degree C ambient environment. Provide enclosure-mounted, closed-loop heat exchanger or closed-loop air conditioner powered from incoming line or load side of CPT. Provide enclosure high temperature switch and thermostatically controlled space heater.

3. Outdoor Enclosures: NEMA 4X type 316 stainless steel. Oversize the drive and/or provide heat sinks on the drive and enclosure to allow operation in a 50 degree C ambient environment. Provide enclosure-mounted, stainless steel weatherproof corrosion-resistant, closed-loop air conditioner or closed-loop heat exchanger powered from incoming line or load side of CPT. Provide type 316 stainless steel or aluminum sunshields on top and sides of enclosure. Proved enclosure high temperature switch and thermostatically controlled space heater.

2.03 Controls

A. Provide the following door mounted operator control devices:

1. “Local-Off-Remote” selector switch for remote start/stop and remote speed control.

2. Manual “Start-Stop” selector and speed adjustment knob.

3. Speed indicating meter.

4. Elapsed time meter for drives 5 HP and larger. Elapsed time meter may be included in drive diagnostic module or may be a separate six digit, non reset, 3-1/2-inch square case meter equal to GE type 236.

5. Power on indicating light.

6. Human interface module (HIM) to give access to all drive parameters, status and alarms.

B. Provide the following for remote control interface:

1. Remote (auto) speed command, isolated 4-20 mA DC.

2. Remote start stop command, maintained dry contact, close to run if two wire

control is utilized and two maintained contacts, one close to run, and one open to stop if three wire control is utilized.

3. Isolated 4-20 output signal for remote speed indication.

4. 120 volt, 10 amp dry contact for remote run indication; closed when running.

5. 120 volt, 10 amp dry contact for remote alarm indication; closed on occurrence of any fault condition.

6. Two 120 volt powered contacts, one closed when motor operates and one open when motor operates, for accessories (motor space heater, pump seal water solenoid, etc.). Unless otherwise noted, provide 100 VA spare capacity in drive control power transformer for accessories.

7. Provide additional input/output functions and control logic as indicated.

C. Communications Card:

Provide Ethernet/IP communications adapter to allow drive to communicate directly with the Owner's plant SCADA system. All remote control functions (run-off, speed set) as well as status and alarms (speed, run, fault, etc.) shall be available over the communications link.

2.04 Service Conditions

A. Operating Temperature: 0 to 40 degrees C.

B. Altitude: Up to 3,300 feet above sea level.

C. Relative Humidity: 0 to 90 percent.

D. Voltage Variation: +5 percent to -10 percent.

Part 3 Execution

3.01 Installation

A. Install in accordance with the manufacturer's instructions. Anchor drive cabinets to the floor, wall or support stand in accordance with Sections 01 35 13 and 03 15 19 of these Specifications. Install floor-mounted cabinets on concrete pads. Drilling into reinforcing steel or pre-stressed tendons is not permitted. Therefore, when drilling into any concrete for anchorage, Contractor shall locate reinforcing steel and/or pre-stressed tendons using concrete imaging equipment, such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide minimum spacing of 3 inches between anchors and reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors will not allow 3-inch spacing to reinforcing steel/pre-stressed tendons. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.

B. Verify motor alignment prior to operation.

C. Ensure adequate space for air circulation around drive ventilation openings.

D. Furnish the services of a factory representative, having complete knowledge of the operational and maintenance requirements of the equipment for a minimum of one 8-hour day per drive. The factory representative shall inspect the installation, perform start-up service, assist functional testing, and instruct the Owner’s personnel in the proper operation of the equipment.

E. Replace all air filters at completion of startup.

3.03 Training

Provide a minimum of eight hours classroom training to instruct Owner's personnel in operation and maintenance of the system.

END OF SECTION

Part 1 General

1.01 Scope

A. Work provided under this Division includes final system design implementation, furnishing all components, system programming and configuration, system installation services, required support services, and complete documentation for the Plant Control System (PCS). This work shall include all materials, labor, and tools required to fabricate, deliver, unload, handle, erect, adjust, field calibrate, and test a complete and operable PCS as indicated on the Drawings and Specifications. Install all panels and designated instrumentation devices and provide all mechanical and pneumatic interconnections between the various components and their local sources of supply.

B. The intent of these Specifications is for the System Manufacturer to provide a complete and operational PCS. Additional items of equipment, materials, or labor not specifically called for by these Specifications, which may reasonably be considered to make the system complete and operational, shall be supplied as part of this work.

1.02 Definitions

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared documentation, specific to the installation.

D. Indicated: Shown on the Drawings.

E. Noted: Indicated or specified elsewhere.

1.03 Work Specified Elsewhere

A. Installation of Inline Instruments: Instruments such as venturi tubes, magmeters, and control valves, which are specified in this Division and mounted in process piping, are installed under other Divisions.

B. Vendor-Supplied Devices: Field instrumentation and panels supplied as part of mechanical equipment or equipment packages shall be furnished, installed, and calibrated under other Divisions.

C. Conductors: Discrete signal conductors, twisted pair analog signal conductors, and RTD conductors are furnished and installed under Division 26. All other instrumentation and signal conductors, including digital data conductors and fiber optic cables are furnished under this Division and installed under Division 26. Special cables for a particular instrument device which are specified in this section are installed under Division 26.

D. Raceways: All raceways and pulling of conductors (including placement in cable trays) are furnished under Division 26.

E. Terminations: All power, control, and signal conductor terminations are provided under Division 26. This shall include, but not be limited to, terminations for all control panels. Termination of the RS-232 cables, RS-485 cables, Ethernet cables, fiber optic cables and other digital communication media shall be provided by the System Manufacturer under Division 40. HVAC control terminations are provided under Division 23. Interconnections between equipment and integral equipment control panels (e.g., packaged air compressors, etc.), are provided under the applicable equipment Section.

1.04 Plant Control System Description

A. The PCS consists of programming and configuration, operator interface, Plant Control Network, local control panels, field instruments and control devices, and other appurtenances noted in these Specifications.

B. The control panel schedule will be completed during detailed design.

Panel No.	Location	Mounting Type	Enclosure Rating	Light/Receptacle	Heat Shield/ Drip Shield

C. The System Manufacturer shall integrate data from the motor protection relays and the power monitoring modules furnished under Division 26 into the plant control system. The System Manufacturer shall provide a separate monitoring graphic screen to view the data retrieved from the modules as shown on the Drawings.

D. The System Manufacturer shall install an operator color touchscreen interface at LCP-B to accomplish the operator interface functions shown on the drawings. Operator interface shall be fully compatible with the PLC and shall have a screen size of 13 inches diagonal, minimum. Provide the Owner with all necessary development software.

1.05 Quality Assurance

A. The Contractor shall ensure that the PCS is an integrated system furnished by the System Manufacturer who shall provide all of the equipment and appurtenances, regardless of manufacture and be responsible to the Contractor for correct operation of the entire system.

B. The System Manufacturer shall be responsible for the detailed design implementation and the proper functioning of the PCS, programming and/or configuration of all digital hardware, preparation of required submittal data including operations and maintenance manuals, preparation of test procedures, factory and field tests, start-up

including field calibration, operational demonstrations, providing technical supervision for installation and connections to equipment, and training of the Owner's operating personnel.

C. The System Manufacturer shall be regularly engaged in the type of work called for under these Specifications and must have capital facilities, personnel, plant, and service capabilities required to successfully perform the work. The System Manufacturer shall employ competent personnel experienced in the design, manufacture, and programming of equipment and systems required. The System Manufacturer shall assign an experienced person who shall act as Project Manager. This person shall have responsible project experience on similar systems of a comparable complexity to that specified herein.

D. The System Manufacturer shall have in employment, a permanent field service organization capable of providing service and maintenance of the system.

E. The System Manufacturer shall have installed similar systems which have been in satisfactory operation to establish the reliability of the equipment proposed to be furnished.

F. All control panels furnished by the System Manufacturer shall be fabricated in the System Manufacturer's own panel shop.

1.06 Submittals

A. The system manufacturer shall make submittals in accordance with the requirements of Section 01 33 23. The submittal shall be divided into separate sections as listed below. Refer to related work sections for additional requirements.

B. Field Devices: This section shall include primary elements, transmitters, switches, analytical instruments, etc. List all dimensions, power requirements, enclosure types, ranges, and signal form or value. Provide data, including proposed length, on special cables required between sensing elements and electronics units and data on any special equipment used for calibration or maintenance of a particular device. Field device submittals shall also include specific data sheets for each device which shall contain the following information:

1. Tag number per Specifications and Drawings.

2. Manufacturer's complete model number with complete model number breakdown.

3. Input – output characteristics.

4. Range, size, and graduations.

5. Physical size with dimensions, NEMA enclosure classification and mounting details.

6. Materials of construction of all components.

7. Instrument or control device sizing calculations where applicable.

8. Certified calibration data on all flow metering devices.

9. Environmental requirements during storage and operation.

10. Power requirements.

C. Digital System Hardware: This section shall include computer hardware complete with printers, magnetic storage devices, cables, UPS systems, and other peripherals. Include PLC hardware, communications hardware, and LAN and data highway conductors.

D. Digital System Software: This section shall include documentation on system software, standard software packages supplied, and custom software developed for reports, process control, and graphic displays. Include software developed for both the operator interface and PLC system.

E. Control Panels: This section shall include dimensions, terminal block designations, front panel arrangement, back panel layout, and ladder logic diagrams for both PLC-based and discrete component type control panels, etc. Provide catalog sheets for all panel components, indicate ranges, and provide nameplate schedules. All connections for new instruments terminating in the System Manufacturer's panels shall be clearly shown. All devices installed in each panel or connected to each panel, shall be identified on the panel drawings by the tag number included in the Specifications and Drawings. Any miscellaneous equipment not clearly falling into one of the above volumes, including recommended spare parts list, shall be included in the control panel volume.

F. Loop Diagrams: This section includes no more than 10 typical loop diagrams for approval of format only. The submitted loop diagrams shall represent different types of process measurements.

G. Factory Test: This section shall include the witness test and final checkout procedural outline detailed in Article 3.04 – B.

1.07 Construction Documentation

The System Manufacturer shall provide loop diagrams to the Contractor. The Contractor shall provide loop diagrams to the electrical subcontractor. Loop diagrams shall be issued as a group with the delivery of their respective control panel or area instrumentation. Two sets of loop diagrams shall be issued to the electrical contractor and one set to the Engineer.

1.08 Record Documentation

A. General: Record documentation shall be provided in accordance with Section 01 78 39. Additionally, provide all information listed in Article 1.06 above, corrected to reflect the system as installed. Include also any instruction books, operation manuals, and other information pertaining to service and maintenance. Bind record documents in 3-

ring, hardback notebooks complete with tabs and index. Include name, address, and telephone number for each manufacturer's service contact. For all major components, provide a recommended spare parts list.

B. Loop Diagrams:

1. Provide an individual wiring diagram for each analog and discrete loop showing all terminations, terminal numbers, conductor numbers, cable numbers, the location of the DC power supply, power panel, and circuit numbers for all 120 VAC power to field instruments, MCC and bucket numbers for all 480 VAC power to motor operated valves, signal polarity, the location of any dropping resistors, surge protectors, shielding, grounding, etc. Devices shall be identified by the tag number included in the Specifications and Drawings. Cabling between sensors/elements and associated transmitter shall be included. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus the requirements below.

2. Each loop diagram shall be divided into areas for identification of device locations (e.g. panel face, back-of-panel, field, etc.). Loop diagrams shall be on 11 x 17-inch drawings.

3. The loop number shall be incorporated into the loop diagram drawing number. If the System Manufacturer does not have any specific loop diagram drawing number requirements, the Drawing number shall be the loop number (the drawing number for loop F-1004 would be 1004). If a requirement exists (one requirement may be to incorporate the Project number XXXXXX), the loop number shall be included as the suffix. The drawing number for loop F-1004 would be XXXXXX-1004.

C. Instrument Hardware: Record documents shall include bills of material, front views, assembly drawings, component layout drawings and schematics, nameplates, schedules, electrical schematics, electrical connection diagrams, and tubing/piping connection diagrams. Electrical and piping connection diagrams shall show all terminations of equipment, complete with instrumentation, wire, equipment, and cable designations. Interconnecting diagrams shall be prepared in a neat and legible manner on 11 x 17-inch or 24 x 36-inch sheets.

D. Software Documentation: In addition to the hard copies of Drawings, programming and literature generated specifically for the Project, two sets of compact disks shall be provided to the Owner with copies of all custom files specifically created for the Project, including all panel drawings, I/O drawings, termination drawings, communication architecture drawings, data sheets, bills of material, operating procedures, etc. Additional files included in this set shall be PLC programs and copies of the operator interface software application program. Drawing format shall be AutoCAD latest version. All Drawings shall also be furnished as Acrobat *.pdf files. Include copies of all *.shp and *.shx files used in the AutoCAD drawings. Compact discs shall have a complete listing of their contents along with the names and version numbers of the software used to generate each file. Discs shall be clearly identified by the following:

1. Project Name

2. Volume Number

3. Labeled “AS-INSTALLED”

E. Configuration Documentation: Instrument Configuration and Calibration sheets shall be generated for all instruments requiring configuration and/or calibration. The intent of the Instrument Configuration and Calibration sheets is to provide all necessary information required to enable the Owner to calibrate and/or configure a replacement instrument identical to the original instrument. One sheet shall be provided for each instrument. The sheets shall be 8-1/2 x 11 inch size and shall be included in the O&M Manual. Each sheet shall list the instrument tag number (as depicted on the Drawings and Specifications), the date, the System Manufacturer company name and phone number, the name of the individual who filled out the sheet, the instrument manufacturer’s name and phone number, the complete model number, the calibrated range, and all configuration information.

F. SCADA Documentation: Generate a SCADA software document containing the following information for each SCADA related software product purchased.

a. The facility/plant name where the software is installed.

b. The computer name that the software is installed on (master SCADA workstation, historical data computer, etc.)

c. The computer manufacturer and model, processor speed, and installed RAM.

d. The computer operating system (model and version).

e. The product name, version, and serial number.

f. The name and quantity of client licenses (if applicable).

g. The product name and version of all supporting software installed.

h. The date purchased and the company name it was purchased from.

i. The name of the person purchasing the software, and the person’s company name.

j. The date the software was installed.

1.09 Environment

A. Local Control Panels: Local control panels shall be capable of operating between 32 degrees and 120 degrees F and 5 to 95 percent relative humidity without condensation. A 120 VAC single-phase, three-wire grounded power source will be supplied.

B. Field Devices: Field devices shall be housed in NEMA 4X enclosures. Ambient temperature rating shall be suitable for the project locale. All enclosures, including field instruments and control panels, which are located out-of-doors shall be provided with adequate sunscreens.

1.10 Deliver, Storage, and Handling

A. After completion of shop assembly and tests, control panels shall be enclosed in heavy polyethylene envelopes to provide complete protection from dust and moisture. Desiccant materials shall be placed inside the envelope prior to sealing. The equipment shall then be mounted on skids, enclosed in protective boxes, and braced for final transport. Removable lifting rings shall be provided on all sections weighing more than 150 pounds to permit moving without removal of protective covering. Shipping weights shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling on the job site. If practical, termination cabinets shall be delivered first to permit field wiring to be complete and checked out before receipt of remainder of equipment. None of the control room equipment shall be delivered until the environmental services required by the Specifications and Drawings are available and operating in accordance with manufacturer's specifications.

B. The Contractor shall be fully responsible for moving the equipment through new and existing facilities and setting it in the proper location.

1.11 Warranty

A. Warranty Period: In accordance with Division 01 and the following:

1. Corrective hardware maintenance shall be performed by a trained service technician specifically trained to service the equipment involved. The technician shall be available, on-site, within 24 hours after notification by the Owner.

2. Software maintenance shall be performed by suitably qualified individuals from the System Manufacturer's software service staff. Representatives from third party software sources may additionally be involved, but the System Manufacturer shall be represented at all times during on-site services. Software service representative shall be available for consultation within four hours and, if required, on-site within 16 hours after notification by the Owner.

3. Deliver a copy of all service reports to the Owner on the day the work is performed.

Part 2 Products

2.01 Equipment

A. Quality Standards: It is not the intention of these Specifications to detail every component, accessory, signal conditioning device, etc. that is required to provide a complete system. The System Manufacturer shall provide all required components,

using equipment from established manufacturers with a proven history of service and support.

B. Electronic Equipment: All solid state, printed circuit boards and components shall be suitable for the specified environment. Provide complete circuit diagrams for troubleshooting and repair. All parts shall be replaceable with standard commercial components without degrading the performance of the completed assembly.

2.02 Spare Parts

A. The System Manufacturer shall supply spare parts for the Plant Control System.

B. The System Manufacturer shall provide a list of all spare parts being provided under this Division. The spare parts list shall be included in the documents to be reviewed by the Engineer during the shop drawing review process. The spare parts shall include, but shall not be limited to, the items included in the list below.

1. Two of each type PLC processor.

2. Two each type of PLC I/O card.

3. Two each type of PLC power supply.

4. One lot of PLC I/O Card Fuses, 10 spare fuses for each type of fuse used in PLC I/O cards.

5. One lot of PLC Fuses, 5 spare fuses for each type of fuse used in PLC hardware (excluding I/O cards).

6. One Plant Control Network backbone Fast Ethernet switch.

7. One spare for each different type of media converter (fiber-to-copper, etc.)

8. Five fiber optic patch cards with connectors.

9. One lot of Terminals, 10 spare terminals for each type of terminal used in local control panels.

10. One lot of Terminal Fuses, 5 spare fuses for each type of miscellaneous fuse used in local control panels.

11. One heavy-duty relay.

12. Two ice-cube relays.

13. One spare for each different type of timing relay.

14. One lot of surge protectors, including 5 spare of each type used.

15. One 24 VDC power supply.

16. Two of each type of Intrinsic Safety Barrier provided.

17. One lot of Zener type Intrinsic Safety Barrier Fuses, standard lot cartons equal to 10 percent of the number of furnished IS Barrier fuses provided, two cartons of each type size and type of fuse minimum.

18. Other spares as noted in other Division 40 Sections.

Part 3 Execution

3.01 Installation - General

A. The system manufacturer shall assign a full time representative to provide coordination and supervision of on-site PCS construction work. The individual is to be on-site during all times when PCS work is being done.

B. The system, peripherals, and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings unless otherwise approved by the Engineer.

C. All work shall be executed in full accordance with all applicable codes and local rulings. Should any work be performed contrary to said rulings, ordinances, or regulations, the Contractor shall bear the full responsibility for such violations and assume all costs arising therefrom.

D. The Contractor shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall ship the equipment in sections sized to permit passage through such areas.

3.02 Installation – Field Control Devices

A. Install and align instruments in accordance with vendor instruction manuals. Locate all field instruments so as to be easily accessible for maintenance.

B. Install all field mounted instruments having indicators to make the scale visible from the adjacent operating area.

C. Provide sufficient clearances for access and instrument servicing to include dismantling of the instrument.

D. Space instruments at least 1-inch off walls using stainless steel channels.

E. Mount all field instruments securely, using manufacturer mounting yoke, when furnished, on a pipe stand to ensure a rigid, vibration-free installation.

F. Locations of instruments shown on the Drawings are approximate. If the Contractor needs to move a particular instrument more than five feet from its designated location, the Contractor shall obtain prior approval from the Owner.

G. Provide any necessary tubing raceways, supports, and tie downs. Tubing raceways and supports shall be stainless steel. Install tubing and fittings in a neat, professional manner. Tubing shall be connected to the Field Instrument so as to prevent stress on the Field Instrument.

H. Provide all electronic transmitters which are located out-of-doors with adequate sunscreens.

I. When drilling into any existing concrete for anchorage, contractor shall locate existing reinforcing steel and/or pre-stressed tendons using concrete imaging equipment, such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide minimum spacing of 3 inches between anchors and existing reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors would not allow 3-inch spacing to reinforcing steel/pre-stressed tendons.

J. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.

3.03 System Noise Rejection

A. Electrical isolation shall be provided between input systems and the processor units. Noise rejection for common mode shall be at least 100 decibels from 0 to 100 Hertz, and up to 175 volts. Normal voltage rejection shall be not less than 35 decibels at 60 Hertz.

B. All instrument signal wiring, control wiring, and AC control power wiring shall be protected against lightning, spikes, and other transient surges at all field and control panel termination points.

3.04 Grounding

A. Bond all instrument and control panel enclosures to the power system ground.

B. Ground analog signal conductor shields at the control panel end only.

3.05 Surge Protection

A. General:

1. It is the responsibility of the system manufacturer to provide appropriate protection against transients and surges for all field instruments, field wiring, and devices interfacing with control panels. All instrument signal wiring, control wiring, telephone wiring, and data transmission wiring which enters or exits buildings shall be protected against lightning strikes, and other transient surges at all control panel termination points. All instrument signal wiring, control wiring, telephone wiring, and data transmission wiring which terminates out-of-doors shall be protected against lightning strikes, and other transient surges at all termination points. All AC control power wiring shall be protected against lightning strikes, and other transient surges at all control

panel termination points. Lightning and surge devices shall protect the system from induced surges in analog, discrete, and control circuitry and power supply lines. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding.

2. All field instruments located indoors or out-of-doors provided by the system manufacturer under this Contract shall be supplied with surge protection for 120 VAC power to the instrument.

3. Surge protectors shall include a combination of surge suppression technologies including metal oxide varistors, gas discharge tubes, diodes, and 3AG size fuses for line-to-line and line-to-ground protection.

B. Analog Instruments:

1. All signal powered analog field instruments located out-of-doors shall be equipped with direct-mounted surge protectors which screw directly into the unused conduit entry hub or a conduit tee. Acceptable Manufacturer: Phoenix Contact Model S-PT1-2PE-24VDC.

2. All field powered analog instruments located outside shall be equipped with surge protectors for both signal and power, mounted in a NEMA 4X enclosure. Acceptable Manufacturer: Phoenix Contact BOXTRAB with individual protection for signal and power circuits.

C. Control Panels:

1. All instrument analog signal wiring which enters or exits buildings or which terminates out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT 1X2 Series.

2. All instrument discrete signal wiring which enters or exits buildings or which terminates out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT 2X1 Series (Inputs) and PT 2-PE/S Series (Outputs).

3. All data transmission wiring which enters or exits buildings or which terminates out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT HF Series and D-UFB Series.

4. All 120 VAC power wiring to control panels whether located indoors or out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT 2-PE/S Series.

5. Surge protection shall be provided for all telephone connections. Acceptable Manufacturer: Phoenix Contact MT-2FM-RJ12 Series.

D. Antennae: RF surge protection shall be provided for all antennas. Acceptable Manufacturer: Phoenix Contact COAXTRAB Series.

E. Ethernet: Surge protection shall be provided for all copper Ethernet connections. Acceptable Manufacturer: Phoenix Contact D-LAN Series.

F. Miscellaneous Digital Equipment: Provide surge protection for all computers, printers, uninterruptible power supplies, digital equipment power supplies, PLCs, fiber optic modems, telephone modems, digital signal converters, and other miscellaneous digital hardware to include communications wiring and 120 VAC power supply wiring for each device. Acceptable Manufacturer: Phoenix Contact.

G. Installation:

1. Install all surge protection equipment in strict accordance with manufacturer's guidelines.

2. For surge protection devices located out-of-doors and for antenna surge protection, grounding shall use individual ground rods located as close to the surge protection devices as possible. The grounding conductor shall be sized in accordance with manufacturer's recommendations and be routed via the shortest path possible. Bends in the grounding conductor shall be avoided. If bends in the grounding conductor are unavoidable then the number of bends shall be kept to an absolute minimum.

3. Provide installation for all field mounted surge protection equipment. Provide all wiring terminations for surge protection equipment.

4. If a particular piece of equipment is protected by two surge protection devices in series, ensure that the resulting equipment protection is not diminished.

3.06 Tests and Acceptance

A. The equipment and programs shall be factory-tested prior to shipment for compliance with the conditions of this section, these Specifications, and for environmental conditions.

B. Factory Testing: Factory-test setup shall demonstrate peripheral performance, including all displays and graphics. All discrete and analog points shall be verified. A 100-hour burn-in test shall be performed on all solid-state devices. The Owner reserves the right to witness the factory tests. At least 20 days written notice shall be given to the Owner and the Engineer by the Contractor prior to the date of starting factory tests. Submit detailed witness test and final checkout procedural outlines for approval to the Engineer not less than 60 days prior to starting factory tests. Testing shall include the complete system with all cabinet doors in place and peripherals attached, for an agreed to period time, with documentation via periodic printouts.

C. After installation of the complete system, the System Manufacturer shall provide the services of a qualified systems engineer to test the complete system under the observation of the Owner or Owner's representative to verify that all functions specified are performed without error or malfunction. As a part of the test procedure, Contractor's personnel, when requested by the system supplier, shall cause each remote process to change state or value three times to verify all functions during the checkout period. This shall be repeated until the system performs correctly to the satisfaction of the Owner or Owner's representative.

3.07 Start-Up Assistance

The System Manufacturer shall provide the on-site services of a project engineer for a minimum of two weeks (10 days at 8-hours per day) for start-up assistance. The individual provided shall be familiar with the Project and with all software packages and supplied hardware. This individual shall be capable of modifying PLC programming or operator interface configuration during the start-up period.

3.08 Training

A. The cost of training programs shall be included in the Control Price. The training and instruction shall be directly related to the PCS being supplied.

B. The System Manufacturer shall provide the following training courses for designated Owner's personnel. The courses shall be taught by professional, full-time instructors. All course materials required to adequately support the material presented shall be included. The System Manufacturer shall set the schedule for all courses with the Owner at least 20 days prior to the proposed date. All training sessions shall be recorded by video. The System Manufacturer shall provide two DVDs within two weeks.

1. Computer Process Control Overview:

    a. Length: Four hours

    b. Location: Owner's plant site

    c. This course will familiarize students with the basic structure of a computer process control system and will explain the interrelationships between hardware, software, and the process.

2. System Hardware Maintenance:

    a. Length: Eight hours

    b. Location: Owner's plant site

    c. This course will instruct the computer maintenance personnel in maintenance and repair practices used to support the system hardware.

3. Application Software:

    a. Length: Eight hours

    b. Location: Owner's plant site

    c. This course will provide the student with a working knowledge of all software supplied with the computer system. Topics covered shall include the operating system software, file structures, and application software. Include lab sessions to reinforce classroom lessons.

4. Operator Familiarization:

    a. Length: Eight hours

    b. Location: Owner's plant site

    c. This course will be taught on-site to ensure that plant operating personnel will be thoroughly familiar with the PCS as delivered. The students will be instructed in PCS start-up and loading procedures, loop tuning via the operator's console, and all computer features.

5. HMI Software Training:

    a. Length: Three days

    b. Location: Owner's plant site

    c. This course will familiarize students with the HMI software and shall include such topics as generating graphics, database modifications, short and long term historical data, reporting, and scripting. This course will cover the basics of configuring the Industrial SQL package including configuring and printing reports, adding and deleting points, modifying data storage parameters, etc.

6. PLC Software:

    a. Length: Three days

    b. Location: Owner's plant site

    c. This course will provide the student with a working knowledge of the software used to program the PLCs. Topics shall include ladder logic programming, data transfer between PLCs, program debugging, and program simulation. Include lab sessions to reinforce classroom lessons.

7. Report Generation Software:

    a. Length: One day.

b. Location: Owner's plant site.

c. This course will provide the student with a working knowledge of the software used to generate custom reports. Topics shall include data storage, data retrieval (including queries), report layout, and automatic report generating and printing for daily, weekly, and monthly reports. Include lab sessions to reinforce classroom lessons.

C. In addition to the courses enumerated above, the System Manufacturer shall provide training courses taught by the equipment and software manufacturers, or their certified training provider, for the Owner's personnel as follows. The courses shall be purchased in the names of the individuals designated by the Owner. The Owner will bear the cost of student transportation and boarding.

1. Wonderware:

a. Provide two individual Industrial SQL Clients training passes for the Owner's personnel. This course shall provide ActiveFactory training including trending, live and historical data retrieving and displaying, and report generating.

b. Each pass shall serve as tuition for one individual in the specified course taught at InSource Software Solutions in Duluth, Georgia, (770) 935-9364.

c. The passes shall be valid for a minimum of 12 months from the date of purchase.

END OF SECTION

Part 1 General

1.01 Scope

A. Primary elements.

B. Transmitters.

C. Receivers.

D. Analytical instruments.

1.02 System Description

A. System consists of all field and panel mounted instrumentation devices as noted, complete with all necessary signal converters, isolators, amplifiers, power supplies, and other appurtenances necessary for interfacing with other components.

B. Except as noted, scale all indicators in engineering units.

1.03 Submittals

Submit product data.

Part 2 Products

2.01 Alarm Horn

A. Type: Electro-mechanical diaphragm.

B. Mounting: Conduit or panel as required by schedule.

C. Housing: Cast aluminum.

D. Diaphragm Material: Stainless steel.

E. Grille Material: Die-cast aluminum.

F. Power: 120 VAC.

G. Sound Intensity: 100 Db at 10 feet.

H. Area Classification: As required by schedule.

I. Schedule:

Tag	Mounting	Area Classification
YA-	Conduit	Unclassified
YA-	Conduit	Unclassified

J. Acceptable Manufacturer: Federal Signal Corporation Model 350 (for Unclassified Areas), Model 31X (for Class I, Division 1, Group D Areas).

2.02 Alarm Light – Strobe

A. Type: High-intensity strobe warning light.

B. Enclosure: Corrosion-resistant, NEMA 4X, suitable for outdoor service.

C. Area Classification: As required by schedule.

D. Power: 120 VAC.

E. Dome Color: Red, blue, or amber, as required by schedule.

F. Schedule:

Tag	Color	Area Classification
YI-	Amber	Unclassified
YI-	Amber	Unclassified

G. Acceptable Manufacturer:

1. General Purpose Areas: Federal Signal Corporation Model LP3

2. Class I, Division 2, Group D Areas: Federal Signal Corporation Model 151XST

3. Class I, Division 1, Group D Areas: Federal Signal Corporation Model 27XST

2.03 Analytic Instrument Transmitters

A. Transmitter to be mounted in a NEMA 4X non-metallic enclosure with a condensate heater and thermostat. Enclosure to have a clear front, hinged door such that the LCD display is able to be read without opening enclosure door.

B. Transmitter to be a microprocessor based controller.

C. Interface shall allow operators to control sensor and interface functions with menu driven software. Interface to also have a built-in data logger with the capacity to store data in 15 minute intervals for up to 6 months for two sensors.

D. Electrical Requirements: Line voltage to automatically accept a voltage range of 100 to 230 VAC, 60 Hz. Interface to sensor to connected utilizing manufacturer's molded and sealed plugs.

E. Communications: The transmitter shall support Modbus TCP/IP communications protocol for seamless integration into a network of devices that support TCP/IP sockets and use a standard Ethernet cable or connect wirelessly using GSM/GPRS to communicate with your SCADA, PLC or other network. Available with analog 4-20mA, Modbus 485, Profibus DP, or HART digital communication options.

F. Warranty: Transmitter to be warrantied for two years.

G. Output: Isolated 4 to 20 mADC proportional to measurement range. Provide three independently configurable alarm outputs for high limit, low limit, and fault output, rated 3 amps, 120 VAC.

H. Calibration: Unit shall have one-touch, automatic calibration.

I. Area Classification: Transmitters shall be supplied with intrinsically safe barriers, in accordance with the manufacturer's recommendations, for mounting in hazardous areas if required in the table below.

J. Acceptable Manufacturers:

1. Multiple Instrument Transmitter: Hach SC1000 or YSI 2020XT.

2. Single Instrument Transmitter: Hach SC200 or YSI 182.

2.04 Free Chlorine Analyzer

A. Type: Chlorine analyzer with a free chlorine sensor, a pH sensor, flow cells for each sensor and a flow controller.

B. Analyzer: The analyzer shall have a range of 0 to 10 ppm, 0.01 ppm resolution. The unit shall have three alarm outputs with individual, adjustable set points. The pH sensor range shall be between 6.0 and 9.5.

C. Sample Conditioning Equipment: Provide pressure regulator, strainer kit and flow meter as required.

D. Enclosure: The analyzer, free chlorine sensor, a pH sensor, flow cells for each sensor and flow controller shall be pre-mounted on a back plate. Sensor cables shall be pre-wired to the analyzer. The analyzer case shall be NEMA 4X.

E. Accuracy: Dependent on the chemical test used to calibrate the sensor.

F. Power Supply: 120 VAC.

G. Power Cord: Provide standard 3-prong, 120 VAC male plug and three feet of power cord as scheduled below. Plug and cord shall meet Division 16 requirements.

H. Schedule:

Tag Number	Range	Location	3-ProngPower Plug
AIT-	0-10 ppm	Lab	Yes

2.05 Gas Analyzer

A. Type: Continuous gas monitor; photo ionization principle of detection; suitable for measuring aromatics, chlorinated hydrocarbons, ketones, hydrogen sulfide, sulfur compounds, phosphine, ammonia, iodine, and hydrazine. Unit consists of sample pump, heated detector and indicator calibrated in PPM.

B. Application: Detection of volatile organics in water to signal the presence of a spill.

C. Output: Normally open dry contact for remote alarm annunciation.

D. Adjustments: Span, zero and range.

E. Enclosure: NEMA 4; stainless steel; free standing; with thermostatically controlled space heater.

F. Power Supply: 120 VAC.

G. Acceptable Manufacturers: HNU (Model 201), Horiba, Analytical Instrument Devices, Inc., or Sensidyne, Inc.

2.06 Gas Detector - Chlorine

A. Type: Electrochemical to measure 0-5 ppm of chlorine in ambient air.

B. Sensor: Integral mounted.

C. Transmitter:

1. Indication: Digital LCD

2. Housing: NEMA 4X, aluminum, epoxy-coated.

3. Mounting: 2-inch pipe stand or wall mount.

4. Calibration: Unit shall be capable of being calibrated at the transmitter by the introduction of zero and span gases. Provide calibration kit including zero gas and span gas, required fittings, gauges, etc.

5. Output: Provide three separate discrete outputs as follows:

a. Fault: Internal gas monitor fault contact, SPDT, rated at 5 A/120 VAC.

b. 1 PPM: SPDT, rated at 5 A/120 VAC.

c. 3 PPM: SPDT, rated at 5 A/120 VAC.

D. Sensitivity: ± 1.0 PPM.

E. Power: 120 VAC.

F. Schedule: Tag

G. Acceptable Manufacturers: MSA Instrument Division Ultima Series, Draeger Safety (PointGard II), Sensidyne (Sens Alert Plus).

2.07 Conductivity Transmitter

A. Type: Microprocessor-based analyzer with diagnostic capabilities that continuously measure electrical conductivity in the process line.

B. Sensor: Provide a 0.05 cell constant 316 stainless steel submersion type sensor with a minimum of two 316 stainless steel electrodes. The sensor shall be suitable for mounting in a 1-1/2-inch tee. Provide appropriate length cable for interconnection to the analyzer/transmitter.

C. Transmitter: The analyzer shall have a user-adjustable isolated 4 to 20 mADC current output that is continuously expandable over the measurement range. Provide dual alarm outputs with independent set points, adjustable hysteresis and time delay action. Provide an operator-selectable automatic or manual temperature compensation of -20 to 200 degrees C.

D. Enclosure: NEMA 4X, fiberglass, aluminum or thermoplastic.

E. Accuracy: ± 0.5% of reading.

F. Repeatability: ± 0.25% of reading.

G. Power: 120 VAC.

H. Schedule:

Tag	Mounting	Area Classification

I. Acceptable Manufacturers: Rosemount or Hach.

2.08 Dissolved Oxygen Transmitter – Submersible

A. Type: Continuous-reading dissolved oxygen probe with microprocessor based electronics unit incorporating diagnostic capabilities. Unit shall be supplied with automatic temperature. Display shall be two rows of sixteen alphanumeric digits.

B. Sensor: The sensor shall use the Clark principle for measurement of dissolved oxygen. Sensor shall be contained in a sealed enclosure and shall be non-repairable

requiring no special tools for replacement and shall be installed in an 11-inch diameter ball float if floating is required in the table below. Mounting bracket shall be corrosion resistant stainless steel, fiberglass or thermoplastic.

C. Range: 0-5 mg/l dissolved oxygen.

D. Output: Isolated 4 to 20 mADC proportional to measurement range. Provide three independently configurable alarm outputs for high limit, low limit, and fault output, rated 3 amps, 120 VAC.

E. Enclosure: NEMA 6, stainless steel, fiberglass, aluminum or thermoplastic. For outdoor applications, provide thermostatically controlled space heater as required to maintain operating temperatures.

F. Power Supply: 120 VAC.

G. Calibration: Unit shall have one-touch, automatic calibration.

H. Area Classification: Sensor shall be supplied with intrinsically safe barriers, in accordance with the manufacturer's recommendations, for mounting in hazardous areas if required in the table below.

I. Schedule

Tag	Mounting	Sensor Area Classification
AE/AIT-04A41	Rod	Class 1, Div 2, Group D
AE/AIT-04A42	Rod	Class 1, Div 2, Group D
AE/AIT-04A43	Rod	Class 1, Div 2, Group D
AE/AIT-05A15	Rod	Class 1, Div 2, Group D
AE/AIT-05A25	Rod	Class 1, Div 2, Group D
AE/AIT-05A35	Rod	Class 1, Div 2, Group D

J. Acceptable Manufacturers: Hach or YSI.

2.09 Fluoride Transmitter

A. Type: Microprocessor-based, 2-wire intelligent transmitter with on-line diagnostic capabilities and self-prompting calibration. Unit shall be supplied with automatic temperature compensation and 3-line LCD display.

B. Sensor:

1. Type: Continuous on-line fluoride measurement.

2. Temperature Compensation: Automatic, 2-wire, 100 ohm RTD.

3. Process connections: 1/2-inch NPT inlet and outlet.

4. Mounting: Surface or 2-inch pipe.

5. Range: Saturation to 0.02 PPM.

6. Cable Length: 20 feet.

7. Materials: PVC/316 SS.

8. Approvals: Intrinsically safe and non-incentive.

C. Transmitter:

1. Range: See schedule below.

2. Output: One isolated 4 – 20 mADC representing fluoride concentration.

3. Enclosure: NEMA 4X, epoxy-painted cast aluminum. For outdoor enclosure, provide thermostatically controlled space heater.

4. Power: Signal powered, 12.5 to 42 VDC.

D. Supplies: Furnish 1 year's supply of standard solution and buffer solution.

E. Schedule:

Tag	Calibrated Range	Mounting	Area Classification
AE/AIT-		Flow-through	Inside / Unclassified

F. Acceptable Manufacturer: Foxboro Model 871ITPH with EP459A sensor.

2.10 Flow Transmitter – Magnetic – Submergence Rated

A. Type: Pulsed DC coil.

1. Flanged Type (for line sizes 8 inches and up).

2. Wafer type (for line sizes less than 8 inches) unless scheduled otherwise.

3. Submergence Rated: The flow tube shall be rated for continuous submergence to 30 feet (IP68).

B. Body:

1. Flanged Tube: Short form design, 304 stainless steel flowtube, carbon steel ANSI 150 flanges.

2. Wafer Type: Designed to mount between ANSI 150 flanges (provided by others) unless scheduled otherwise. Flowmeter housing shall be manufacturer's standard material of construction.

C. Electrodes: High impedance type, 316 stainless steel unless scheduled otherwise.

D. Grounding Rings: As required by schedule, 316 stainless steel unless scheduled otherwise.

E. Transmitter:

1. Power: 120 VAC.

2. Enclosure: NEMA 4, coated cast aluminum or fiberglass.

3. Mounting Bracket: 2-inch pipe.

4. Local Indicator: Included.

5. Cabling: Sufficient to connect flow element and transmitter. Transmitters may be remotely mounted inside buildings.

6. Output: Isolated 4-20 mADC.

7. Accuracy: ± 1.0 percent of flow rate.

F. Schedule:

Tag	Service	Meter Size (In.)	Calibrated Range	Liner Material	Electrode Material	Grounding Ring Material	Max Temp / Max Press	Location/Area Classification
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								
FE/FIT-								

G. Acceptable Manufacturers: Endress Hauser Promag 10.

2.11 Flow Switch – Thermal Dispersion – Liquid Service

A. Type: Thermal flow switch, liquid service only. The process connection shall be 3/4-inch MNPT with a standard “U” length suitable for mounting in a 3/4-inch threaded tee. The unit shall be designed to mount in horizontal piping in a side mounted configuration.

B. Contacts: SPDT 5 amp resistive at 120 VAC.

C. Response Time: Unit shall guarantee less than 10 seconds response time for the line sizes, flow rates and other conditions as installed in this application.

D. Power: 120 VAC.

E. Materials of Construction:

1. Wetted Parts: 316 stainless steel.

2. Electronics Enclosure: Cast aluminum with epoxy coating, suitable for outdoor service.

F. Schedule:

Tag	Range	Set Point	Switch Actuates On	Service

G. Acceptable Manufacturers: FCI (Series FLT) or STI / Magnetrol (Thermatel Model).

2.12 Level Switch - Float

A. Type: Submersible impact and corrosion resistant ABS body; non-mercury switch, contact rated 13 A / 120 VAC; SPDT contact configuration. Mercury float switches are unacceptable.

B. Cable: 16 gauge, 2 or 3 conductor, SJOW oil resistant, CPE. Provide sufficient length for mounting at the elevations indicated.

C. Junction Box: Provide NEMA 4X stainless steel junction box, mounted near the switch (must be mounted outside hazardous area) for terminating vendor supplied cable and discrete control wiring to control panel.

D. Switch Mounting: The System Manufacturer shall provide 3/4 or 1 inch Schedule 40, 316 stainless steel pipe or 1/4-inch cable for mounting the floats for a particular tank or well. The pipe shall extend from two feet above the highest switch setting (up to the top of the vessel) to two feet below the lowest level setting (down to the vessel bottom) for the vessel or well and allow for adjustment of the switch or switches anywhere along the length of the pipe. The method for fixing the float to the pipe shall be easily adjustable and shall provide for protection and strain relief for the float switch cable. Provide a minimum of two mounting brackets for fixing the pipe to the vessel wall while maintaining appropriate standoff distance. The System Manufacturer shall ensure mounting is in accordance with the manufacturer's recommendations.

E. Schedule:

Tag	Contracts Required	Level Sensor Setpoint Elevation	Sensor Area Classification

F. Acceptable Manufacturers: Gems/Warrick Controls Series M or ITT Flygt ENM-10.

2.13 Level Transmitter – Gauge Pressure

A. Type: "SMART" gauge with capacitance or piezoresistive element and integral digital indicator.

B. Accuracy: ± 0.35 percent of calibrated span.

C. Output: Isolated 4-20 mADC.

D. Adjustments: Span and zero shall be continuously adjustable. Maximum zero elevation shall be at least 400 percent of calibrated span. Maximum zero suppression shall be at least 300 percent of calibrated span.

E. Enclosure: NEMA 4X; low copper aluminum with epoxy polyester or polyurethane coating; suitable for 2-inch pipe mounting.

F. Power Supply: 24 VDC, Loop Powered.

G. Wetted Materials: As scheduled below.

H. Process Connection: 1/2-inch NPT.

I. Schedule:

Tag	Type	Range	Units	dP @ Full Scale	Diaphragm Seal	Valve Manifold	Location/ Area Class	Wetted Material
								See Note 1
								See Note 1
								See Note 1
								See Note 1
								See Note 1
								See Note 1
								See Note 1
								See Note 1
								See Note 1

Note 1: Ceramic sensor and Hastelloy C wetted metal parts.
Note 2: Verify range of 0-24" using tank submittal drawings.

J. Acceptable Manufacturers: Endress+Hauser (Model PMC-51).

2.14 Level Transmitter - Submersible Sensor with Remote Transmitter

A. Type: Microprocessor-based level transmitter with submersible head sensor. Provide intrinsically safe electronics as required for hazardous area locations.

B. Sensor: Sensor shall be remote mounted from transmitter and have sufficient range for the application. Unit shall be supplied with urethane cable with length as required to

connect the sensor to the transmitter. Transmitters may be remotely mounted inside buildings. Provide stainless steel cable and mounting clamps to hang sensor.

C. Transmitter: Transmitter shall have integral loop-powered indicator. Transmitter shall be capable of wall or 2-inch pipe stand mounting.

D. Transmitter Output: Isolated 4-20 mADC.

E. Transmitter Enclosure: NEMA 4X, glass reinforced polyester.

F. Transmitter Power Supply: 24 VDC loop powered.

G. Accuracy: ± 0.5 percent of calibrated span or better for spans greater than one tenth of unit standard measuring range.

H. Mounting: The System Manufacturer shall provide secure mounting bracket for cable clamp and 2-inch pipe stand for transmitter/indicator.

I. Schedule:

Tag	Level Range	Indicator Scale	Cable Length	Sensor Area Classification

J. Acceptable Manufacturers: Endress+Hauser (Deltapilot S DB51A or DB50A).

2.15 Level Transmitter - Ultrasonic

A. Type: Non-contact, ultrasonic, microprocessor-based with input or output filter capability.

B. Sensor:

1. Mounting: The System Manufacturer shall coordinate mounting to ensure that the sensor is mounted away from vessel walls and other obstructions in accordance with the manufacturer's recommendations. The System Manufacturer shall provide appropriate standoff distance for sensor face from the highest liquid level to accommodate blanking distance.

2. Range: Sufficient range for the application.

3. Cable Length: Sufficient to connect sensor and transmitter. Transmitter may be remote mounted in a building.

4. Enclosure: NEMA 4X, rated for mounting in hazardous area as required by schedule.

5. Automatic Temperature Compensation: Required.

6. Face Material: CPVC or PTFE.

7. Process Connection: 8 inch ANSI flange.

C. Transmitter:

1. Digital Indicator: Required.

2. Output: Isolated 4-20 mADC.

3. Enclosure: NEMA 4X, aluminum, polycarbonate, or fiberglass.

4. Power Supply: 120 VAC.

5. Accuracy: ± 1.0 percent of calibrated range or better for ranges greater than 25-inches.

6. Mounting: Remote, 2-inch pipe.

D. Schedule:

Tag	Level Range (Feet)	Indicator Scale Units	Location/Area Classification

E. Acceptable Manufacturers: Siemens Milltronics (EnviroRanger), Endress+Hauser (Prosonic S).

2.16 ORP Control System

A. Type: Microprocessor-based Disinfection and Dechlorination Controller.

B. Inputs:

1. RS-485 digital network signal for ORP sensors.

2. Effluent Flow: 4 to 20 mADC.

C. Outputs:

1. Two 4 to 20 mADC to control chemical feeders.

2. Two 4 to 20 mADC for remote indication of ORP values.

D. Power: 120 VAC.

E. Sensors: Two ORP sensors included.

F. Controller:

1. Enclosure Material: FRP

2. Enclosure Rating: NEMA 4X (IP 66)

3. Display: 2-line x 40 character LCD

4. Data Logging: The system shall store the following for each channel: ORP input values, flow input value, and chemical feeder output values. Values shall be stored at an interval of two minutes. The system shall also store all alarms, key presses, and adjustments at the controller. Memory capacity shall be such that downloading is not required more than once a week. Stored values shall be accessible by RS-232 direct connection.

G. Acceptable Manufacturers: Stranco Strantrol 900 with Strantrol 880 ORP sensors.

2.17 pH/ORP Transmitter

A. Type: Dual measurement microprocessor-based with diagnostic capabilities and two-point calibration. Unit shall accept two inputs. Unit shall be supplied with automatic temperature compensation. Display shall be 3-1/2 digit LCD.

B. Sensors: Sensors with integral preamplifier shall be completely sealed and suitable for submersion. Actual mounting (submersible or union-mount) configuration as required by schedule. Interconnecting cable, for use with integral amplifier, shall be 25 feet long.

C. Range: 1 to 14 pH units and -1400 to +1400 mV.

D. Output: Two independent isolated 4-20 mADC outputs for pH and ORP. Provide two, independently configurable alarm outputs rated at 5 Amps, 120 VAC.

E. Enclosure: NEMA 4X, fiberglass, aluminum or thermoplastic. For outdoor enclosure, provide thermostatically controlled space heater.

F. Power Supply: 120 VAC.

G. Spare Sensors: Provide two of each sensor.

H. Schedule:

Tag	Calibrated Range pH/ORP	Mounting Configuration	Location/Area Classification

I. Acceptable Manufacturers: Rosemount (Model 1055 Analyzer with pH and ORP sensors).

2.18 pH/pH Transmitter

A. Type: Dual measurement microprocessor-based with diagnostic capabilities and two-point calibration. Unit shall accept two inputs. Unit shall be supplied with automatic

temperature compensation. Display shall be 3-1/2 digit LCD.

B. Sensors: Sensors with integral preamplifier shall be completely sealed and suitable for submersion. Actual mounting (submersible or union-mount) configuration as required by schedule. Interconnecting cable, for use with integral amplifier, shall be 25 feet long.

C. Range: 1 to 14 pH units for both sensors.

D. Output: Two independent isolated 4-20 mADC outputs for pH and pH. Provide two, independently configurable alarm outputs rated at 5 Amps, 120 VAC.

E. Enclosure: NEMA 4X, fiberglass, aluminum or thermoplastic. For outdoor enclosure, provide thermostatically controlled space heater.

F. Power Supply: 120 VAC.

G. Spare Sensors: Provide two of each sensor.

H. Schedule:

Tag	Calibrated Range pH/pH	Mounting Configuration	Location/Area Classification

I. Acceptable Manufacturers: Rosemount (HACH Model DPD1P1 with SC200 controller).

2.19 Particle Counting System

A. Particle counting system for potable water shall consist of: Sensor(s), Transmitter(s), Flow Regulator Device(s), Power Supply(s) and Power Cabling, and Tubing for connection between sensors and flow regulator devices and drain.

B. Particle Counter Sensor:

1. Type: Light-blocking type with a laser diode light source.

2. Range: 2 – 750 microns.

3. Maximum Concentration: 17,000 particle/mL.

4. Resolution: ±10 percent.

5. Number of Particle Size Channels: Five.

6. Materials: Wetted parts: Stainless steel, sapphire, Teflon, or other non-corrosive material.

7. Power: 120 VAC.

8. Provide one spare sensor, delivered loose with no enclosure.

9. Calibration: Sensors shall be capable of calibration in their installed location on site by plant personnel. Provide standardized particle solution sufficient for one year's calibration for all sensors, calibration software, and any other hardware or supplies necessary for sensor calibration.

10. It shall be possible to individually select and change all of the particle size thresholds of each connected sensor. This threshold selection capability shall include the sensitivity (first particle size threshold) of the sensor. Each sensor shall measure particles continuously with no interruptions for data processing or printing.

C. Flow regulator device(s) shall control flow rate through each sensor without the use of valves or other constrictions in the sample line. Device shall function without the need for operator interaction after initial set-up.

D. Transmitter(s):

1. Input: From particle counter sensors.

2. Output: Isolated 4 to 20 mADC for each particle size.

3. Power: 120 VAC.

E. Installation Supervision: Particle counters shall be installed under the direct guidance and supervision of an authorized manufacturer's representative. Manufacturer shall provide two days on-site for installation and start-up. Manufacturer shall also provide a comprehensive, one day, on-site training session for the Owner's personnel.

F. Manufacturer shall guarantee on-site service by manufacturer-trained personnel within 48 hours of notification. Replacement sensors, if necessary, shall be made available within 24 hours.

G. Schedule:

Tag	Service

H. Acceptable Manufacturers: Hach (Model 2200 PCX), Chemtrac Systems (Model PC 2400D).

2.20 Turbidity Transmitter – Laser Nephelometer with sc100 Controller, RS-485 (Modbus) Communications

A. Type: Microprocessor-based, continuous-reading, on-line laser nephelometric instrument measuring light scatter at 90 degrees from incident beam. Unit shall be complete with flow-through turbidimeter, transmitter, and interconnecting cabling.

B. Turbidimeter:

1. Sample Flow: 1.6 to 11.9 GPH.

2. Sample Temperature: 32 to 121° F.

3. Sample Inlet / Drain: 1/4-inch NPTF / 1/2" NPTF.

4. Mounting: Wall or floor stand.

C. Interconnection Cable: 20 foot cable included.

D. Transmitter:

1. Mounting: Wall, panel or floor stand.

2. Enclosure: NEMA 4X / IP66.

3. Range / Resolution: 0.000 to 5,000 mNTU.

4. Accuracy / Repeatability: ± 3% of reading / ± 1.0% of reading.

5. Output: Two 4 to 20 mADC.

6. Communications: Modbus RS-485.

7. Alarms: Three SPDT, rated 5A at 230 VAC.

8. Power: 120 VAC.

E. Accessories: Calibration kit, including all hardware and materials for six months of calibration at once per week.

F. Approval: USEPA approved method 10133 for regulatory compliance reporting.

G. Schedule:

Tag	Service	Maximum Turbidity	Normal Turbidity	Location/Area Classification
AE/AIT-1	Combined Filter Effluent	1.0 NTU	< 1.0 NTU	Non-Classified

H. Acceptable Manufacturer: Hach FilterTrak 660 sc with sc100 Controller, RS-485 Output.

2.21 Temperature Gauge

A. Type: Bi-metallic, hermetically sealed, silicon-filled, externally adjustable.

B. Mounting and Process Connection: 1/2-inch NPT.

C. Case: Stainless steel with polycarbonate glass window.

D. Dial: 3-inch.

E. Accessories: 316 stainless steel thermowell.

F. Schedule:

Tag	Range	"U" Length	Lagging

G. Acceptable Manufacturer: Ashcroft Series EL.

2.22 Temperature Switch

A. Type: Direct mount thermal system assembly with adjustable set point and deadband.

B. Contacts: Snap-action switch, SPDT or DPDT, rated at 5 A / 120 VAC.

C. Enclosure: Watertight NEMA 4X. Exception: Provide NEMA 7 explosion proof enclosure where hazardous areas are indicated in schedule.

D. Thermal Well: 316 SS, included.

E. Schedule:

Tag	Min. Adj. Range	Set point	Actuate on Incr or Decr	Area Classification

F. Acceptable Manufacturers: ASCO, Ashcroft, Static-O-Ring.

2.23 Temperature Transmitter

A. Type: Microprocessor based "SMART" transmitter complete with 3-wire, 100 ohm platinum RTD element and integral indicator.

B. Accuracy: $\pm$ 0.20 percent of calibrated span.

C. Output: Isolated, 4 to 20 mADC, linear with temperature into loop loads of 0 to 500 ohms.

D. Power Supply: 24 VDC (two wire).

E. Enclosure: NEMA 4X, low copper aluminum with epoxy polyester or polyurethane coating.

F. Accessories: Sensor connection head, extension fitting and 316 stainless steel thermowell; bracket for remote mounting of transmitter.

G. "U" Length: System manufacturer shall verify thermowell will not interfere with mixers, packing, or other internal devices within tank/vessel where applicable.

H. Schedule:

Tag	Calibrated Range	Indicator Scale Units	"U" Length	Location/Area Classification

I. Acceptable Manufacturers: Rosemount, Honeywell, Foxboro, ABB, Endress+Hauser.

2.24 Potentiometer Transmitter

A. Potentiometer Type: Single-turn, linear 1 K ohm potentiometer, front panel mounted. Provided with dial pointer and 0-100 percent scale late, equal to Allen-Bradley Series 800H.

B. Transmitter Type: Three-wire potentiometer input, 0-1,000 ohms. 4-2 mADC isolated output into a 0-500 ohm minimum load. Output scale shall be linear with resistance input.

C. Power Supply: 120 VAC, single phase, +10 percent.

D. Housing: General purpose, single unit, NEMA 1, subpanel mounted.

E. Accuracy: +0.1 percent span.

F. Schedule:

Tag	Service	Location

G. Acceptable Manufacturers: Moore Industries, Action Instruments, Acromag.

2.25 Pressure Gauge

A. Type: Bourdon tube or bellows, as required by pressure range, with blowout protection. Provide glycerine filled gauge as required by schedule.

B. Dial: 4.5-inch, white face with black lettering.

C. Materials:

1. Case: Phenolic.

2. Lens: Acrylic.

3. Bourdon Tube and Socket: 316 stainless steel (bronze and brass if diaphragm seal is used).

4. Movement: Stainless steel.

D. Accuracy: $\pm$ 0.5 percent (Grade 2A).

E. Connection Size/Location: 1/2-inch/lower.

F. Snubber: 316 stainless steel as required by schedule.

G. Diaphragm Seal: As required by schedule, provide diaphragm seal with flushing connection:

1. Seal: Welded diaphragm.

2. Upper Housing Material: Carbon steel.

3. Wetted Parts: Hastelloy C.

4. Upper Connection Size/Type: 1/2-inch/NPT.

5. Lower Connection Size/Type: 1-inch/NPT.

6. Fluid Fill: Glycerine.

H. Schedule:

Tag	Pressure Range	Diaphragm Seal	Gauge Fill	Snubber Required	Pressure Sensor
PI-					
PI-					
PI-					
PI-					
PI-					
PI-					
PI-					
PI-					
PI-					
PI-					

Note 1: Gauge shall be assembled with pressure element and vacuum-filled per manufacturer's recommendations. See Pressure Element paragraph below.

I. Acceptable Manufacturers: Ashcroft, Dwyer, U.S. Gauge.

2.26 Pressure Isolation Ring

A. Type: Wafer style sensing ring designed to fit between ANSI Class 125 or 150 flanges.

B. Materials:

1. Body: Carbon steel.

2. Isolating Sleeve: Black natural rubber or pure gum rubber.

3. Fill Fluid: Glycol/Water.

C. Schedule:

Tag	Line Size	Solids	Maximum Line Velocity	Items Mounted to Sensor
PE-				PI-
PE-				PI-

D. System Manufacturer shall mount items shown above to pressure element and vacuum fill entire unit per manufacturer's instructions.

E. Acceptable Manufacturers: Ashcroft, Red Valve, Onyx Valve.

2.27 Pressure Switch - Spring and Piston

A. Type: Spring-opposed piston assembly with externally adjustable setpoint and deadband.

B. Contacts: Snap-action switch, SPDT or DPDT, rated at 4 Amps/120 VAC.

C. Enclosure: NEMA 4X. Exception: Provide NEMA 7 explosion proof enclosure where hazardous areas are indicated in schedule.

D. Diaphragm Seal: Provide diaphragm seal with flushing connection as required by schedule:

1. Seal: Welded diaphragm.

2. Upper Housing Material: Carbon steel

3. Lower Housing Material: 316 stainless steel.

4. Upper Connection Size/Type: By System Manufacturer.

5. Lower Connection Size/Type: 1-inch/NPT.

6. Diaphragm Material: 316 stainless steel.

7. Fill Fluid: Glycerine.

E. Schedule:

Tag	Minimum Adjustable Range	Setpoint	Diaphragm Seal	Set to Actuate on Incr or Decr	Area Classification

F. Acceptable Manufacturers: ASCO, Ashcroft, Static-O-Ring.

2.28 Pressure Transmitter

A. Type: "SMART" gauge or differential as required by schedule with capacitance or piezoresistive element and integral digital indicator. Wetted parts to be 316 or 316L stainless steel.

B. Accuracy: ± 0.15 percent of calibrated span.

C. Output: Isolated 4-20 mADC.

D. Adjustments: Span and zero shall be continuously adjustable. Maximum zero elevation shall be at least 400 percent of calibrated span. Maximum zero suppression shall be at least 300 percent of calibrated span.

E. Enclosure: NEMA 4X; low copper aluminum with epoxy polyester or polyurethane coating; suitable for 2-inch pipe mounting.

F. Power Supply: 24 VDC, Loop Powered.

G. Three-Valve Manifold: As required by schedule, transmitter shall be furnished with single flanged manifold valve. Valve shall be hard seated type with PTFE packing material. Stem manifold body and all wetted materials shall be 316 stainless steel. Acceptable manufacturers are Hex Valve or Anderson-Greenwood.

H. Diaphragm Seals: As required by schedule, provide threaded, remote diaphragm seal with single flushing connection equal to Rosemount Model 1199 ARTW. Provide 316 stainless steel armored capillary of sufficient length for proper remote mounting of transmitter.

1. Fluid Fill: Glycerin and water.

2. Diaphragm Material: 316L stainless steel.

3. Lower Housing and Wetted Parts Material: 316 stainless steel.

4. Lower Housing Process Connection: 1-inch NPT.

5. Mounting Ring Material: Plated carbon steel.

6. Upper Housing Material: 316 stainless steel.

I. Installation: Install transmitters in accordance with manufacturer's recommendations. For transmitters to be used with venturi tubes, coordinate with venturi manufacturer and install in accordance with venturi manufacturer recommendations.

J. Schedule:

Tag	Type	Range	Units	dP @ Full Scale	Diaphragm Seal	Valve Manifold	Location/ Area Class
PIT-	Gage						
PIT-	Gage						

Notes: Calibrated differential pressure range by System Manufacturer based on venturi tube manufacturer recommendation and maximum permanent loss.

K. Acceptable Manufacturers: Rosemount, Endress+Hauser, Siemens, Honeywell, ABB, Yokogawa.

2.29 Streaming Current Detector

A. The streaming current detector shall be of the continuous reading, flow-through type. The streaming current shall be a measure of the electrical charge in a water sample after the water has been dosed with coagulants that destabilize suspended colloids.

B. The streaming current sensor shall be self-cleaning, designed for a sample rate of 5 gpm and furnished complete with sample cell and stainless steel electrodes. The generated signal shall be transmitted through a vendor-supplied shielded cable to the monitor. The monitor may be remote mounted in the lab. Power to the sensor shall be 120 VAC.

C. The monitor shall accept the generated current and provide a continuous, linear 4-20 mADC signal, proportional to electrokinetic potential. The monitor shall also provide adjustable dual relay contact outputs. Power to the monitor shall be 120 VAC.

D. The monitor shall be housed in a NEMA 4X polycarbonate enclosure. The monitor shall include an LCD display calibrated to read directly in volts with switch selectable ranges, adjustable zero and span, zero offset in/out switch, adjustable high and low alarm setpoints, and high and low alarm indicator lights.

E. Schedule:

Tag Number	Range	Location Sensor/Transmitter
AE/AIT-	+/-1,000 Streaming Current Units	

F. Acceptable Manufacturer: Chemtrac.

2.30 Power Supply

A. Type: Linear regulated.

B. Input Voltage: 120 VAC, 60 Hz, 1 ph.

C. Output Voltage: 28 VDC, 1 Amp.

D. Enclosure: NEMA 1.

E. Mounting: Wall.

F. Schedule: AX-101.

G. Acceptable Manufacturer: Equal to Acopian Gold Box Model B28G110.

2.31 Recorder – Data - Paperless

A. Videographic Multipoint Data Recorder.

B. Number of Channels: Up to 15, including 3 computation channels.

C. Inputs: 6 or 12 direct universal inputs, including DC Voltage, DC Current, Thermocouple, and RTD. See table below.

D. Display: VGA Active-Matrix, Color LCD with Touchscreen control. Modes include Graphic Trend, Bargraphs, Digital Meters, Alarm/Event Summary, with split screen combinations. Status windows include Time/Data, Alarms, Disk Capacity Used, and Menu.

E. Data Storage: 3-1/2-inch, 1.44 MB, IBM format floppy diskette or PCMCIA flash card with 220 MB.

F. Data Conversion: Sixteen bit A/D converters. Measurement accuracy - $\pm$ 0.05%. Measurement rate – 4 times per second.

G. Recording Rate: Four times per second to 1 time per 10 minutes.

H. Alarms: Five alarm set points per channel, 3 or 6 alarm contact outputs, latching or non-latching.

I. Communications: RS232, RS485, Modbus RTU, or Modbus ASCII.

J. Companion Software: Windows-based software for PC data display, analysis, and export.

K. Tag Schedule:

Tag(s)	# of Inputs	# of Alarms

L. Acceptable Manufacturers: Monarch, Yokogawa, ABB.

2.32 Signal Auxiliary – Loop Isolator

A. Type: Current-to-current loop isolator.

B. Mounting (as listed in schedule):

1. Panel: DIN rail, track mount or individual metal bracket mount.

2. Field: NEMA 4X enclosure.

C. Input: 4-20 mADC.

D. Output: Isolated 4-20 mADC.

E. Power: Loop powered.

F. Accuracy: Manufacturers standard.

G. Schedule:

Tag Number	Mounting

H. Acceptable Manufacturers: Action Instruments, Acromag, Moore Industries, Phoenix Contact.

2.33 Totalizer – Loop-Powered

A. Type: Digital, configurable panel indicator for single analog input.

B. Input: 4 to 20 mADC.

C. Readout: Engineering units with provision to scale input and place decimal point.

D. Power: Loop powered.

E. Update Rate: Once per second.

F. Accuracy: 0.05 percent of span, ± 1.

G. Totalizer: Programmable time base.

H. Enclosure: Panel Mount, NEMA 4X, or Explosion-proof (as listed in schedule).

I. Display: 6 digit, LCD with ½-inch character height.

J. Schedule:

Tag Number	Mounting

K. Acceptable Manufacturer: Precision Digital PD696/7/8 Series.

2.34 Indicator - Digital - Panel Mounted

A. Type: Digital, microprocessor-based, configurable panel indicator for single analog input.

B. Display: LED, 3-1/2 digit, 1/2-inch display height. Engineering units with provision to scale input and place decimal point.

C. Enclosure: NEMA 4X for panel mounting.

D. Input: 4-20 mADC.

E. Power Supply: 120 VAC.

F. Read Rate: 2.5 per second.

G. Accuracy: ±0.1 percent of reading, ± 1 count.

H. Schedule:

Tag	Range	Units

I. Acceptable Manufacturer: Action Instruments, Precision Digital, Red Lion.

2.35 Solenoid Valve - 3-Way

A. Type: Three-way pilot operated action per schedule below.

B. Materials of Construction:

1. Body: Brass

2. Seals and Discs: Buna-N

3. Disc Holder: Nylon

4. Core, Core Tube and Springs: Stainless steel

C. Enclosure: NEMA 4X.

D. Coil Voltage/Rating: 120 VAC, 60 Hz, Class F insulation

E. Minimum Operating Pressure Differential: 10 PSIG

F. Maximum Operating Pressure Differential: 150 PSIG

G. Connection Type: FNPT

H. Schedule:

Tag	Valve Size (inches)	Valve Cv (minimum)	Normally Open / Closed
EV-			
EV-			
EV-			

I. Acceptable Manufacturer: ASCO, Skinner.

Part 3 Execution

3.01 Installation

A. Locate field instruments so they are accessible for maintenance and orient so that indicators are readily visible. Unless otherwise indicated, mount instruments 36 to 60-inches above work surface. Provide 2-inch diameter, 304 stainless steel, Schedule 10 pipe welded to a 10-inch square by 1/4-inch thick stainless steel base plate for support unless wall or other mounting arrangement is indicated. Space instruments at least 1/2-inch off concrete walls by stainless steel channels or phenolic spacers.

B. Provide stainless steel or aluminum sun screens or shades for all electronic instruments located outdoors.

C. Provide stainless steel identification tags attached with stainless steel wire or screws for all field instruments.

3.02 Tests and Calibration

A. Perform continuity test on instrumentation conductors in accordance with Section 16120.

B. Calibrate each instrument to its published accuracy. Submit calibration sheets including the instrument tag number or name, the date, name of individual performing calibration, procedures and equipment used, and results obtained.

END OF SECTION

Part 1 General

1.01 Scope

Programmable logic controllers (PLC).

1.02 System Description

A. This Section covers the technical requirements for programmable logic controllers (PLC) that will receive discrete and analog inputs, and through the use of an internal ladder logic program, control output relay operations and perform data handling functions.

B. The capabilities of the individual PLCs shall be as required to perform the control functions associated with the particular control panel or system.

C. The System Manufacturer shall determine the actual amount of memory and I/O requirements necessary for each control panel to function as specified or shown on the Drawings. Each processor shall have 50 percent spare memory capacity (not less than 1K). Where rack type PLCs are used, each rack shall have a minimum of 10 percent spare I/O points per type (but not less than four discrete inputs, four discrete outputs, two analog inputs, and two analog outputs) and a minimum of 25 percent spare slots (not less than two).

1.03 Submittals

A. For each individual PLC, the following record documentation shall be furnished in addition to documentation requirements in other Sections:

1. Complete software documentation, including annotated ladder logic diagram printout. Printout shall include a complete set of comments identifying relays, function of logic blocks, I/O points, etc.

2. Narrative description of the sequence of operation. Description shall reference, as applicable, the ladder diagram.

B. For the PLC system, documentation shall consist of descriptive literature and installation, operation, and instruction manuals, and shall be included in prints for approval and prints for record. In addition, record drawings shall include PLC manufacturer's recommended list of spare parts with prices, and availability/cost of maintenance contracts and similar support services available.

Part 2 Products

2.01 Acceptable Manufacturers

A. Programmable Logic Controllers shall be manufactured by:

1. Rockwell Automation Allen-Bradley ControlLogix 1756-L61.

2. Telemecanique Modicon Quantum.

3. Siemens Simatic S7-300.

B. Program development software shall be as distributed by the PLC manufacturer.

2.02 Central Processing Unit (CPU)

A. The CPU shall contain the program memory in static RAM, PROM, or a combination of both.

1. Provide visual indication of backup battery status with alarm in the event of low battery voltage before battery failure.

2. Provisions shall be made for connecting an external DC voltage to the system to provide auxiliary protection for CMOS RAM memories.

B. At least 1,024 internal storage registers shall be available for data storage. These registers shall be independent of and in addition to program storage memory.

C. Software or key locking arrangement at the CPU shall prevent memory modification by unauthorized personnel.

D. The processor unit shall be expandable to at least 4,000 I/O points.

2.03 Input/Output (I/O) Devices

A. Discrete Inputs/Outputs:

1. Discrete inputs shall be available in 24 and 115 VAC/DC. Discrete outputs shall be available in 24 VDC and 115 VAC.

2. Discrete inputs shall be guaranteed “on” if at least 78 percent of nominal voltage is present. Discrete inputs shall be guaranteed “off” if 20 percent or less of the nominal voltage is present.

3. Minimum isolation between input/output and logic voltage shall be 1,500 V RMS per NEMA standards via optoisolation.

4. AC discrete outputs shall be rated at 20 amps inrush, 2 amps continuous. DC discrete outputs shall have a 2 amp rating. All outputs shall have 3 amp normal fuse protection.

5. Each discrete input and output shall have an LED or other visible indication of on/off status.

B. Analog Inputs/Outputs:

1. Analog inputs shall be available in 4-20 mADC, 1-5 VDC, and 0-10 VDC. Analog outputs shall be available in 4-20 mADC, 0-10 VDC, and –10 to +10 VDC.

2. All of the above inputs and outputs shall have at least 11 bit resolution with an accuracy of ± 1 percent over the rated temperature range.

3. Minimum isolation between input/output and logic voltage shall be 1,500 VDC per NEMA standards via optical isolation.

4. Analog inputs shall be available in isolated and loop-powered versions.

5. All analog outputs shall be isolated.

C. All PLC terminal blocks shall be 300 V minimum NEMA rated, and accommodate at least two #14 gauge wires.

D. Marker strips shall be attached adjacent to the field wiring and the status indicating lights to allow easy identification of inputs and outputs by the user. These markers shall not change when devices are replaced during repair or maintenance. Color code marker strips according to voltage.

E. Field wiring shall not have to be removed in order to replace an I/O device during repair or maintenance.

2.04 Data Processing

A. The controller system shall have the ability to perform the following data processing functions without significantly slowing down or interrupting the logic processing:

1. The controller system shall be capable of storing, displaying, and printing messages containing numerical information, including information from timers, counters, math functions, and analog functions. These messages shall contain the full range of alphanumeric characters and shall be capable of assuming user required formats. A minimum storage capacity of 64,000 characters in addition to program memory and storage registers shall be available for these messages.

2. Provide proportional, integral, derivative (PID) fixed point control with ability to solve 32 PID loops with a repetition rate of one second.

3. The controller system shall have data storage capability which will allow the storage of recipes or other information in a structured file system. The file system shall be accessible from the user program.

2.05 Program Development Software

A. Provide Windows XP Professional-based programming software.

B. Programming capabilities shall include the ability to alert the programmer to errors in order to prevent not closing logic circuits, entering non-allowable addresses, or missing addresses.

C. Programming field for each rung shall be 70 elements minimum. Program changes shall be allowed element by element such as adding, deleting, or reversing (NO to NC) contacts without replacing an entire rung. It shall be possible to delete or insert entire rungs inside the program.

D. A search feature shall allow the operator to call up any contact or coil in the program by reference.

E. The controller system shall allow an operator to override inputs and outputs on or off from the development software.

F. The programming software shall have off-line, on-line, and monitor modes of operation, controlled by password to provide an additional tier of security.

1. Off-Line Mode: Normal programming shall be in the off-line mode. The PC shall not be connected to the control system for off-line programming.

2. On-Line Mode: In the on-line mode, the programming device shall be connected to the control system, and two-way communication shall exist between individual CPUs and the PC. On-line programming shall include the ability to make program edits, upload data and download data while the CPU is running. The status of contacts and coils in the ladder logic program shall be displayed on the PC. The PC shall display the current values of timers, counters, and internal registers, and the programmer shall be able to modify these values through the programming software while in the program display mode.

3. Monitor Mode: In the monitor mode the programming device shall be connected to the control system. The programming device shall be able to read from but not write to the CPU. The status of contacts, coils, timers, counters, and registers shall be displayed on the PC, but a programmer shall not be able to modify them.

2.06 Program Development PC

A program development PC is not included in the Project. It shall be the responsibility of the System Manufacturer to supply a PC, for their use, for the development of the PLC program.

Part 3 Execution

3.01 Installation

A. PLC equipment is to be mounted on the back panel of the local control panels, unless otherwise noted, and incorporated in the panel design by the system manufacturer.

B. The Contractor shall furnish the required footage for the data highway to the system manufacturer. Data highway conductors shall be furnished by the System Manufacturer for installation by the Contractor.

C. Data highway routing shown on the Drawings is based on a loop feed system. Other configurations which meet the redundancy requirements specified above will be permitted so long as the Contractor provides any additional raceways or conductors required and coordinates all clearances, at no cost to the Owner.

END OF SECTION

Part 1 General

1.01 Scope

Digital system hardware.

1.02 System Description

A. The system consists of PLC hardware and associated components, Plant Control System network hardware and associated components, computers, monitors, keyboards, mass storage devices, historical data (HD) storage devices and human machine interface (HMI) workstations as described below and on the Drawings. The hardware shall form a complete system including all components necessary to support the specified software. SNMP Software shall be used whenever possible for extensive diagnostics and configuration functions. System shall include, but not be limited to, items listed in Part 2 below.

B. All computer hardware shall comply with the latest amendment to Part 15 of the FCC Rules and Regulations, Dockets No. 20780 and 80-284 relating to restricted radiation devices and low power communication devices.

C. All applicable computer hardware must be compatible with the Operating System and shall be listed on the Operating System's approved hardware list.

1.03 Submittals

Submit product data for all components. Include a comprehensive bill of materials.

Part 2 Products

2.01 General Requirements

A. All digital hardware shall be modular construction to provide for future hardware expansion.

B. All devices located on the control system network shall continuously perform on-line diagnostics and failure reporting to the master operator interface workstations.

C. The temperatures inside the enclosure(s) for the equipment described in this section shall be monitored continuously and shall generate an alarm if the temperature rises to a preset, adjustable temperature value.

D. The Owner's HMI software license (Trihedral VTScada) shall be utilized for the project.

2.02 Redundancy/Fail-Over Requirements

A. Where redundant equipment is specified, the failure of either device in a redundant pair shall not alter the performance of the control system. The fail-over shall be fully automatic and shall require no action on the part of the operator to effect the transfer from one device to its back-up.

B. Where a failed device contains real-time control system data, the swap-over to the redundant device shall not cause more than 3 seconds of data to be lost.

C. Where the failed device contains control system intelligence such as graphics or programs, the redundant device shall have this intelligence internally resident and shall not require the downloading of graphics or programming to resume system control.

D. No degradation in control system performance shall occur when a redundant device is operating in a fail-over mode. No degradation of performance shall occur while redundant equipment is undergoing preventive or corrective maintenance.

2.03 Master Workstation and Backup Master Workstation

A. These workstations are based on Intel Xeon processors operating at a minimum clock speed of 3.0 GHz. Two workstations are required. Provide three year same day, 4-hour response, 7 days x 24 hours, on-site parts and labor warranty in the Owner's name from the PC manufacturer. Acceptable manufacturer is Dell (Precision Tower 7000 Series Workstation). These workstations shall be provided with the following devices as a minimum:

B. Memory: 64 GB expandable up to 256 GB

C. Video Card: Required.

D. Mass Storage: 2 TB internal storage

E. DVD/CD combo drive with 4x DVD rewriteable and CD rewriteable. Provide 20 spare writeable blank DVD and CD discs.

F. Zip Drive: Not required.

G. Keyboard and Pointing Device: Provide detachable, Microsoft Windows compatible keyboard with 104 ASCII Keys (minimum). Provide mouse pad and mouse.

H. Serial Interface: Provide two, asynchronous RS232C ports.

I. Parallel Interface: Provide two, parallel ports for printer communications.

J. Ethernet Interface: Provide one 100 Ethernet network interface card with RJ-45 ports, SNMP enabled.

K. The HMI Operating System shall be Microsoft Windows (latest version).

L. Monitor: Provide two, 21 inch flat panel, high resolution color monitors. Acceptable Manufacturer: Dell.

M. Speakers: Harmon Kardon.

2.04 Historical Data Computer

A. This historic data computer is based on Intel Xeon processors operating at a minimum clock speed of 3.0 GHz. One historical data computer is required. Provide three year same day, 4-hour response, 7 day x 24 hours, on-site parts and labor warranty in the Owner's name from the PC manufacturer. Acceptable manufacturer is Dell (Precision Tower 7000 Series Workstation). This historical data computer shall be provided with the following devices as a minimum:

B. Memory: 64 GB expandable up to 256 GB.

C. Video Card: Required.

D. Mass Storage: 2 TB internal storage.

E. DVD/CD Drive: DVD/CD combo drive with 4X DVD rewriteable and CD rewriteable. Provide 20 spare writeable DVD and CD blank discs.

F. Keyboard and Pointing Device: Provide detachable, Microsoft Windows compatible keyboard with 104 ASCII Keys (minimum). Provide mouse pad and mouse.

G. Serial Interface: Provide two, asynchronous RS232C ports.

H. Parallel Interface: Provide two, parallel ports for printer communications.

I. Ethernet Interface: Provide one 100 Ethernet interface communications card with RJ-45 ports, SNMP enabled.

J. The HD Operating System shall be Microsoft Windows (latest version).

K. Monitor: Provide two, 21 inch flat panel, high resolution color monitors. Acceptable Manufacturer: Dell.

2.05 Printers

A. Color Report/Graphics Printer (Two Required): Provide two color ink-jet printers, capable of printing 8.5 x 11 inch and 11 x 17 inch, tray feed, plain-paper media. Printer shall have 600 dpi black and color resolution. Tray capacity shall be 150 sheets plain paper. Unit shall have 8 Mb (minimum) memory. Provide five spare each of all color and black ink cartridges and 5,000 spare sheets of paper. Provide one-year (minimum) on-site service contract (three-year if available). Acceptable Manufacturer:Hewlett-Packard,Dell.

2.06 Fiber Optic Cable and Fiber Optic Patch Cords

A. The fiber optic cable for communication between buildings shall be all-dielectric. Fiber optic cable and patch cords shall be multimode, graded index profile, dual window type, with the following characteristics:

1. Core diameter: 62.5 microns.

2. Cladding diameter: 125 microns.

3. Attenuation at 850 nm: 3.0 dB/km (maximum).

4. Attenuation at 1,300 nm: 1.0 dB/km (maximum).

5. Bandwidth at 850 nm: 160 MHz/km (minimum).

6. Bandwidth at 1,300 nm: 500 MHz/km (minimum).

B. The fiber optic cable shall be loose tube style, waterblocking water-swellable tape and yarn type, with non-metallic strength members. Patch cords shall be provided with connectors installed. Cable shall be provided with a minimum number of fibers as shown on the Plant Control System Architecture drawing. Cable shall be suitable for continuous underwater submergence within underground ductbanks.

C. All fiber optic connectors shall be “ST” type, or as required to match device connections.

D. Acceptable Manufacturers: Corning Cable Systems (Altos or Altos/LST) or Comm Scope Arid Core (LST/CT).

2.07 Fiber Optic Patch Panels

A. Provide one fiber optic panel for each fiber cable entering each LCP as shown on the Plant Control System Architecture drawing. Each fiber cable shall have a separate fiber optic patch panel. All fibers within each fiber cable shall be terminated in their respective patch panel. Fiber optic patch cords shall be installed between the patch panels for all spare fibers.

B. Acceptable Manufacturers: Corning Cable Systems or CommScope.

2.08 Uninterruptible Power Supply

A. Provide one uninterruptible power supply (UPS) in each LCP which houses a PLC. Also provide UPS for the Plant Control system workstations, Plant Control system historical data computer, engineering workstation, and printers. Each UPS unit shall be sized to provide nominal power requirements for a minimum of 10 minutes at full load (unless noted otherwise). The UPS shall be provided with a 100/1000 Base-T port (RU-45) and shall be SNMP enable for extensive diagnostics and configuration functions. In addition to the above, the following devices, as a minimum, shall be provided with UPS based power:

1. Plant Control System network backbone fast Ethernet switches.

2. Standard Ethernet switches.

3. Loop powered analog devices, including loop powered analog I/O.

4. Power supplies for Plant Control System processors and I/O hardware.

5. Plant Control System Master and Backup Master Workstations.

6. Plant Control System Historical Data Computer.

7. Fiber optic modules and media converters.

8. Spread spectrum and licensed radios.

B. Acceptable Manufacturers: MGE (Pulsar Ex) or APC ("Smart-UPS" 700 or higher).

2.09 Ethernet Fiber/Copper Media Converter

Provide Ethernet fiber/copper media converters as shown on the Plant Control System Architecture drawing. The converter shall be compatible with 62.5/125 micron fiber optic cable and shall be compliant with the 100/1000BASE-T standard, as required. Converters shall have ST style fiber connectors. Acceptable Manufacturers: Phoenix Contact, Hirschmann, Modicon, or Black Box.

2.10 Fiber Termination Kit

Provide one fiber terminating kit for installation of fiber connectors. Acceptable Manufacturers: Corning Cable Systems, CommScope, or Black Box.

2.11 Plant Control System Engineering Workstation

A. The System Manufacturer shall provide one Plant Control System Engineering Workstation laptop computer. The intended use of the laptop is for dial-up troubleshooting by the System Manufacturer, for connecting directly to any plant control system PLC processor, and for connecting to any dedicated 100/1000Base-T Ethernet port in any of the plant control system LPCs. The HMI application and as-built copies of all plant control system PLC programs shall reside on the laptop. The SNMP software shall also be loaded on the laptop. The laptop shall be ordered by the System Manufacturer in the latter part of the Project and shall not be used by the System Manufacturer for program development, or for any purpose other than those listed above, without prior written permission from the Owner. It shall be the System Manufacturer's responsibility to provide computers as required for their use in program development. Program development computers are not included in the Project.

B. The laptop shall normally reside in a lockable room or closet and shall normally be connected to the plant control system network backbone.

C. The laptop may be plugged into any dedicated 100Base-T Ethernet port in any of the plant control system LCPs and the HMI application started. The HMI software on the laptop shall be provided with I/O and shall poll for data. This shall permit the laptop to communicate with the local PLC and monitor/control regardless of the status of the plant control system network backbone. Provide all cabling and connectors as required for connecting to the dedicated 100Base-T Ethernet port.

D. The laptop may be plugged in to any PLC communications port and the annotated PLC software application started. This shall permit the laptop to be plugged in to the communications port on the PLC regardless of the status of the Plant Control System network backbone and perform offline or online editing of the annotated PLC software application. Provide all cabling and connectors as required to connect the laptop to the PLC.

E. The laptop shall be a Dell Latitude 14 Rugged Extreme with Intel Core i7 processor operating at a minimum of 2.0 GHz clock speed. Provide three year minimum next business day on-site parts and labor, complete care warranty in the Owner's name from the PC manufacturer. The PC shall be provided with the following devices as a minimum:

1. Integral keyboard and pointing device. Unit shall include external mouse.

3. 500 GB (minimum) internal storage.

4. 8 GB (minimum) memory.

5. 14-inch HD color display.

6. Unit shall have a PCMCIA expansion slot.

7. Internal DVD/CD-RW drive.

8. Ethernet Interface: 100/1000 Mbps Ethernet

9. Additional lithium ion battery.

10. Nylon carrying case.

11. The HMI operating system shall be Microsoft Windows Latest Version.

2.12 Presentation Projectors

A. Projector shall have the following features:

1. Input sources – CableWizard system for connecting computers, including connection to USB systems.

2. Lens – 1.3:1 manual zoom lens.

3. Light source – 120 watt UHP lamp (2,000 hour half life).

4. Brightness – 1,000 ANSI Lumens.

5. Contrast Ratio – 300:1.

6. True Resolution – 1,024 x 768 XGA.

7. Displayable Colors – 16.7 million.

8. Video Compatibility – NTSC, NTSC 4.43, PAL, SECAM.

9. Response time – 25 ms.

B. Provide cables between computers and presentation projectors.

C. Provide commercial metal mounts for hanging from ceilings. Mount shall allow orienting presentation projectors in horizontal and vertical planes.

D. Acceptable Manufacturer: Equal to InFocus LP755 Personal Projector.

2.13 Automatic Printer Sharer

The automatic printer sharer shall be capable of automatically sharing one printer with up to six computers and shall support latest version of windows. An internal 1 MB buffer shall be standard. 120 VAC power cord, plug-in adapter, and a 10-foot bi-directional cable shall be provided. Acceptable Manufacturer: Black Box.

Part 3 Execution

3.01 Labeling

Fiber optic patch panel fiber connectors shall be individually labeled on the outside of the panel. Labels shall be made of engraved lamacoid and shall be permanently affixed to the panel side. Labels shall bear the numbers 1 through X, with X being the total number of fibers in the cable. A directory card shall be provided with each panel and shall list the service of each fiber. Spare fibers shall be listed as such. All plant control system network backbone fiber optic patch panels shall use the same numbering scheme such that fiber No. 1 is always in the same location.

3.02 Fiber Optic Cable Testing

A. The System Manufacturer shall perform testing on all fiber optic cable.

1. Provide all equipment, instrumentation, and supplies necessary for testing.

2. After all PCS backbone cables are installed and all fibers are connected to the patch panels, install all patch cords between the two patch panels in each LCP. Each fiber in the PCS backbone cables shall have patch cords installed.

3. Conduct an Optical Time Domain Reflecto meter (OTDR) test at 850 nm wavelength on each fiber. Use a stabilized light source and an optical power meter. Submit a completed hard copy of the test documentation to the Engineer. Provide a finalized hard copy and disk of the test documentation, including reference power reading, to the Owner.

4. OTDR test documentation shall include cable and fiber identification; fiber length; test direction; test wavelength; traces; fiber attenuation; attenuation breakdown for each fiber segment, connector, and coupling, and splice attenuation, if applicable.

END OF SECTION

Part 1 General

1.01 Scope

Control panels.

1.02 Submittals

A. The Contractor shall furnish the following items from the System Manufacturer for approval prior to fabrication:

1. Layout drawings of the front of the panel showing mounting dimensions for all instruments and associated hardware.

2. Assembly drawings shall include:

   a. Details of panel fabrication including outline dimensions and locations of rear of panel mounted equipment.

   b. Wiring layout.

3. Electrical wiring and termination drawings.

4. Complete bill of materials describing all panel components, including manufacturer and complete model number for all components.

5. Catalog cut sheets for all panel components.

1.03 Record Drawings

Submit shop drawings as listed under Article 1.02 above plus operation and maintenance information.

1.04 Delivery, Storage, and Handling

A. Wrap the completed panel in polyethylene plastic and crate in a wooden shipping crate with sufficient packing to avoid damage in shipment.

B. Support the base of the shipping crate with the cross members of sufficient strength and clearance to allow movement of the entire crated panel by fork-lift truck.

Part 2 Products

2.01 Enclosure

A. Provide wall mounted, stanchion mounted, free-standing, or walk-in enclosures as scheduled.

B. Provide NEMA 12 enclosures for control panels located indoors and NEMA 4X stainless steel for outdoor locations (except walk-in) unless otherwise noted.

C. In all NEMA 4X enclosures, provide a thermostat controlled space heater and corrosion inhibitor blocks. Provide NEMA 4X rated devices on front of enclosure or mount devices on interior panel and provide door mounted tempered glass or polycarbonate viewing window.

D. Free-standing enclosures are a minimum of 20-inches deep.

E. NEMA 12 and general purpose enclosures shall be fabricated from a minimum 14 gauge steel, unless noted otherwise, with all seams ground smooth, all corners rounded, and all flat surfaces smooth with no ripples, dimples, or surface imperfections and no screws, bolts, or nuts visible from outside. Provide panel stiffeners as required to provide a rigid, non-bowing surface. Thoroughly clean and degrease the steel shell before painting or coating. Apply one coat of a rust inhibiting primer and two coats of air dry enamel or acrylic with flattening agent to produce a smooth semi-gloss finish, or apply a powder coat approved to protect against rust and has UV resistant properties. Colors are to be chosen by the Engineer.

F. Install a continuous hinged front access door. For freestanding enclosures, furnish a three point latch. A single point latch is acceptable for wall-mounted enclosures. Wire door mounted instruments and controls to stationary components with suitable flexible connections and protection where wiring crosses the hinge. Provide double or multiple doors as required for stability and smooth mechanical operation.

G. Terminate all tubing and electrical connections at the bottom of the panel to bulkhead fittings and terminal strips, with all external connections properly identified for field connections. Space shall be provided at the bottom of the panel for excess wiring to be laid out before landing on the associated field terminal strip. Space shall also be provided at the top and sides of the panel for routing cables entering from the top of the panel.

H. For panels with 120 VAC power supply, provide appropriately sized circuit breaker, single pole, 22,000 AIC, mounted in the rear of the panel to disconnect power. Mount an engraved nameplate (white letters, red background) to read “WARNING – This panel energized by foreign control power sources. Equipment will be live with panel disconnect in either on or off position”.

I. Internal panel sub-feeds of 120 VAC power shall be divided into separate circuits protected by properly sized circuit breakers or fuses. The following separate circuit divisions shall be provided:

1. Panel light(s) and panel fans (where used).

2. Each receptacle.

3. Power to the panel UPS (where supplied).

4. Thermostatically controlled heaters (where supplied).

5. Each power supply (including 24-volt power supplies, power supplies for PLCs, power supplies for fiber optic transceivers, etc.)

6. 120-volt power to field mounted instruments (each instrument shall be provided with a separate circuit).

J. Provide copper ground bus bar(s) in the rear of the panel. All bus bars shall be bonded together. Ground bus shall be capable of accepting System Ground Grid connection and Power System Ground connection.

K. Provide 20 percent spare, contiguous panel/sub-panel mounting area to accommodate future panel expansion, unless noted otherwise.

L. The System Manufacturer shall investigate the space allocated for control panels on the accompanying drawings and inform the Engineer of any potential problems.

N. All indicator lights shall be push-to-test. In cases where it is not practical to use push-to-test indicator lights (Engineer's approval required), then a lamp test circuit with a lamp test pushbutton mounted on the front-of-panel shall be provided. Pressing the lamp test pushbutton shall illuminate all indicator lights without interrupting control circuits.

Lamp Colors:	Red	Stopped, Off, Closed
	Green	Running, Open
	Amber	Alarm

O. Provide one 120 VAC duplex receptacle and fluorescent light(s) as scheduled. Incandescent lights may be used where panel size prohibits the use of fluorescent lights. Provide one standard on/off light switch for the lights. Receptacles and lights shall be provided with a separate circuit breaker and shall be fed from the 120 VAC power supply to the panel. Receptacles and lights shall be fed from uninterruptible power supplies.

P. All PLC discrete outputs shall have interposing relays installed in the control panel.

Q. Where Intrinsic Safety (IS) barriers have been supplied as a means of providing electrical hazardous area protection for the associated field device, all IS barriers and associated IS wiring shall be separated by at least two inches of air space from all regular non-hazardous wiring inside the control panel. Per NEC Article 504-30, grounded metal or other insulated partitions with lesser distance requirements shall be permitted. IS wiring entering the control panel shall be located in dedicated conduits, which also shall be separated from any non-hazardous wiring. IS Barriers

shall be located in electrical non-hazardous areas.

R. Conduits containing IS wiring where entering enclosures containing regular, non-IS wiring shall be externally sealed to prevent transmission of gases from hazardous areas. Conduit installation and sealing is to be provided under Division 16.

S. All FRP panels located in direct sunlight shall be provided with at least two coats of UV protective coating to prevent discoloration and cracking.

T. All control panels shall be either padlockable or have a lock installed in the door handle. All padlocks will be furnished by the Owner.

U. Front of panel devices, such as analog controllers or annunciators, that have rear mounted terminal strips shall be accessible without standing inside the control panel, (i.e. mounted on panel door or swing-out panels). Walk-in control panels are excepted.

2.02 Wiring

A. Install a minimum of #16 AWG copper stranded, 600 volt, extra flexible type for all control wiring 50 volts and above, and a minimum of #18 AWG twisted, shielded pair for analog signal conductors. Color code wires as follows:

1. Ground: Green.

2. Neutral: White.

3. Line Conductor (150 volts or less to ground): Black.

4. Control (150 volts AC or less): Red.

5. Control (150 volts DC or less): Blue.

6. Interlock control circuits supplied from external power source: Yellow or pink.

7. Intrinsic Safety Conductors: Light blue.

8. Signal, Shielded and Special Cables: Identify with wire markers.

B. Mark all wires with approved wire markers at all terminations, per Section 26 05 53. Clearly mark all terminal blocks with typewritten or ink markings. Label all devices mounted on the steel sub-panel. All instrument and control devices (current switches, MiniCAS II relay modules, etc.), located inside control panels shall have engraved lamacoid nametag affixed on or near the device and shall bear the tag number and service description. Label all devices mounted on the panel front with engraved lamacoid nameplates, fastened with screws. Nameplates shall be three-layer laminated plastic, black letters on a white background. Letter height to be 1/8-inch for individual devices and 1/4-inch for panel designation.

C. Neatly bundle and secure all wiring with plastic ties. Route back-of-panel wiring in slotted plastic wireways with snap-on covers.

D. Terminal blocks shall be provided for all field wiring connections to the panel. This includes shield terminals for shielded cables. Terminal blocks may be mounted horizontally or vertically and shall be easily accessed from panel door(s). Terminal blocks shall be DIN rail mounted, screw clamp, feed-through type with 600 volt minimum rating. A minimum of 20 percent extra terminals shall be provided on the terminal blocks. Each terminal shall be clearly and permanently marked. Provide fused terminal blocks for all 120 VAC discrete inputs and outputs. All terminal blocks shall be suitably sized for #12 AWG (minimum) stranded wire. All terminal blocks shall be grouped apart, depending upon type of signal per Paragraph E below.

E. AC or DC power wiring shall not run in any raceway with any type of instrument wiring. Wiring is to be divided into categories and shall be carried in separate raceways. The minimum acceptable groupings are:

1. 120 VAC, 60 Hz AC power wiring and chart drive power wiring.

2. DC power to electronic instruments (does not include loop powered instruments), contact closure input and output wiring.

3. All wiring carrying pulsed information.

4. Standard range analog DC signals, thermocouple and up to 200 mV DC signals.

5. All intrinsic safe wiring.

F. It is the responsibility of the System Manufacturer to provide appropriate protection against transients and surges for all field wiring, interfacing with the control panels. This protection equipment shall reside in the appropriate control panel. All instrument analog signal wiring, data transmission wiring, and 120 VAC power supply wiring shall be protected against lightning strikes, and other transient surges at all control panel termination points. All control power wiring, AC control power wiring, I/O cabinet discrete input wiring and discrete output wiring which is routed outside of buildings shall be protected against lightning strikes, and other transient surges at all control panel termination points. Lightning and surge devices shall protect the system from induced surges in analog, discrete and control circuitry and power supply lines. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding. Protection devices for all internally mounted power supplies shall be installed on individual 120 VAC supply wiring. Each surge/lighting protector shall be independently grounded to the panel ground bus. Protector mounting rail shall not be used to ground the protector.

G. The System Manufacturer shall provide required hardware and labor for termination of new signals in existing termination cabinets where required. This hardware and workmanship shall match existing work with respect to method, materials, and

workmanship.

H. All control panels furnished under this Section shall carry a UL label which certifies the control panel meets the requirements of UL-508A (latest version). Panels containing any Intrinsic Safety circuits shall meet the requirements of UL-698A.

2.03 Drawings

A. Panel Construction Drawings:

1. Shop Drawings and Catalog Cuts: Provide detailed shop drawings and catalog cuts for all panels, instrument racks, and enclosures. Drawings shall show the location of all front panel and internal sub-panel mounted devices to scale and shall include a panel legend and bill of materials. Layout drawings shall show all major dimensions as well as elevations, in inches from the base up, of all rows of components.

2. The panel legend shall list and identify all front of panel devices by their assigned tag numbers, all nameplate inscriptions, service legends, and annunciator inscriptions. Tag number shall be as listed in the Specifications and Drawings.

3. The bill of materials shall include all devices, including those mounted within the panel that are not listed in the panel legend, and shall include the device tag number, description, manufacturer, and complete model number.

B. Panel Wiring Diagram:

1. Provide complete terminal identification of all external primary elements, panels, and junction boxes that interface directly to the panel wiring being shown. Polarity of analog signals shall be shown at each terminal.

2. All external wiring that the electrical contractor must provide and install shall be shown as a dashed line. Special cables that are provided with the instrument shall be clearly identified.

3. Panel wiring diagrams shall identify wire numbers and types, terminal numbers, and tag numbers. Wiring diagrams shall show all circuits individually; no common diagrams will be allowed.

4. Provide panel power wiring diagrams for all panels. The diagrams shall include the grounding requirements.

C. Interconnecting Wiring Diagrams: Diagrams shall show all component and termination cabinet identification numbers and external wire, fiber, and cable numbers. This diagram shall be coordinated with the electrical supplier and shall bear its mark showing that this has been done.

2.04 Control Panel Schedule

A. The control panel schedule will be completed during detailed design.

Panel No.	Location	Mounting Type	Enclosure Rating	Light/Receptacle	Heat Shield/ Drip Shield

Part 3 Execution

3.01 Testing and Calibration

A. Thoroughly shop test the completed panel. Confirm that all lamps burn. Remove, box, and label all parts that may come loose or detached in shipment, so that after installation they may be easily replaced.

B. Perform preliminary calibrations in the fabricator's shop, and final calibrations at start-up by qualified personnel.

END OF SECTION

Part 1 General

1.01 Scope

The System Manufacturer shall provide programmable logic controller (PLC) programming and loop tuning software, human machine interface (HMI) and historical data (HD) software, Simple Network Management Protocol (SNMP) software, and any additional software required to support the functions specified in these Documents or required to make a complete and workable system. The software functionality described in these Specifications reflects general requirements, and is not intended to detail all software requirements. It is the responsibility of the System Manufacturer to provide a complete and coherent software package, designed to allow the Owner to easily configure, control and view the process, retrieve and store process data and generate a wide range of reports for internal and regulatory use.

1.02 General Requirements

A. The HMI and HD software shall consist of an off-the-shelf, industry standard software product that includes support for process control, data acquisition, alarming, historical data collection and trending, along with other third party software products such as report generation software, spreadsheets, databases, etc., configured specifically for this system by the System Manufacturer.

B. The HMI and HD software shall be based on the concept of fourth generation object based graphics and object based development. The HMI and HD software shall have an architecture, which allows the system to run in a multitasking environment with support for on-line, data exchange with other applications such as expert systems, spreadsheets, and database programs. The HMI and HD software shall have the built-in flexibility to permit easy configuration of the system in accordance with the specific objectives of the end user as well as easy modification of the end application by the user in the field. The HMI and HD software shall have the capability to interface with relational databases, which have an SQL interface and shall also be capable of providing on-line SPC analysis. Drivers for supporting PLC software products shall be manufactured by the PLC manufacturer.

C. The entire software system shall be menu-driven and easily configurable. The software shall not require recompiling or reassembling in the event of future hardware modifications or I/O additions. The System Manufacturer shall describe in detail, in the approval submittal, future expansion capabilities and what specific limitations may exist.

D. The system shall have multiple initiating methods for all common system operations. All operations shall be capable of being initiated from the HMI keyboard. Secondary initiation method shall be via mouse or trackball.

E. All software provided shall be capable of operating concurrently in a multi-tasking, multi-user environment.

F. Access to the system shall be controlled by a log-on user ID and password for all levels, including operator level. Provide at least three security levels above the basic level for the shift foreman, chief operator and plant manager. These security levels shall be reviewed with the Owner and the Engineer prior to beginning work on the HMI and HD software applications.

G. The System Manufacturer software responsibilities shall include, but not be limited to the following:

1. Providing and configuring all system software, to include HMI software, HD software, SNMP software, and application specific software.

2. Development of all required databases, control configuration, displays and reports. These requirements shall be reviewed with the Owner and the Engineer prior to beginning work on the tasks.

3. Configuring a minimum of thirty pages of graphics displays for HMI and generating a minimum of fifteen reports for internal and regulatory use. Report generating shall be through HMI and HD software. These requirements shall be reviewed with the Owner and the Engineer prior to beginning work on the tasks.

4. Generating a program to backup the HD databases on daily, weekly, and monthly intervals. The program shall be manually initiated by the Operator. These requirements shall be reviewed with the Owner and the Engineer prior to beginning work on the tasks.

5. Complete documentation of all system software and configuration.

6. Conducting pre-shipment and installed performance tests. The System Manufacturer shall develop and submit comprehensive test plans and deliver to the Engineer at least 30 days prior to the date of the tests.

H. Provide HMI and HD software package suitable for handling at least 50% more tags than the system described by these Specifications.

I. Provide the HMI software package with I/O as required to provide communications with the PLCs being provided.

J. Acceptable Manufacturers:

1. Human Machine Interface Software: Trihedral VTScada (5,000 Tag minimum), running on the operating system specified in Section 40 95 00.

2. Historical Data Software: VTScada Historian, running on the operating system specified in Section 40 95 00.

3. Network Monitoring Software: Network Vision, Inc., IntraVUE Enterprise, edition with 1-year service.

4. Alarm Software: WIN-911 Pro.

5. Report Generator Software: XL Reporter

1.03 Submittals

Standard Packages (Operating system, third party and other "canned" packages): Submit a list and brief product description. Do not submit full documentation for standard software packages during the approval stage. The System Manufacturer shall submit an experience record containing at least ten (10) references for software packages used. Submit an outline and a narrative describing how each portion of the process control software operates. Include samples of all reports and at least three copies in color of the proposed graphic displays.

1.04 Record Documentation

A. Standard Packages: Complete documentation.

B. Custom Software: As listed in Article 1.03 above, corrected to reflect the installation as-built.

C. Furnish complete operation, maintenance and update, warranty, and service information for each individual software package, as well as magnetic media copies of all as-built software.

D. Furnish one set of documentation for the specified operating system (e.g., Microsoft Windows 10 Professional). This documentation shall be Manufacturer's standard comprehensive documentation for the specific version of the operating system as supplied for this Project. Include complete user setup and configuration information for proper utilization of the system.

Part 2 Products

2.01 Human Historical Data Software Machine Interface

A. The HMI and HD software as specified shall be supplied and fully configured by the System Manufacturer. The System Manufacturer through a collaborative effort with the Owner and the Engineer shall develop reports, graphics displays, real time trends, historical trends, security, and alarming.

B. The HMI and HD software shall have data logging and real time trending capability. It will maintain data from the previous four weeks (minimum) stored on the hard drive. As new data is scanned, it will overwrite the oldest data such that at any time, data is available for a minimum of four weeks prior to the current scan. The software shall allow uploading of data to external drive(s). The HMI and HD software shall provide viewing capability for all information stored on the data storage hardware.

C. The HMI and HD software shall provide capability to monitor the process and download operating information to the distributed PLCs.

D. The HMI software shall continuously poll the Plant Control System network and update data. The most recent status and values of all points shall be held in memory. HMI and

HD software shall provide operator access to data including status displays, data entry, real time and historical trending, totalization, and alarm annunciation.

2.02 Network Monitoring Software

A. The Network Monitoring Software shall automatically discover the exact physical topology of the plant control network using standard SNMP interactions.

B. The Network Monitoring Software shall contain a reporting engine that is preconfigured for searching, filtering and identifying network events from data stored in a relational database.

C. The Network Monitoring Software shall be capable of sending an alarm message in the form of an e-mail message on the event of network load or device connection failure or new device connection.

D. The Network Monitoring Software shall be capable of defining network traffic thresholds and monitoring and graphically reporting the network load.

E. The Network Monitoring Software shall be capable of logging all network events and creating reports on a per device basis.

F. The Network Monitoring Software shall be factory installed onto a computer (appliance) with an embedded operating system that has no moving parts. The appliance shall be provided with a 20-inch color flat panel monitor, equal to Dell, with a mouse and keyboard.

G. The Network Monitoring Software appliance shall connect to the plant control network via an RJ-45 Ethernet port. The Network Monitoring Software appliance shall have two Ethernet ports.

H. The Network Monitoring Software database shall be capable of being copied onto a USB memory stick and e-mailed to The Network Monitoring Software corporate office technical support group for support analysis.

I. Include one full year of support with IntraVUE from start date of official warranty period of system.

J. The Network Monitoring Software “Admin Verify” feature should be performed so that all the network components are verified upon final commissioning of the system Ethernet Network or at the start of the warranty period, whichever comes first.

K. Configure the Network Monitoring Software to backup monthly to the appliance’s hard drive.

2.03 Process Signal Definition

A. The HMI software shall operate from a user generated database. The user shall be able to add, delete, or revise signal definitions at any time without interruption of on-line

operations. All operations on the database shall be accomplished through the supplied operator interface stations.

B. Analog Signal Definition: Shorthand reference tag (1-8 characters); signal description (1-32 characters); code indicating input or output signal; code indicating the control algorithm to be used (computed signals only.); a time constant to be used in a digital filtering algorithm for input signals; signal scan class to select the sampling rate; engineering units (1-10 characters); integrated units (1-10 characters); enable or disable status code; codes to make alarm/event log entry on signal out of range or invalid signal condition; code to indicate integration of the signal; conversion factor to change instantaneous signal to integrated units; codes to specify alarm/event log entry whenever the signal violates a high-high, high-low, low-low, or rate-of-change limits; an alarm time delay to specify an alarm log entry whenever the signal remains in the alarm state longer than the delay period; an alarm/event limit deadband a percentage of signal range; a code to direct checking for new maxima and minima; codes to direct alarm/event log entry whenever new maxima or minima occur; conversion factor to change incoming signals to engineering units; zero clamp deadband.

C. Discrete Signal Definition: Shorthand reference tag (1-8 characters); signal description (1-32 characters); signal scan class to select the sampling rate; a code indicating an input or output signal; a code indicating the control algorithm to be used (computed signals only.); a code to direct either the open or closed states to be the "active" state; an enable or disable status code; a code to direct accumulation of time in the active state; codes to direct alarm/event log entries for transitions from active to inactive, inactive to active, or transitions in both directions.

D. Special signal definition reports shall be available for analog and discrete signals. The reports shall list each signal and all the parameters associated with each signal.

Part 3 Execution

3.01 Software

A. Alarm/Event Log: Prior to beginning work on the alarm groupings, the System Manufacturer shall meet with the Owner to determine the critical alarms. All other alarms shall be categorized into the non-critical alarm group.

1. Alarms shall be categorized into two separate groups, critical and non-critical. Each individual alarm group shall generate a unique audible alarm whenever any one alarm condition in that group exists. “Events” shall be categorized into the non-critical alarm group. The different audible alarms shall be provided to the operator through the PC speakers.

2. After each scan cycle, the HMI software shall check all process variables for conditions such as out-of-range, new maxima, new minima, or state transitions for discrete signals. If the new condition is either an "event" or an "alarm", a message shall be sent to the alarming database/HMI monitors. The message shall contain date, time, signal identification, and the new condition causing the alarm or event.

3. Alarm messages shall be formatted so as to be readily distinguishable from event messages. The audible alarm shall continue until the operator acknowledges the alarm by depressing a function key or using the mouse. The date and time of the acknowledgment shall also be sent to the alarming database.

4. Alarm messages displayed on the HMI monitor shall remain there until the operator presses a function key. If multiple alarms have occurred, each press of the function key shall bring the next sequential alarm message into view.

B. Graphic Displays:

1. In general, the HMI shall be via a hierarchy of graphics screens with "buttons" which will allow operators to navigate the plant facility by facility by simply clicking on the "buttons" with a mouse. The HMI graphic screens shall be 3D in nature, and shall accurately depict installed processes and instrumentation.

2. A main menu shall be developed and will contain "buttons" to allow navigation to the following major subsystems:

   a. Plant Overview Display.

   b. Real-time Trend Displays.

   c. Historical Trend Displays.

   d. Reporting Subsystem.

   e. Plant Control System (Plant Control System network backbone, Plant Control System network fast Ethernet switches with fault alarms, PLCs, HMI workstations, UPSs, Standard Ethernet switches, etc.) Display.

   f. Alarm Summary.

   g. Equipment Maintenance Subsystem.

3. The Plant Control System display shall contain dynamic symbols to depict the status of each PLC, each network backbone fast Ethernet switch, each standard Ethernet switch, each UPS, each computer that is connected to the backbone, and any additional devices that are SNMP enabled. The status signals for the PLCs shall be generated by the PLC. The status signal for the network backbone fast Ethernet switches shall be generated by the switches (hardwired contacts) and by the SNMP software. The status signals for the remaining devices shall be generated by the SNMP software. The dynamic symbols for all devices other than the PLCs shall be designed so that an operator may click on the symbol to gain access to its related pop-up display shall contain detailed data specific to the device, as listed below. Data shall be generated by the SNMP software unless noted otherwise.

   a. PLC: PLC generated status (OK or fault), PLC generated internal battery status (OK or replace).

b. Network Backbone Fast Ethernet Switch: Switch generated status (OK or fault), port status for each 100/1000 Base-T port (enabled or disabled, in use or not in use, fault), port status for each fiber port (OK or loss of communications), average port traffic for each port (10-minute average updated every 5 minutes).

c. Standard Ethernet Switch: Port status for each port (enabled or disabled, in use or not in use, fault), average port traffic for each port (10 minute average updated every 5 minutes).

d. UPS: Online or fault, switched to battery power, low battery.

e. Computer: Hard disk free space (updated hourly).

f. Include a note at the top of the graphics display that reads “THE SNMP SOFTWARE MUST BE RUNNING ON THE ENGINEERING LAPTOP FOR ALL THE ALARMS AND INFORMATION ON THIS DISPLAY TO BE FUNCTIONAL”.

4. Each graphic display shall be designed so that an operator may click on "buttons" to gain access to any area of the plant or to the Main Menu. The operator shall also be able to access the Alarm Summary Display from any graphic display.

5. The alarm summary display shall be configured to retain 48 hours of alarm data (critical, non-critical and event). The alarm summary data shall be collected and stored as a single file by the historical data software once every 24 hours.

6. Special graphics displays shall be developed by the System Manufacturer for each process control strategy. These graphic displays shall allow authorized operators to modify control parameters such as set points, operational sequences, etc. Passwords shall be utilized to determine the authorization level of operators.

7. Graphics screens shall be developed for each major item of process equipment for which equipment runtime or equipment maintenance data is being collected. These graphics screens shall contain all data relative to the piece of equipment including runtime since last serviced and total runtime between maintenance intervals.

8. Each graphic display shall be designed so that an operator may click on "buttons" to login and logout. The login process shall be a 3-step process. To login, the operator will click on the login button and the login pop-up display shall appear. The operator will enter his/her name. The operator will enter his/her password. A successful login shall automatically close the login pop-up display. An unsuccessful login shall generate a “Login Failure” message. The logout process shall be a 1-step process. To logout, the operator clicks on the logout button and a “Successful Logout” message will appear. In addition, automatic logout shall occur after 15 minutes of inactivity.

9. Each graphic display shall be designed so that the very top portion of the display and the very bottom portion of the display are covered up by password protected bars. This shall prohibit unauthorized personnel from accidentally closing files (top

portion), opening other programs (lower portion) or shutting down the computer (lower portion). These password protected covering bars shall be identical on each graphic screen. The password protection shall allow authorized personnel to hide or minimize the covering bars, which shall provide access to the underlying portion of the display.

C. Data Acquisition Functions:

1. The HMI shall display all long term trending, reporting, and historical data functions.

2. At regular intervals the HMI/HD software shall transfer averages or summaries of the current data to 5-minute summary data file on the historical data computer hard disk. The data shall be further summarized into hourly, daily, and monthly history files. Daily data shall be archived routinely on tape drive or optical disk and any data file shall be archived on demand.

3. Reports that summarize the data in the history files shall be printed automatically at regular intervals. Special reports shall be produced on demand from any data file on disk. Trends of any historical data file shall be produced on demand. Utility programs for correcting errors in historical data shall be provided and shall be password protected as required by the Owner.

4. Scan/Update Rates: Each process data item shall be classified by the System Manufacturer in one of two scan rate groups. Typical items in the fast scan rate group shall be items likely to have values, which may fluctuate rapidly such as analytical instruments and flow devices. Software shall allow for easy modification of scan category in the field.

5. Historical Data Summaries:

a. Current analog signal average, total, and status shall be written to a 5-minute analog data file. Current discrete signal status, transition counts, and percent on time shall be written to a 5-minute discrete data file. The 5-minute summaries shall be retained on-line for 4 days.

b. All 5-minute analog data shall be summarized into hourly status, total, and average with 5-minute minima and maxima and times of occurrence. All 5-minute discrete data shall be summarized into hourly status, transition count, and percent on time. Hourly data shall be retained on-line for 10 days.

c. All hourly analog data for the previous day shall be summarized into daily status, total, average, minima, maxima, and times of occurrence. All hourly discrete data for the previous day shall be summarized into daily status, transition count, and percent on time. Daily data shall be retained on line for 30 days.

d. All daily analog data for the previous month shall be summarized into monthly status, total, average, maxima, minima, and times of occurrence. All daily analog data for the previous month shall be summarized into monthly status, transition count, and percent on time.

6. Scheduled Reports:

    a. Report generation software shall initiate reports at a specified time or on demand.

    b. Reports may be scheduled for any time of day and have any reschedule interval.

    c. Reports, which describe the operating characteristics of each major piece of equipment and an overall plant summary, shall be developed specifically for this facility and submitted to the Engineer for approval.

    d. Provide, on an hourly basis, an operator information report consisting of a summary of operating characteristics of each major equipment item.

    e. Provide, on a daily basis, a supervisor summary report consisting of an overview of operating characteristics of all equipment for the previous day.

    f. Provide, on a monthly basis, a management summary report consisting of a day by day summary of plant operations for the previous month.

7. It shall be possible to produce reports from all levels of data summarization between user specified start and stop times. It shall be possible to select any signal from the database for inclusion on the report. Operator comments selected by time, date, and classification code shall be included at the end of the report. The report generation software shall have a flexible format to be used by the Owner to generate and format reports.

8. Features to be included in the report generation software are:

    a. Record selection logic to limit the report to a specific subset of the data. For example, print only data for a particular time interval.

    b. Inclusion of user-selected signals.

    c. User control of report titles, column headings, and individual report line formats.

    d. Signal averages, minima, maxima, and times of occurrence for all selected analog signals.

    e. Equipment operation times for all selected discrete signals.

    f. Operator comments from the comments file.

9. Report Scheduling: The report generation software shall contain a mechanism for scheduling a report to be printed at a future time as well as printing on demand. Any defined report shall be eligible for scheduling. The scheduling function shall also allow a reschedule interval to be specified so that reports can be generated automatically.

10. Historical Data Maintenance:

    a. The HD software shall provide the ability to enter manual data to replace existing data in the historical database at all levels of summarization. This feature shall be password protected as required by the Owner.

    b. The HMI/HD software shall also provide the ability to perform "smoothing" for all or selected signals in the historical data files. This feature shall allow a linear interpolation of signal data to be entered for periods in which there has been a loss of actual data.

11. Data Archiving:

    a. The HD software shall provide the ability to transfer selected time periods from any of the historical data summary files and comment files to Backup Media. One specific use of this function shall be to copy all daily summaries, hourly data, and related comments for a calendar month to Backup. These will provide a permanent record of the plant's operating history. These requirements shall be reviewed with the Owner prior to beginning work on the program.

    b. Software shall also allow the recovery of data from the Backup Media. The recovery procedure shall not interfere with the on-line data collection. Recovered data files shall be accessible by the report generation software or other data analysis programs. Programs shall also be provided to rebuild the daily or monthly summary data from the recovered hourly data files.

12. Statistical Analysis and Graphics: All historical data files shall be designed such that data may be extracted from those files for statistical analysis and graphing the results.

13. The System Manufacturer shall, using the report generation software, develop report formats and submit to the Owner for final approval/modification. In addition, the System Manufacturer shall have included in the Bid, as a separate line item, a cost to develop additional reports, of similar complexity to those the System Manufacturer plans to provide.

14. The System Manufacturer shall provide report generation software with the historical data software. The report generation software shall permit the Owner to create new reports and edit existing. The System Manufacturer shall provide instruction to the Owner on creating/editing reports.

END OF SECTION

Part 1 General

1.01 Requirements

Process equipment shall meet the following minimum design requirements. Exceptions to these standards shall be noted in the RFP.

1.02 Pumps

A. General:

1. Reference Standards: All pump designs shall comply with the applicable standards listed below except as otherwise specified:

   a. Standards of the Hydraulic Institute

   b. American National Standards Institute

   c. Standards of American Water Works Association

   d. American Gear Manufacturers Association

   e. National Electric Code

   f. Standards of National Electrical Manufacturers Association

   g. Institute of Electrical & Electronic Engineers

   h. American National Standards Institute

   i. Anti-Friction Bearing Manufacturers' Association Standards

   j. Occupational Safety and Health Administration

2. General Requirements: Unless otherwise stated all type pumps shall comply with the following general design criteria:

   a. All pumps shall be non-overloading throughout their entire operating range and shall be sized so that the operating point will be in the mid-range of characteristic curves and reasonably close to maximum efficiency. In no case will pumps be sized for the operating condition with a maximum or near maximum impeller diameter. Impellers shall be dynamically balanced.

   b. Motor shall have a 1.15 service factor, and shall comply with the latest ANSI, NEMA, and IEEE Standards as a minimum. Motors for use on pumps with variable frequency drives shall have an inverter duty rating.

c. Provide nameplates of corrosive resistant metal and that contain the manufacturer's name, pump size and type, serial number, speed, impeller diameter, capacity, head rating and other pertinent data.

d. Spare parts for each pump shall include a complete set of seals, bearings, wearing rings, shaft sleeve, etc., and sufficient lubrication material for a complete pump rebuild of each pump.

e. All pumps shall be performance tested in accordance with Hydraulic Institute Level B Standards.

3. Controls:

a. All Control Panels in process areas shall be NEMA 4X 316 SS. Control Panels located in a separate electrical room can be NEMA 12.

b. All controls shall operate on 120 VAC. Provide a suitably sized control transformer with primary and secondary overcurrent protection. The panel shall have a nameplate engraved with panel name and tag number.

B. Horizontal Close Coupled/Frame Mounted End Suction Centrifugal Pumps:

1. Design Requirements:

a. Pumps shall be designed for continuous duty with a maximum motor speed of 1,800 rpm.

b. Frame Mounted type pumps shall be mounted on a common base with a flexible coupling between the motor and the pump. The pump shaft shall be designed to limit shaft deflection at the stuffing box to no more than 0.002-inch.

c. Pumps shall be factory-made by the following acceptable manufacturers: Flowserve, Goulds, Grundfos, Gorman-Rupp-Patterson, Pentair Aurora, Pentair-Fairbanks Nijhuis or Peerless.

2. Materials and Construction:

a. The pump casing and impeller shall be stainless steel.

b. Fittings shall be stainless steel with stainless steel impellers.

c. The pump shaft shall be stainless steel with stainless steel sleeve.

d. Pumps shall be furnished with mechanical seals. Mechanical seal parts shall be of stainless steel.

e. The pump shall have replaceable casing wear rings of either bronze or stainless steel, if applicable for the selected model of pump.

C. Vertical Turbine Pumps:

1. Design Requirements:

a. Pumps shall be designed for continuous duty with a maximum motor speed of 1,200 rpm.

b. Pumps shall be vertical turbine type with variable frequency drives.

c. Pumps shall be manufactured by Flowserve, Grundfos, Peerless or Goulds.

2. Materials and Construction:

a. Column: The discharge column shall be flanged steel pipe fabricated in accordance with ASTM A 53, Grade B. The column shall be furnished in sections not over ten feet in length. Bearing spiders shall be bronze or stainless steel, retained between the adjacent column pipe ends by the flanges, and locked against rotation.

b. Discharge Head:

i. The discharge head shall include a three-piece, 90 degree, discharge elbow fabricated of ASTM A 36 steel. The discharge elbow shall have a flange connection compatible with ANSI B16.1, Class 125.

ii. The top shaft shall be ASTM A 582, Type 416 stainless steel furnished with a coupling above the stuffing box.

iii. The top shaft below the coupling shall enter the discharge column through an ASTM A 48, Class 30 (minimum) ductile iron stuffing box and ASTM B 584, Alloy 836 bronze bearing. The stuffing box shall contain a minimum of five rings of graphite impregnated Teflon packing with a split type gland, stainless steel adjustment studs, and brass nuts.

c. Baseplate: The pump head shall be mounted on a separate baseplate.

d. Shaft:

i. The line shafting shall be precision polished ASTM A 582, Type 416 stainless steel shafting of ample size to operate the pump without distortion or vibration. The minimum shaft diameter shall be 1-inch. The shaft shall be furnished interchangeable sections not over 10 feet in length and shall be coupled with ASTM 582, Type 416 stainless steel couplings machined from solid bar, designed with a safety factor of 1.5 times the shaft safety factor.

ii. Place an ASTM A 269, Type 304A stainless steel sleeve on each full-sized shaft without undercutting at the bearing point. Replaceable sleeves shall permit field install without special tools.

iii. The pump shaft shall be open with water lubricated, rubber type bearings installed in fabricated steel bearing retainers.

e. Bowls:

i. Pump bowls shall be ASTM A 48, minimum Class 30 cast iron. Bowl bushings shall be ASTM B 584, Alloy 844 bronze.

ii. The pump bowl shall have a flanged connection to the column pipe. All bearings shall be ASTM B 584, Alloy 844 bronze.

iii. The impeller shaft shall be ASTM A 582, Type 416 stainless steel supported by bronze bearings.

iv. Impellers shall be enclosed turbine type of Alloy C 952 bronze. Impellers shall be mounted and keyed on the shaft.

v. Each bowl shall have ASTM 505 or 584, Alloy 954 bronze wear rings.

f. Suction Inlet: The suction inlet shall be flared and contain sufficient number of vanes to support the lower guide bearing as well as the weight of the impeller and pump shaft when dismantling the pump. The inlet shall be provided with an ASTM A 555, Type 316 stainless steel basket strainer.

3. Motor:

a. The motor shall have a solid shaft with non-reverse ratchet. High thrust bearings shall be provided at both the top and bottom of the motor. The motor shall be coupled to the column shaft through a three-piece, flanged adjustable driver coupling. The impeller clearance with reference to the bowl shall be adjustable at the coupling.

b. Motors shall have the following characteristics:

i. Bearing Life: B-10 of 100,000 hours.

ii. WP2 enclosure.

iii. Space heaters, rated at 120V.

4. Controls:

a. Provide winding temperature switches in the motors.

b. Provide two vibration sensors per motor bearing, mounted in an X, Y fashion. Sensors shall be piezo type seismic sensors, Velomitor XA type

by Bently Nevada. Junction boxes for termination of sensors shall be 316 stainless steel and NEMA 4X rated.

1.03 Blowers

A. Reference Standards: The design of blowers shall comply with the applicable standards listed below, except as otherwise shown or specified.

1. Standards of the American Society for Testing and Materials

2. National Electric Code

3. Standards of National Electrical Manufacturers Association

4. Institute of Electrical and Electronics Engineers

5. American National Standards Institute

6. AWS D1.1, Structural Welding Code

7. AISC, Manual of Steel Construction

8. AGMA Standards

9. Joint Industrial Council

B. General Requirements:

1. Blowers shall be designed for continuous 24 hour per day, 7 day per week operation, and shall be provided and designed for the local ambient and service conditions.

2. Noise levels five feet from each blower in any direction shall not exceed 90 dBA free field noise where required below, provide sound attenuating enclosures.

3. Blowers shall be frame mounted, V-belt driven. Each blower shall function at the rated capacity throughout the specified temperature and barometric pressure ranges without exceeding the motor nameplate rating.

4. Accessories that the blowers shall be provided will include, but are not necessarily limited to, inlet filters, inlet silencers, discharge silencers, pressure gauges, suction and discharge pressure switches, temperature gauges, and expansion couplings and relief valves.

5. Filter shall be capable of 95 percent efficiency on particles with a mean diameter of 5 microns or more. Headloss through the filter/silencer shall not exceed 3 inches of water for a clean filter.

6. Each blower shall be provided with inlet and discharge silencers. Acoustical material shall be hair felt, fiberglass or stainless wool.

7. Silencers shall be capable of an average attenuation of 25-30 db, and shall have a pressure drop through each unit of not more than 8 inches of water column at blower design discharge conditions.

C. Controls:

1. The manufacturer shall provide a local control panel for each blower that can start up and shut down the blower in either a manual or automatic mode. These panels shall contain safety and permissive interlocks for the operation of the blowers, including as a minimum:

a. Lubrication oil pumps and filter, where required.

b. Water cooled oil cooler, where required.

c. Bypass valve and discharge valve.

d. Blower motor run status.

e. Blower high discharge temperature.

f. Blower vibration, centrifugal blowers only.

g. Surge, centrifugal blower only.

D. Tools and Spare Parts:

1. The following spare parts shall be furnished for each blower, suitably boxed and plainly labeled:

a. One complete set of bearings for total bearing replacement.

b. One set, complete of all shaft seals.

c. One set of gaskets.

d. Two spare filter elements.

e. One complete set of spare V-belts.

E. Rotary Positive Displacement Blowers:

1. Design Requirements:

a. Positive displacement blowers shall be two or three lobe involute design.

c. Blowers shall be manufactured by Roots (Dresser), Spencer, Sutorbilt, Kaeser, or Aerzen.

2. Materials and Construction:

a. The impeller casings and end plates shall be of a close-grained, high strength cast iron. The casing and end plates are to be suitably ribbed for strength and to prevent distortion under operating conditions.

b. The impellers shall be cast or ductile iron. The shaft may be integral with the impeller or made separately of steel. The shafts shall run in heavy-duty bearings having a B-10 life expectancy of at least 60,000 hours.

c. Lubrication:

   i. The timing gears and gear-ending bearings shall be splash oil lubricated by oil slingers mounted on the shaft. The timing gears shall be AGMA quality 12 or better. Drive end bearings shall be oil lubricated.

   ii. Piping and silencers shall be lagged and frames shall be grouted for additional vibration dampening. Lagging shall include all hot piping within reach of operator to insulate and protect operator from heat.

   iii. High Discharge Temperature Switch: Each blower shall be furnished with a high-temperature cutout switch with adjustable range to open on temperature rise.

d. Motors:

   i. Motors shall be designed and manufactured in accordance with the standards of NEMA and shall have the following characteristics:

      1) Design B

      2) Class F insulation

      3) Service factor: 1.15 (Constant Speed)

      4) Service factor: 1.0 (Inverter Duty)

      5) Open drip-proof or TEFC premium efficiency motor

      6) Inverter duty, where required

   ii. Motors shall be connected to the blowers through a V-belt drive arrangement with provisions for convenient adjustment of belt tension. The V-belt drive shall be sized with a minimum safety factor of 1.5.

e. Accessories:

   i. The blower manufacturer shall provide the required accessories and appurtenances for the complete installation.

ii. Relief Valves: Each blower shall be furnished with one relief valve for installation on the blower discharge silencer. Valves shall be sized to provide adequate protection for the blower and motor in case of operation against a closed discharge valve. Valves shall be either all bronze or cast Iron.

iii. Discharge Check Valves: Each blower shall be furnished with a check valve for mounting on the discharge of the blower. Valves shall have cast iron bodies and aluminum-bronze plates with Type 316 stainless steel pins and springs with Viton seals.

iv. Isolation Valves: Each blower shall be provided with isolation butterfly valves on both the suction and discharge. Valves shall be metal seated and shall be conform to the requirements of this Attachment. Valves shall be rated temperatures above 250 deg. F.

v. Thermometer: Each blower shall have a suction and discharge thermometer installed on the discharge pipe. The range shall be inlet thermometer: minus 20 to 120 degrees F, discharge thermometer: 30 to 300 degrees F. The thermometers shall have a 3-1/2-inch face and shall be equal to American or Ashcroft.

vi. Pressure Gauges: Each blower shall have a vacuum gauge on inlet side and pressure gauge on discharge side before and after the silencer. Vacuum gauges shall be magnehelic type with 4-inch face, zero adjustment screw, aluminum case and diaphragm actuated equal to Dwyer Instruments, Inc., Series 2000. Pressure gauges shall be bourdon tube type, stainless steel case and tube with a 3-1/2-inch face equal to American or Ashcroft. The range shall be:

1) Vacuum gauge on inlet side: 0 to 30-inches of water

2) Pressure gauge on discharge side: 0 to 30 psig

vii. Expansion Couplings: Each blower shall be furnished with standard couplings such as a reinforced, flexible, single filled, arch spool type; rubber expansion joint equal to Metraflex 300HT or EPDM sleeve and clamp style couplings. Couplings shall have full-faced flanges per 125 pound ANSI specifications. Steel washers shall be used at the joint where the rings are split.

viii. Discharge couplings shall be suitable for pressures to 15 psig and temperatures of up to 250 degrees F. and shall be provided with retaining bolts. Inlet couplings shall be suitable for a maximum vacuum of 12 inches within center and temperatures up to 110 degrees F.

ix. Blowers shall be provided with a sound attenuating enclosure.

F. Variable Speed Drives: Where required for the membrane system design, blowers shall be equipped with constant torque, variable frequency AC drives. VFDs shall be equipped with the necessary control logic to start and stop the blowers automatically on command from the membrane control system. The blowers shall be stopped automatically on fault conditions specific to the type of blower due to high temperature, high or low pressure, low lubrication level, surge, vibration (centrifugal only) or any other condition that could result in damage to the equipment.

1.04 Tank Mixing Equipment

A. Design Requirements:

1. All turbine type tank mixers shall be complete with all anchorage, motors and controls, drives, couplings, base plates, shafting, supports, and all other accessories necessary to provide a complete installation.

2. Acceptable Manufacturers: Tank mixers shall be manufactured by Lightnin or Philadelphia Mixers Corporation.

3. The propeller shall be dynamically balanced and shall be 316 stainless steel.

1.05 Chemical Metering Pumps

A. General Requirements:

1. Acceptable Pump Manufacturers: Progressive cavity type shall be Moyno or Netzsch; diaphragm type shall be Pulsafeeder, Prominent, Wallace & Tiernan or Milton Roy; peristaltic type hose pumps shall be Watson-Marlow Bredel or Verder; tube type peristaltic metering pumps shall be Watson-Marlow or Verderflex; air operated double diaphragm pumps shall be Wilden or Sandpiper.

   a. Material of construction for the wetted parts shall be resistant to the chemical being pumped.

   b. The pumps shall be supplied with a variable speed DC drive motor.

   c. Pump Stands/Supports: The pump stand or shelf shall be fabricated from welded carbon steel structural components or fiberglass reinforced plastic (FRP). Metal stands shall be sandblasted to near white, shop primed and painted with PVC coating material. The final coating shall have a minimum of 20-mil dry film thickness.

   d. Pulsation Dampeners: An air or nitrogen charged type double diaphragm pulsation dampener shall be provided, sized by the pump supplier. Isolation diaphragms shall separate the process chemical from the air chamber. Single diaphragm pulsation dampeners may be used if the body material is resistant to the chemical being pumped.

e. Backpressure Valve: Each pump shall be furnished with a backpressure valve having the size and pre-set pressure as recommended by the manufacturer.

f. Calibration Chamber: Suction piping shall have provisions provided by the Contractor for temporary or permanent installation of a removable and transferable calibration chamber.

B. Diaphragm Metering Pumps:

1. The capacity adjustment from 0 to 100 percent providing positive repeatable accuracy of two percent or better over a 10:1 range shall be accomplished by changing stroke speed. The stroke speed shall be manually adjustable and shall be capable of being automatically adjustable proportional to a 4-20 mA signal. The stroke length shall also be manually adjustable. The manually adjustable stroke mechanism shall incorporate a calibrated stroke length indicator. Pumps shall be self-priming and capable of continuous operation without process fluid.

2. Solenoid driven, diaphragm type chemical metering pumps can be used for flows 10 GPH or less. The pumps shall be thermally protected to shut off upon detecting excessive temperature. Pumps shall be capable of receiving a 4-20 mA signal for use in paced operation to a 4-20 mA signal.

1.06 Valves

A. General:

1. Valves for all clean water or process air piping shall be butterfly valves. Valves for sludge shall be plug valves. Valves for all chemical piping shall be true union PVC ball or diaphragm valves. Valves for sodium hypochlorite shall be true union PVC diaphragm valves.

2. Valves are to be rated for a minimum pressure of 1.5 times the maximum operating pressure.

3. Valves, 8-inch and smaller, shall be provided with manual lever operators, motor operators or pneumatic operators as recommended by the manufacturer. Valves larger than 8-inch shall be provided with geared operators. Valves for buried or submerged service shall be provided with extended bonnets.

4. Any valve that is expected to operate more than one time per day shall be provided with either a motor or pneumatic operator.

5. Flanges shall conform to ANSI/ASME B16.1, Class 125 or ANSI/ASME B16.5, Class 150.

6. Overhead valves shall be provided with chain wheel operators.

B. Butterfly Valves: Valves for clean water or air service shall be a lug or flanged body design and shall have cast iron, ductile iron or stainless steel body and disc. Stainless

steel or PVC valve shall be provided where corrosion resistance is necessary to protect the valve from corrosion or chemical attack.

C. Plug Valves: Plug valves shall be a 90 degree turn, eccentric type with resilient faced plug. Valve bodies shall be cast iron conforming to ASTM A 126, Class B. Valve opening shall be a minimum of 80 percent of the full pipe area.

D. PVC Ball, Ball Check, and Diaphragm Valves:

1. All valves for chemical service shall be rated for use with the intended chemical.

2. PVC valves shall be true union type valves.

3. O-rings shall be EPDM. Diaphragms for diaphragm valves shall be rated for the intended chemical service.

4. Valves shall be rated for a minimum pressure of 120 psig.

E. Motorized Valve Operators:

1. Motor operators shall be sized to operate the valve in a minimum of 30 seconds.

2. Operators shall be sized to operate using 120 volt/single phase power or 480 volt/three phase power.

3. Valves shall be provided with a NEMA 4X enclosure.

4. Valves shall be provided with necessary limit switches and input/output capability for the intended service. Provide modulating operation using a 4-20 mA signal where required.

1.07 Compressed Air Systems

A. Reciprocating Type Compressors:

1. Air compressors shall be designed for 150% of the maximum air flow and 100% of the pressure required for the membrane system as well as any peripheral equipment provided by the membrane manufacturer including any pneumatically operated pumps, valves and instruments provided as part of the membrane system.

2. Compressors shall be duplex, heavy duty, industrial rated, air cooled, lubricated, reciprocating type. Each compressor shall include a dry type 4 micron inlet filter/silencer and a heavy duty filter silencer. Each system shall be provided with a sound attenuating enclosure.

3. The compressor shall include a receiver tank that is sized for 125% of the application. The receiver shall be a ASME Section VIII code rated vessel and shall include a minimum 1/16” corrosion allowance. The receiver can either be a separate vessel or integral with the compressors. Separate vessels shall be free

standing and shall be equipped with a support base.

4. The compressed air system shall include a suitably sized dryer.

5. The compressors shall include a duplex control panel for each duplex compressor.

END OF SECTION

APPENDIX M

Drawings

Number	Title
Figure 1	Preliminary Water Treatment Plant Site Plan
Figure 2	Preliminary Process Flow Diagram
Figure 3	Preliminary Hydraulic Profile

J:\C6A01402\600DI\SC\Membrane Request for Proposals\Figures\Figure 1_Preliminary Site Plan

City of Oak Ridge

Appendix M

Preliminary Water Treatment Plant Site Plan

Figure 1

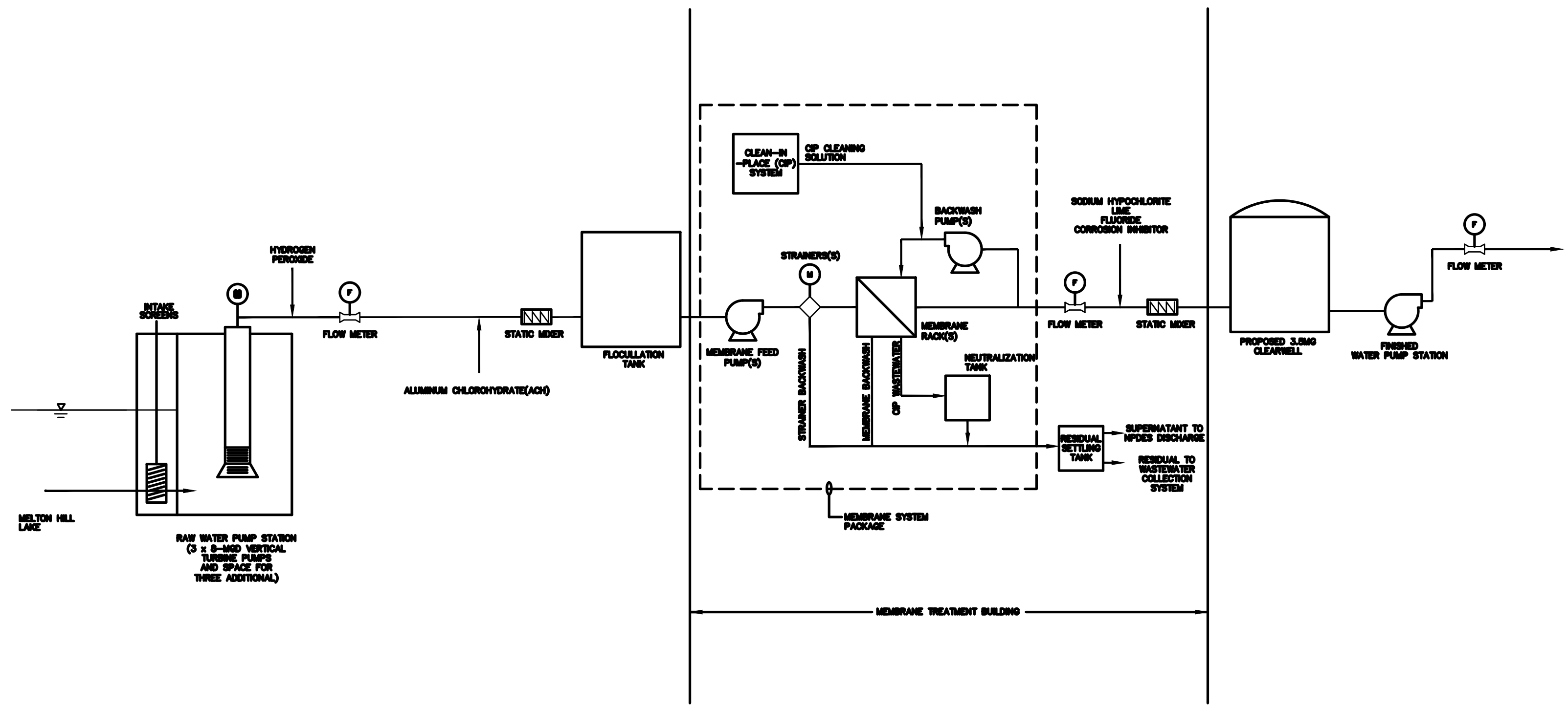
0 50 100 200 Feet

N

WGS 1984 Web Mercator Auxiliary Sphere

Map Published: 10/5/2017 4:02:12 PM
Project #: C6A01402

JACOBS®



PLOT DATE: 11/15/2017
BY: EVERENRE
LAST SAVED: 11/15/2017
CREATED: 9/27/2017

JACOBS

9721 Cogdill Road, Suite 201
Knoxville, Tennessee 37932-3425
Phone(865)966-1000 Fax(865)966-1099

CITY OF OAK RIDGE
WATER TREATMENT PLANT
FACILITIES PLAN

REV	DATE	REVISION DESCRIPTION

THIS LINE IS ONE INCH LONG WHEN PLOTTED FULL SCALE

THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE APPLICABLE OR GOVERNING TECHNICAL SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.

PROJECT NO: C6A01402 FIG 2.dwg

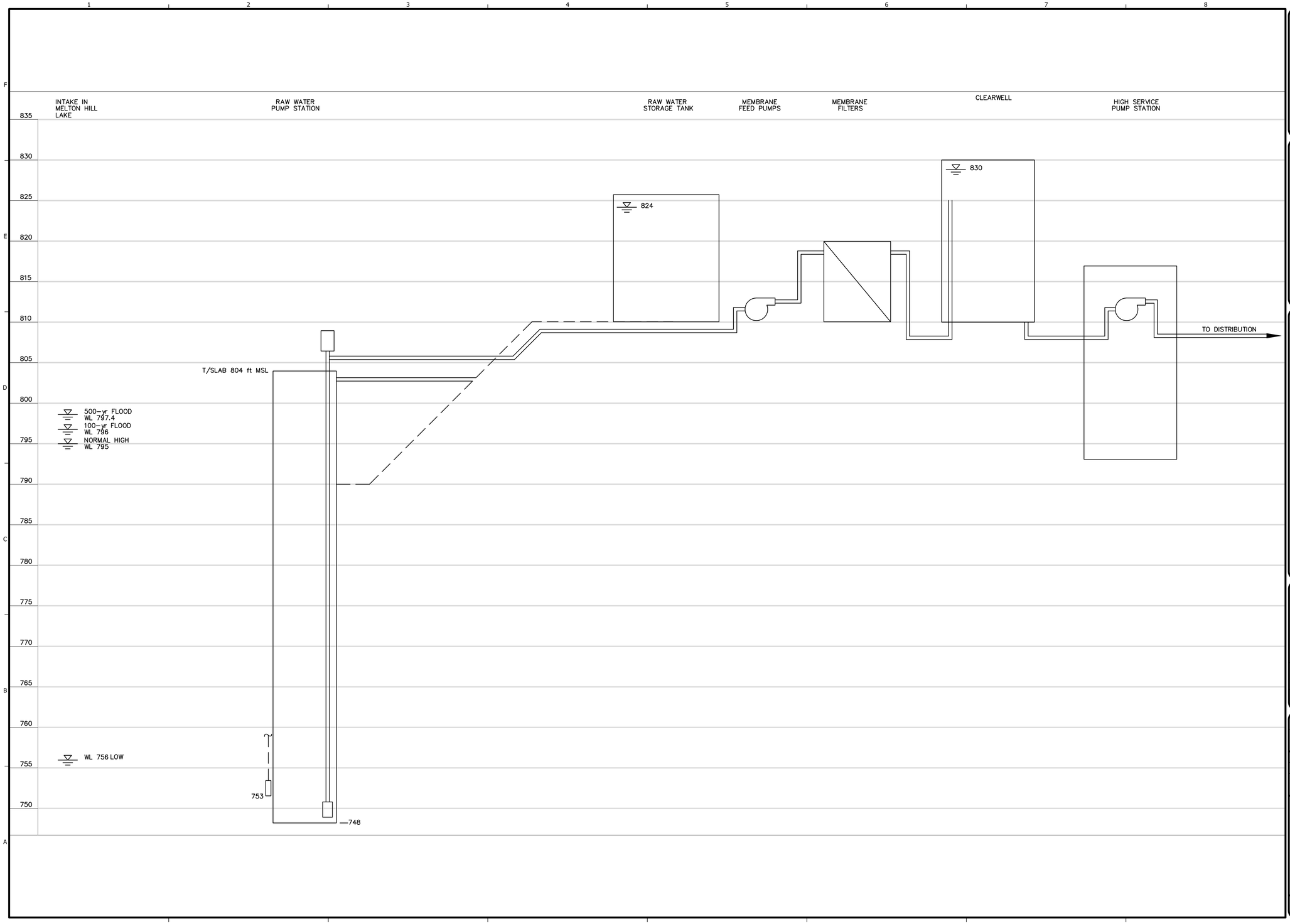
DATE: 08/30/2017

DISC. LEAD:	DESIGNER:	CHECKER:
BRS	REE	

SHEET TITLE

PROCESS FLOW DIAGRAM

SHEET FIGURE 2



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CITY OF OAK RIDGE
WATER TREATMENT PLANT
FACILITIES PLAN

REV	DATE	REVISION DESCRIPTION

THIS LINE IS ONE INCH LONG WHEN PLOTTED FULL SCALE

THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE APPLICABLE OR GOVERNING TECHNICAL SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.

PROJECT NO: C6A01402 FIG 3.dwg

DATE: 08/30/2017

DISC. LEAD:	DESIGNER:	CHECKER:
BRS	REE	

SHEET TITLE

HYDRAULIC PROFILE

SHEET FIGURE 3

PLOT DATE: 11/15/2017
BY: EVERENRE
LAST SAVED: 9/28/2017
CREATED: 9/27/2017

APPENDIX N

Funding Agency Forms

Note:

The forms included in Appendix N are intended to provide the System Supplier guidance on the SRF Loan Funding Agency Requirements, and are required for use by the General Contractor for construction of the water treatment plant.

Forms 01 01, 01 02, 02 01, 03 01, and 04 01 in bold below are to be completed and signed by the System Manufacturer and Contractor in order to satisfy TN Bidding and SRF Loan Funding requirements.

Section	Title
01 01	**Certification Regarding Debarment**
01 02	**Certification Regarding Equal Employment**
02 01	**Compliance With Iran Divestment Act**
03 01	**Drug Free Workplace Affidavit**
04 01	**Certifications for AIS Compliance**
04 02	Sample Certification for AIS Compliance
04 03	Information Checklist for Waiver Request
04 04	Implementation Compliance Waiver Process
05 01	Retainage TCAs 2017 Public Chapter
05 02	Advertisement for Bids Example – AIS and Davis Bacon
06 01	Guidance Document
06 02	Loan Recipient’s Requirements
06 03	Loan Recipient’s Good Faith Effort Letter
06 04	Loan Recipient’s Certification and Summary
06 05	Bidder’s Requirements
07 01	Certified Lists
08 01	Davis Bacon Poster English
08 02	Davis Bacon Poster Spanish
08 03	Project Wage Rate Sheet
08 04	Davis-Bacon Act Wage Determination – Bidder Guidance
08 05	Davis-Bacon Act Wage Determination – Loan Recipient’s Requirements
09 01	Tracking and Reporting
10 01	Comptroller Hotline Notice
11 01	Stormwater NOI
11 02	Stormwater NOT
14 01	Project SRF Signage
15 01	Bid Package Submittal Requirements
16 01	Letter In Lieu of Site Certificate
16 02	Site Certificate

U.S. Environmental Protection Agency

CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILTITY MATTERS

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statues or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____

Typed Name & Title of Authorized Representative

_____

Signature of Authorized Representative Date

____ I am unable to certify to the above statements. My explanation is attached.

CERTIFICATION BY PROPOSED PRIME OR SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

_____

Name of Prime Contractor **Project Number**

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246, Part II, Section 203 (b), 30 F.R. 12319-25). Any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicated that the prime or subcontractor has not filed a compliance report due under applicable instruction, such contractor shall be required to submit a compliance report.

CONTRACTOR'S CERTIFICATION

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 □

   If yes, state what reports were filed and with what agency.

   _____

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100. Yes □ No □

4. 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. (A willfully false statement is punishable by law-U.S. Code, Title 18, Section 1001.)

_____

Name and title of signer (Please type)

_____ _____

Signature **Date**

Compliance With Iran Divestment Act

By submission of this bid, each bidder and each bidder signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder in not on the list created pursuant to § 12-12-106.

BIDDER: _____

By: _____
(signature)

_____
(name – printed)

Title: _____

Date: _____

END OF SECTION

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____
COUNTY OF_____

The undersigned, principal officer of _____, an employer of five (5) or more employees contracting with _____County government to provide construction services, hereby states under oath as follows:

1. The undersigned is a principal officer of _____ (hereinafter referred to as the "Company") and is duly authorized to execute this Affidavit on behalf of the Company.

2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the *Tennessee Code Annotated.*

   The Company is in compliance with T.C.A. § 50-9-113.

Further affiant saith not.

_____
Principal Officer

STATE OF TENNESSEE
COUNTY OF _____

Before me personally appeared _____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this _____ day of _____.

_____
Notary Public

My commission expires: _____

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

Appendix 4: Sample Construction Contract Language

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____ ("Purchaser") and the _____ (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking 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 Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State 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.

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) **What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?**

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) **What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?**

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) **What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?**

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) **What if a project has split funding from a non-SRF source?**

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

Covered Iron and Steel Products

11) What is an iron or steel product?

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

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

*** Current through 2017 Regular Session (Chapter 493). ***

Title 66 Property
Chapter 34 Prompt Pay Act
Part 1 General Provisions

Tenn. Code Ann. § 66-34-103 (2017)

66-34-103. Withholding of retainage -- Violations -- Penalties.

(a) All construction contracts on any project in this state, both public and private, may provide for the withholding of retainage; provided, however, that the retainage amount may not exceed five percent (5%) of the amount of the contract.

(b) The owner, whether public or private, shall release and pay all retainages for work completed pursuant to the terms of any contract to the prime contractor within ninety (90) days after completion of the work or within ninety (90) days after substantial completion of the project for work completed, whichever occurs first. As used in this subsection (b), work completed shall be construed to mean the completion of the scope of the work and all terms and conditions covered by the contract under which the retainage is being held. The prime contractor shall pay all retainages due any subcontractor within ten (10) days after receipt of the retainages from the owner. Any subcontractor receiving the retainage from the prime contractor shall pay to any subsubcontractor or material supplier all retainages due the subsubcontractor or material supplier within ten (10) days after receipt of the retainages.

(c) Any default in the making of the payments shall be subject to those remedies provided in this part.

(d) In the event that an owner or prime contractor withholds retainage that is for the use and benefit of the prime contractor or its subcontractors pursuant to § 66-34-104(a) and (b), neither the prime contractor nor any of its subcontractors shall be required to deposit additional retained funds into an escrow account in accordance with § 66-34-104(a) and (b).

(e) (1) It is an offense for a person, firm or corporation to fail to comply with subsection (a) or (b) or § 66-34-104(a).

(2) (A) A violation of this subsection (e) is a Class A misdemeanor, subject to a fine only of three thousand dollars ($3,000).

(B) Each day a person, firm or corporation fails to comply with subsection (a) or (b) or § 66-34-104(a) is a separate violation of this subsection (e).

(C) Until the violation of this subsection (e) is remediated by compliance, the punishment for each violation shall be consecutive to all other such violations.

(3) In addition to the fine imposed pursuant to subdivisions (e)(2)(A) and (B), the court shall order restitution be made to the owner of the retained funds. In determining the

appropriate amount of restitution, the formula stated in § 40-35-304 shall be used.

HISTORY: Acts 2007, ch. 201, § 3; 2008, ch. 804, § 3; 2012, ch. 609, § 1.

*** Current through 2017 Regular Session (Chapter 493). ***

Title 66 Property
Chapter 34 Prompt Pay Act
Part 1 General Provisions

Tenn. Code Ann. § 66-34-104 (2017)

66-34-104. Retention of portion of contract price in escrow -- Applicability -- Mandatory compliance.

(a) Whenever, in any contract for the improvement of real property, a certain amount or percentage of the contract price is retained, that retained amount shall be deposited in a separate, interest-bearing, escrow account with a third party which must be established upon the withholding of any retainage.

(b) As of the time of the withholding of the retained funds, the funds shall become the sole and separate property of the prime contractor or remote contractor to whom they are owed, subject to the rights of the person withholding the retainage in the event the prime contractor or remote contractor otherwise entitled to the funds defaults on or does not complete its contract.

(c) In the event that the party withholding the retained funds fails to deposit the funds into an escrow account as provided herein, such party shall be responsible for paying the owner of the retained funds an additional three hundred dollar ($300) penalty per day for each and every day that such retained funds are not deposited into such escrow account.

(d) The party with the responsibility for depositing the retained amount in a separate, interest-bearing, escrow account with a third party shall have the affirmative duty to provide written notice that it has complied with the requirements of this section to any prime contractor upon withholding the amount of retained funds from each and every application for payment, including:

(1) Identification of the name of the financial institution with whom the escrow account has been established;

(2) Account number; and

(3) Amount of retained funds that are deposited in the escrow account with the third party.

(e) Upon satisfactory completion of the contract, to be evidenced by a written release by the owner or prime contractor owing the retainage, all funds accumulated in the escrow account together with all interest on the account shall be paid immediately to the prime contractor or remote contractor to whom the funds and interest are owed.

(f) In the event the owner or prime contractor, as applicable, fails or refuses to execute the release provided for in subsection (c), then the prime contractor or remote contractor, as applicable, may seek any remedy in a court of proper jurisdiction and the person holding the fund as escrow agent shall bear no liability for the nonpayment of the fund to the prime contractor or remote contractor; provided, however, that all claims, demands, disputes, controversies, and differences that may arise between the owner, prime contractor or prime contractors, and remote contractor or remote contractors regarding the funds may be, upon written agreement of all parties concerned, settled by arbitration conducted pursuant to the Tennessee Uniform Arbitration Act, compiled in title 4, chapter 5, part 3, or the Federal Arbitration Act (9 U.S.C. § 1, et seq.), as may be applicable.

(g) In contracts to which the state or any department, board or agency of the state, including the University of Tennessee, is a party, interest shall be paid on the retained amounts at the same rate interest is paid on the funds of local governments participating in the local government investment pool established pursuant to § 9-4-704, for the contract period.

(h) This section shall be applicable to the state, any department, board or agency of the state, including the University of Tennessee, and all counties and municipalities and all departments, boards or agencies of the counties and municipalities, including all school and education boards, and any other subdivision of the state.

(i) This section shall be applicable to all prime contracts and all subcontracts thereunder for the improvement of real property when the contract amount of such prime contract is five hundred thousand dollars ($500,000) or greater, notwithstanding the amount of such subcontracts.

(j) Compliance with this section shall be mandatory, and may not be waived by contract.

(k) Failure to deposit the retained funds into an escrow account as provided herein, within seven (7) days' receipt of written notice regarding such failure, is a Class A misdemeanor.

HISTORY: Acts 1975, ch. 345, §§ 1-4; T.C.A., §§ 64-1148 -- 64-1151; Acts 1985, ch. 340, §§ 1, 2; 1986, ch. 551, § 9; 2007, ch. 189, § 43; 2007, ch. 201, §§ 1, 2; T.C.A. § 66-11-144; Acts 2008, ch. 804, §§ 1, 2; 2010, ch. 875, §§ 1, 2; 2012, ch. 609, §§ 2-5.

*** Current through 2017 Regular Session (Chapter 493). ***

Title 66 Property
Chapter 34 Prompt Pay Act
Part 2 Owner/Contractor Payment

Tenn. Code Ann. § 66-34-203 (2017)

66-34-203. Withholding of payment or retainage by owner.

Nothing in this chapter shall prevent the owner from reasonably withholding payment or a portion of a payment to the contractor; provided, that such withholding is in accordance with the written contract between the owner and the contractor. The owner may also withhold a reasonable amount of retainage as specified in the written contract between the owner and the contractor; provided, however, that the retainage amount may not exceed five percent (5%) of the amount of the contract.

HISTORY: Acts 1991, ch. 45, § 1; 2007, ch. 201, § 4.

ADVERTISEMENT FOR BIDS EXAMPLE – DBE

The {City/Town/County/Utility District/Authority} will receive separate sealed BIDS for the construction of a {water or wastewater} project at {location to deliver bid proposal} until {closing time}, local time, on {date}, and, then, at said time, publicly open and read the BIDS aloud.

The work to be bid on is as follows: {Description of work to be performed here.}

The allotted time for construction is {# of days for work to be performed} calendar days.

The information for Bidders; Bid Form; Form of Agreement; Drawings; Specifications information; Bid Bond, Performance Bond, and Payment Bond information; and other contract documents may be examined at the addresses below:

{Please type address of consulting engineer's office}

{Please type address of City/Town/Utility District/Authority}

Builder's Exchange of Tennessee

Nashville Office	Knoxville Office	Ms. Marilyn Robinson, Executive Director
2322 Winford Ave	300 Clark street	Nashville Minority Business Office
Nashville, TN 37211	Knoxville, TN 37921	1919 Charlotte Avenue, Suite 310
		Nashville, TN 37203
		(615) 255-0432

Copies of the CONTRACT DOCUMENTS may be obtained at the {name of office to pick up contract documents} Office, located at {address of office}, upon payment of $ {Amount} for each set.

Any BIDDER, upon returning the CONTRACT DOCUMENTS within {number of days} days after BID opening and in good condition, will be refunded {his/her payment or $ amount} and any non-bidder will be refunded $ {Amount}.

No bid may be withdrawn within (#) days after the scheduled time for receipt of bids.

DAVIS-BACON ACT and AMERICAN IRON AND STEEL REQUIREMENTS

This project is being funded by a State Revolving Fund loan on or after 2014 EPA Fiscal Year. The loan recipient must be in compliance with all applicable Davis-Bacon Act and American Iron and Steel requirements.

DISADVANTAGED BUSINESS ENTERPRISES (DBE) REQUIREMENTS

Any contract or contracts awarded by the Owner through this invitation for bids will be funded by a State Revolving Fund (SRF) loan from the State of Tennessee. State and Federal funds will be involved in this project, and, as a result, Bidders must comply with the SRF Loan Program's Disadvantaged Business Enterprises (DBE) requirements including contacting a minimum of 10 qualified DBE sub-contractors, professional service providers, vendors, and/or suppliers by certified mail to solicit bids. The apparent successful Bidder must submit to the Owner copies of the certified letters and return receipts prior to contract award. Neither the State of Tennessee nor any of its departments, agencies, or employees is or will be a party to this Invitation for Bids or any resulting contract(s) awarded by the Owner.

SPECIAL NOTICE TO DISADVANTAGED BUSINESS ENTERPRISES (DBE) FIRMS

All qualified Disadvantaged Business Enterprises (DBE) firms desiring to bid as a General Contractor, sub-contractor, professional service provider, supplier, or equipment vendor are encouraged to contact Ms. Marilyn Robinson at the Nashville Minority Business Center office listed above to review bidding/contract documents. Qualified Disadvantaged Business Enterprises (DBE) firms may also contact {Name of the Engineer, office address, and phone number}, in order to obtain a list of prospective bidding General Contractors or to obtain copies of bidding/contract documents.

Disadvantaged Business Enterprise (DBE) Requirements
for
State Revolving Fund Loans Awarded after May 27, 2008

GUIDANCE DOCUMENT

Items included in the Guidance Document:

- **General Contract Administration Provisions Table**
- **Six Good Faith Efforts, Purpose and Definitions Table**
- **List of DBE Forms for Loans Awarded After May 27, 2008**

GENERAL CONTRACT ADMINISTRATION PROVISIONS—www.epa.gov			
Requirement	**Circumstance**	**Responsible Party:**	**Submitted To:**
A **Loan Recipient** must be notified in writing by its **Prime Contractor** prior to any termination of a **DBE Subcontractor** for convenience by the **Prime Contractor**.	Termination of a **DBE Subcontractor** for convenience by the **Prime Contractor**	**Prime Contractor**	**Loan Recipient**
A **Loan Recipient** must require its **Prime Contractor** to pay its **Subcontractor** for satisfactory performance no more than 30 days from the **Prime Contractor's** receipt of payment from the **Loan Recipient**.	**DBE Subcontractor's** satisfactory performance	**Loan Recipient** **Prime Contractor**	**DBE Subcontractor**
If a **DBE Subcontractor** fails to complete work under the subcontract for any reason, the **Loan Recipient** must require the **Prime Contractor** to employ the **Six Good Faith Efforts** (see Table below) if soliciting a replacement **Subcontractor**.	**DBE Subcontractor** fails to complete work under the subcontract for any reason and will be replaced	**Loan Recipient** **Prime Contractor**	**SRF Loan Program**
A **Loan Recipient** must require its **Prime Contractor** to employ the **Six Good Faith Efforts** (see Table below) even if the **Prime Contractor** has achieved its fair share objectives.	Employment of the **Six Good Faith Efforts**	**Loan Recipient** **Prime Contractor**	**SRF Loan Program**
Inclusion, completion, and/or transmittal of required **DBE Forms** as instructed below: **Loan Recipient Requirements** **Bidder Requirements** **DBE Participation/Certification Summary** **Advertisement for Bids and Publisher's Affidavit** 10 Certified Letters and Return Receipts to certified **DBEs** **Good Faith Letter** **Prime Contractor's Notice Letter** for EPA Form 6100-2 **EPA Form 6100-2** **EPA Form 6100-3** **EPA Form 6100-4**	---	**Loan Recipient** **Prime Contractor** **DBE Subcontractor**	See instructions below and on Forms

SIX GOOD FAITH EFFORTS—www.epa.gov	
PURPOSE	The Good Faith Efforts are required methods employed by all EPA financial assistance agreement recipients to ensure that all disadvantaged business enterprises (DBEs) have the opportunity to compete for procurements funded by EPA financial assistance dollars.
Definitions	
EFFORT 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.
EFFORT 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.
EFFORT 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.
EFFORT 4	Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
EFFORT 5	Use the services and assistance of the Small Business Administration (SBA) and the Minority Business Development Agency of the Department of Commerce.
EFFORT 6	If the **Prime Contractor** awards subcontracts, require the **Prime Contractor** to take the steps in the Good Faith Efforts 1 through 5 (above) and in the General Contract Administration Provisions (above).

Disadvantaged Business Enterprise (DBE) Requirements
for
State Revolving Fund Loans Awarded after May 27, 2008

GUIDANCE DOCUMENT

DBE FORMS FOR SRF LOANS AWARDED AFTER MAY 27, 2008—www.epa.gov				
Form	**Requirement**	**Provided By:**	**Completed By:**	**Submitted To:**
List of certified **DBE** contractors, subcontractors, supplies vendors, equipment vendors, and service providers	Keep list with project files/information for duration of project	**SRF Loan Program**	---	---
Loan Recipient's Requirements regarding DBEs	Include this information sheet in the Information for Bidders section of bid documents	**SRF Loan Program**	---	To be included in the contract specifications book
Bidder's Requirements regarding DBEs	Include this information sheet in the Information for Bidders section of bid documents	**SRF Loan Program**	---	To be included in the contract specifications book
Loan Recipient's Certification and Summary of **DBE** Participation	To be completed and submitted with the Authority-to-Award/ Bid Package. The SRF Loan Program must be notified of any changes, additions, or deletions to the contract during construction.	**SRF Loan Program**	**Loan Recipient**	**SRF Loan Program**
Advertisement for Bids and **Publisher's Affidavit**	**DBE** solicitation information must be included in the actual advertisement for bids. A Publisher's Affidavit (signed, original, notarized certification of publication) denoting the actual published date of the advertisement will be submitted to the SRF Loan Program as part of the Authority-to-Award/Bid Package documents.	An example advertise-ment with appropriate **DBE** language is supplied to the Loan Recipient by the **SRF Loan Program**	**Loan Recipient**	A copy of the actual advertisement and a Publisher's Affidavit will be submitted to the **SRF Loan Program** as part of the Authority-to-Award/Bid Package documents
10 Certified Letters and **Return Receipts** to potential certified DBE subcontractors, supplies vendors, service providers, and/or equipment vendors	These certified letters and copies of the corresponding return mail receipts are submitted with the completed **Loan Recipient's DBE Participation and Certification Summary Form.**	**Prime Contractor and/or Loan Recipient**	**Loan Recipient**	SRF Loan Program as part of the Authority-to-Award/Bid Package documents
Good Faith Letter	If **no DBE** participation is obtained for the contract, the "Good Faith" letter must be written.	Form letter provided by the **SRF Loan Program**	**Loan Recipient**	**SRF Loan Program**

Disadvantaged Business Enterprise (DBE) Requirements
for
State Revolving Fund Loans Awarded after May 27, 2008

GUIDANCE DOCUMENT

DBE FORMS FOR SRF LOANS AWARDED AFTER MAY 27, 2008—www.epa.gov				
Form	**Requirement**	**Provided By:**	**Completed By:**	**Submitted To:**
Prime Contractor's Notice Letter for EPA Form 6100-2	The **Prime Contractor** must submit the Notice Letter to verify that Form 6100-2 was supplied to all **DBE Subcontractors** participating in the contract.	**SRF Loan Program**	**Prime Contractor**	**Loan Recipient** for inclusion in the Authority-to-Award / Bid / Proposal package
EPA Form **6100-2**	**Loan Recipient** required to have **Prime Contractors** provide form to **DBE Subcontractors** This form gives a **DBE Subcontractor** the opportunity to describe the work the **DBE Subcontractor** received from the **Prime Contractor**, how much the **DBE Subcontractor** was paid, and any other concerns the **DBE Subcontractor** might have.	**Loan Recipient** **Prime Contractors**	**DBE Subcontractors**	**EPA DBE Coordinator** at the conclusion of **DBE Subcontractor** participation in the project (Address on Form)
EPA Form **6100-3**	**Loan Recipient** required to have **Prime Contractors** provide form to **DBE Subcontractors** This form captures an intended **Subcontractor's** description of work to be performed for the **Prime Contractor** and the price of the work submitted to the **Prime Contractor**.	**Loan Recipient**	**Prime Contractors** **DBE Subcontractors**	**Loan Recipient** for inclusion in the Authority-to-Award / Bid / Proposal package
EPA Form **6100-4**	**Loan Recipient** required to have **Prime Contractors** complete the form This form captures the **Prime Contractor's** intended use of an identified **DBE Subcontractor** and the estimated dollar amount of the subcontract.	**Loan Recipient**	**Prime Contractors**	**Loan Recipient** for inclusion in the Authority-to-Award / Bid / Proposal package

STATE REVOLVING FUND LOAN PROGRAM

Loan Recipient's Requirements for Solicitation and Documentation
of
Disadvantaged Business Enterprises (DBE) Participation
on State Revolving Fund (SRF) Projects

A goal-oriented system has been established to promote **Disadvantaged Business Enterprises (DBE)** participation by providing construction services, professional services, supplies, and/or equipment on SRF Loan-funded water and wastewater projects. It is the Loan Recipient's responsibility to ensure that Bidders make a good faith effort during the bidding phase to solicit for subcontractor participation by **DBE** subcontractors, service professionals, suppliers, and/or equipment vendors on all SRF-funded projects.

DEFINITIONS

DBE - Minority Business Enterprise (MBE): A qualified socially and economically disadvantaged minority-owned business certified by any State or Federal agency, such as the Tennessee Department of Transportation, U.S. EPA's Office of Small and Disadvantaged Business Utilization, or the U.S. Small Business Administration.

DBE - Women's Business Enterprise (WBE): A qualified independent business at least 51% owned by a woman or women and certified by any State or Federal agency such as the Tennessee Department of Transportation, U.S. EPA's Office of Small and Disadvantaged Business Utilization, or the U.S. Small Business Administration.

Fair-Share Goals: The MBE fair-share goal is 2.6% for construction and 5.2% for supplies, services, and equipment. The WBE fair share goal is 2.6% for construction and 5.2% for supplies, services, and equipment.

INSTRUCTIONS TO LOAN RECIPIENTS

Pre-Bid Requirements

Loan Recipients must include the SRF Loan Program's "Bidder's Requirements for Solicitation and Documentation of **DBE** Participation on SRF-Funded Projects" information sheet in the Information for Bidders section of bid documents. Loan Recipients must also ensure that Bidders take the following affirmative steps that constitute a good-faith effort to secure **DBE** participation:

- Include certified **DBEs** on solicitation lists whenever they are potential sources,
- Divide construction contracts into subcontracts, when economically feasible, to encourage maximum participation by **DBEs**,
- Establish delivery schedules, where requirements of the work permit, that encourage participation by **DBEs**,
- Use the services and assistance of the Office of Minority Business Enterprises of the U.S. Department of Commerce, or the U.S. EPA's Office of Small and Disadvantaged Business Utilization. For assistance or information, Bidders may be referred to:

Tennessee Department of Transportation
Small Business Development
505 Deaderick Street, Suite 1800
Nashville, TN 37243-0347
(615) 741-3681
http://www.tdot.state.tn.us/construction/DBE%20list/dbe_list.pdf

Mr. W. Clinton Smith, District Director
U.S. Small Business Administration
50 Vantage Way, Suite 201
Nashville, TN 37228
(615) 736-5881
http://pro-net.sba.gov/

Ms. Jeanette L. Brown, Director
U.S. Environmental Protection Agency
Office of Small and Disadvantaged Business Utilization
1200 Pennsylvania Avenue, N.W. (1230A)
Washington, D.C. 20460
(202) 564-4100 http://www.epa.gov/osdbu/

POST-BID REQUIREMENTS

Whether or not DBE participation was obtained, the Loan Recipient must complete the **"Loan Recipient's Certification and Summary"** form for every contract detailing whether or not **DBE** participation of subcontractors, professional service providers, suppliers, and/or equipment vendors was obtained. The **"Loan Recipient's Certification and Summary"** form must be submitted to the Administrative Section of the SRF Loan Program prior to the award of any construction contract(s) along with the newspaper **advertisement**, a **Publisher's Affidavit**, and **return receipts** and copies of the **certified letters** that were mailed to a minimum of 10 qualified **DBEs**.

STATE REVOLVING FUND LOAN PROGRAM

Loan Recipient's Requirements for Solicitation and Documentation
of
Disadvantaged Business Enterprises (DBE) Participation
on State Revolving Fund (SRF) Projects

If DBE participation was obtained, the **"Loan Recipient's Certification and Summary"** form must clearly indicate whether **DBE** participation was obtained from either a subcontractor, professional service provider, supplier, and/or equipment vendor participation; identify the **DBE** firm(s) to be used; and certify that the **DBE** firm(s) is a certified **DBE**. In addition to the **"Loan Recipient's Certification and Summary"** form, the Loan Recipient must include in the submittal to the SRF Loan Program, copies of the **Prime Contractor's Notice Letter for EPA Form 6100-2**, **EPA Form 6100-3**, and **EPA Form 6100-4**.

If no DBE participation was obtained, the Loan Recipient must submit a separate letter documenting that a "**good-faith effort**" was made to secure **DBE** participation. This letter is submitted along with the above-mentioned **"Loan Recipient's Certification and Summary"** form, newspaper **advertisement**, **Publisher's Affidavit**, **return receipts,** and copies of the **certified letters.** The SRF Loan Program provides a template to the Loan Recipient for this letter.

This documentation is the only form of documentation that will be accepted by the SRF Loan Program. Failure to provide the required documentation may result in a delay of the SRF Loan Program's approval of the Authority-to-Award/Bid Package, thereby delaying the award of the construction contract(s).

The Loan Recipient should direct all inquiries regarding the SRF Loan Program's requirements for **DBE** solicitation and documentation to Dr. Bagher Sami at (615) 532-0501, bagher.sami@tn.gov, or the following address:

Dr. Bagher Sami, Manager
Administrative and Financial Section
Tennessee State Revolving Fund Loan Program
WRS - Tennessee Tower, 12th Floor
312 Rosa L. Parks Avenue
Nashville, TN 37243

STATE REVOLVING FUND LOAN PROGRAM

Loan Recipient's Good Faith Effort Letter for DBE Participation

(Insert on Loan Recipient's Letterhead)

(Date)

Dr. Bagher Sami, Manager
Administrative and Financial Sections
State Revolving Fund Loan Program
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, TN 37243

RE: Good Faith Effort – Disadvantaged Business Enterprises (DBE) Participation
City/County/UD/Authority (??? County), Tennessee
Loan No. SRF/CWA/CGA/DWF/DWA/DGA 20??-???
Contract No. ????, Contract Description

Dear Dr. Sami:

This letter is to inform you that the City/County/UD/Authority did, in good faith, encourage Disadvantaged Business Enterprises (DBE) to participate in the above referenced project by placing a special notice to Disadvantaged Business Enterprises (DBE) firms in both the invitation to bid and the public advertisement for bids. The City/County/UD/Authority, through the consulting engineer, (A/E Consulting Firm), sent a copy of the invitation to bid and a set of contract documents to the Office of Minority Business Enterprises. The City/County/UD/Authority also sent certified letters, return receipts requested, to a minimum of ten (10) DBE potential subcontractors, professional service providers, suppliers, and equipment vendors requesting DBE participation through their office, A/E, or their contractor. The consulting engineer on this project is (Name), (Firm).

We have not received any DBE participation; we believe we have done a good faith effort.

If you have any questions, please don't hesitate to contact us.

Sincerely,

(Authorized Representative Name)
(Authorized Representative Title)

cc: (A/E Consultant Name and Firm)

STATE REVOLVING FUND LOAN PROGRAM

Loan Recipient's Certification and Summary
of
Disadvantaged Business Enterprises (DBE) Participation

SRF Loan Recipient: _____ SRF Loan No. _____

INSTRUCTIONS TO SRF LOAN RECIPIENTS

The SRF Loan Recipient's Authorized Representative must clearly indicate the Contractor's **Disadvantaged Business Enterprises (DBE)** participation results by placing a check in the appropriate box below. The remainder of the form must be completed if **DBE (Minority Business Enterprise-MBE or Women's Business Enterprise –WBE)** participation was obtained. The form must be signed and dated and returned to Dr. Bagher Sami of the Administrative Section of the SRF Loan Program.

The **completed Form** must be accompanied by **copies of the certified letters** sent from the selected Bidder to a minimum of 10 qualified DBE potential subcontractors, supplies vendor, services provider, and/or equipment vendors, and **copies of the corresponding return mail receipts**.

The SRF Loan Program must be notified of any changes, additions, or deletions to the contract during construction.

☐ **No, Disadvantaged Business Enterprises (DBE) participation was not obtained for this SRF-funded project.** I certify that a good-faith effort was made to solicit **DBE** participation in accordance with the four affirmative steps outlined in the SRF Loan Program's Requirements for Solicitation and Documentation of **DBE** Participation on SRF-Funded Projects. A letter documenting that a good–faith effort was made to secure **DBE** participation has been provided to the SRF Loan Program.

OR

☐ **Yes, Disadvantaged Business Enterprises (DBE) participation was obtained for this SRF-funded project.** I certify that the **DBE** firms participating in this SRF-funded project are qualified in accordance with the SRF Loan Program's Requirements for Solicitation and Documentation of **DBE** Participation on SRF-Funded Projects. Below is a listing of firms to be utilized and the amounts of their respective participation.

1. **DBE type (circle one): Subcontractor, Supplies Vendor, Service Provider, Equipment Vendor**
DBE Name: _____
Address: _____
Subcontract Amount: $ _____ **MBE** ___ **WBE** ___ **% of Contract $:** _____ **%**

2. **DBE type (circle one): Subcontractor, Supplies Vendor, Service Provider, Equipment Vendor**
DBE Name: _____
Address: _____
Subcontract Amount: $ _____ **MBE** ___ **WBE** ___ **% of Contract $:** _____ **%**

3. **DBE type (circle one): Subcontractor, Supplies Vendor, Service Provider, Equipment Vendor**
DBE Name: _____
Address: _____
Subcontract Amount: $ _____ **MBE** ___ **WBE** ___ **% of Contract $:** _____ **%**

4. **DBE type (circle one): Subcontractor, Supplies Vendor, Service Provider, Equipment Vendor**
DBE Name: _____
Address: _____
Subcontract Amount: $ _____ **MBE** ___ **WBE** ___ **% of Contract $:** _____ **%**

PARTICIPATION SUMMARY

Total SRF Loan Amount: $ _____ **Total Construction Contract Amount: $** _____

Total MBE Participation: $ _____ **Total WBE Participation: $** _____

_____ _____
Signature and Title of SRF Loan Recipient's Authorized Representative Date

STATE REVOLVING FUND LOAN PROGRAM

Bidder's Requirements for Solicitation and Documentation of Disadvantaged Business Enterprises (DBE) Participation

A goal-oriented system has been established to promote **Disadvantaged Business Enterprises (DBE)** participation by providing construction services, professional services, supplies, and/or equipment on SRF Loan-funded water and wastewater projects. It is the Bidder's responsibility to make a good faith effort to secure participation by **DBE** subcontractors, professional service providers, suppliers, and/or equipment vendors.

DEFINITIONS

DBE - Minority Business Enterprise (MBE): A qualified socially and economically disadvantaged minority-owned business certified by any State or Federal agency, such as the Tennessee Department of Transportation, U.S. EPA's Office of Small and Disadvantaged Business Utilization, or the U.S. Small Business Administration.

DBE - Women's Business Enterprise (WBE): A qualified independent business at least 51% owned by a woman or women and certified by any State or Federal agency such as the Tennessee Department of Transportation, U.S. EPA's Office of Small and Disadvantaged Business Utilization, or the U.S. Small Business Administration.

Fair-Share Goals: The MBE fair-share goal is 2.6% for construction and 5.2% for supplies, services, and equipment. The WBE fair share goal is 2.6% for construction and 5.2% for supplies, services, and equipment.

INSTRUCTIONS TO BIDDERS

Pre-Bid Requirements

All Bidders must send letters by certified mail with return receipt requested to a minimum of 10 certified **DBE** subcontractors, professional service providers, suppliers, and/or equipment vendors to solicit their subcontract participation in the work. Lists of certified **DBE** firms may be obtained from various State and Federal agencies, including the following:

Tennessee Department of Transportation
Small Business Development
505 Deaderick Street, Suite 1800
Nashville, TN 37243-0347
(615) 741-3681
http://www.tdot.state.tn.us/dbedirectinternet/Vendor.aspx

Mr. W. Clinton Smith, District Director
U.S. Small Business Administration
50 Vantage Way, Suite 201
Nashville, TN 37228
(615) 736-5881
http://pro-net.sba.gov/

U.S. Environmental Protection Agency
Office of Small and Disadvantaged Business Utilization
1200 Pennsylvania Avenue, N.W. (1230A)
Washington, D.C. 20460
(202) 564-4100
http://www.epa.gov/osdbu/

Post-Bid Requirements

Whether or not DBE participation was obtained, the successful Bidder (Prime Contractor) must maintain supporting documents such as certification lists, solicitation documents, letters of intent, contracts, etc., for the duration of the project.

If DBE participation was obtained, the apparent successful Bidder must identify to the Loan Recipient all **DBE** firms to be utilized on the contract and the respective **DBE** type--subcontractors, supplies vendors, service providers, and/or equipment vendors (see "Loan Recipient's Certification and Summary" form)**.** Copies of the State's or Federal agency's **DBE** certification list(s) identifying that the **DBE** firms are certified minority or women's business enterprises must be provided to the Loan Recipient. In addition, copies of the **Prime Contractor's Notice Letter for EPA Form 6100-2**, **EPA Form 6100-3** (to be co-completed by the Prime Contractor and each DBE subcontractor**)**, and **EPA Form 6100-4** must also be provided to the Loan Recipient prior to tentative loan award. The Prime Contractor must provide **EPA Form 6100-2** to each **DBE** utilized on the contract.

If no DBE participation was obtained by the apparent successful Bidder, it remains the responsibility of the Prime Contractor to provide documentation to the Loan Recipient, prior to contract award, that a good faith effort was made to obtain **DBE** participation. Copies of the **certified letters** sent to a minimum of 10 qualified **DBE** potential subcontractors, supplies vendors, service providers, and/or equipment vendors and the corresponding **return mail receipts** are the only documentation of a good-faith effort that will be acceptable to the Loan Recipient.

*Failure to provide the required certified letters, return receipts, State or Federal agency **DBE** certification list(s), **Prime Contractor's Notice Letter for EPA Form 6100-2**, **EPA Form 6100-3**, and **EPA Form 6100-4** to the Loan Recipient may delay the contract award until the required documentation has been provided to and accepted by the Loan Recipient.*

Certified Disadvantaged Business Enterprises (DBE) List

Using Governor's Diversity Business Office and State DOT and CCR DBE Directories to Find Certified WBEs and MBEs

Here are the links:

https://tn.diversitysoftware.com/FrontEnd/VendorSearchPublic.asp?TN=tn&XID=1215

www.osdbu.dot.gov/DBEProgram/StateDOTDBESites.cfm

CCR can be used to search for SBA SDBs. Since the SBA SDB certification is considered acceptable under the EPA DBE Program, firms found using the following search criteria can count toward EPA MBE/WBE fair share objectives.

Access the CCR search page at www.bpn.gov/CCRSearch/Search.aspx

http://www.epa.gov/osbp/dbe_team.htm

EMPLOYEE RIGHTS
UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

THE UNITED STATES DEPARTMENT OF LABOR WAGE AND HOUR DIVISION

PREVAILING WAGES — You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

OVERTIME — You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

ENFORCEMENT — Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

APPRENTICES — Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

PROPER PAY — If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

or contact the U.S. Department of Labor's Wage and Hour Division.

For additional information:

1-866-4-USWAGE

(1-866-487-9243) TTY: 1-877-889-5627

U.S. Wage and Hour Division

WWW.WAGEHOUR.DOL.GOV

U.S. Department of Labor | Employment Standards Administration | Wage and Hour Division

WH 1321(Revised April 2009)

DERECHOS DEL EMPLEADO
BAJO LA LEY DAVIS-BACON

PARA OBREROS Y MECÁNICOS EMPLEADOS EN PROYECTOS DE CONSTRUCCIÓN FEDERAL O CON ASISTENCIA FEDERAL

LA SECCIÓN DE HORAS Y SUELDOS DEL DEPARTAMENTO DE TRABAJO DE EEUU

SALARIOS PREVALECIENTES
No se le puede pagar menos de la tasa de pago indicada en la Decisión de Salarios Davis-Bacon fijada con este Aviso para el trabajo que Ud. desempeña.

SOBRETIEMPO
Se le ha de pagar no menos de tiempo y medio de su tasa básica de pago por todas las horas trabajadas en exceso de 40 en una semana laboral. Existen pocas excepciones.

CUMPLIMIENTO
Se pueden retener pagos por contratos para asegurarse que los obreros reciban los salarios y el pago de sobretiempo debidos, y se podría aplicar daños y perjuicios si no se cumple con las exigencias del pago de sobretiempo. Las cláusulas contractuales de Davis-Bacon permiten la terminación y exclusión de contratistas para efectuar futuros contratos federales hasta tres años. El contratista que falsifique los registros certificados de las nóminas de pago o induzca devoluciones de salarios puede ser sujeto a procesamiento civil o criminal, multas y/o encarcelamiento.

APRENDICES
Las tasas de aprendices sólo se aplican a aprendices correctamente inscritos bajo programas federales o estatales aprobados.

PAGO APROPIADO
Si Ud. no recibe el pago apropiado, o precisa de información adicional sobre los salarios aplicables, póngase en contacto con el Contratista Oficial que aparece abajo:

o póngase en contacto con la Sección de Horas y Sueldos del Departamento de Trabajo de EEUU.

Para obtener información adicional:

1-866-4-USWAGE
(1-866-487-9243) TTY: 1-877-889-5627

WWW.WAGEHOUR.DOL.GOV

U.S. Department of Labor | Employment Standards Administration | Wage and Hour Division

WH 1321 SPA (Revised April 2009)

Project Wage Rate Sheet

U.S. Department of Housing and Urban Development
Office of Labor Relations

PROJECT NAME:	**WAGE DECISION NUMBER/MODIFICATION NUMBER:**
PROJECT NUMBER:	**PROJECT COUNTY:**

WORK CLASSIFICATION	**BASIC HOURLY RATE (BHR)**	**FRINGE BENEFITS**	**TOTAL HOURLY WAGE RATE**	**LABORERS FRINGE BENEFITS:**		**$**
				GROUP #	**BHR**	**TOTAL WAGE**
Bricklayers			**$**			
Carpenters			**$**			**$**
Cement Masons			**$**			**$**
Drywall Hangers			**$**			**$**
Electricians			**$**			**$**
Iron Workers			**$**			**$**
Painters			**$**	**OPERATORS FRINGE BENEFITS:**		**$**
				GROUP #	**BHR**	**TOTAL WAGE**
Plumbers			**$**			
Roofers			**$**			**$**
Sheet Metal Workers			**$**			**$**
Soft Floor Layers			**$**			**$**
Tapers			**$**			**$**
Tile Setters			**$**	**TRUCK DRIVERS FRINGE BENEFITS:**		**$**
				GROUP #	**BHR**	**TOTAL WAGE**
OTHER CLASSIFICATIONS						
			$			**$**
			$			**$**
			$			**$**

ADDITIONAL CLASSIFICATIONS (HUD Form 4230-A)

WORK CLASSIFICATION	**BASIC HOURLY RATE**	**FRINGE BENEFITS**	**TOTAL HOURLY WAGE RATE**	**DATE OF HUD SUBMISSION TO DOL**	**DATE OF DOL APPROVAL**
			$		
			$		
			$		
			$		

STATE REVOLVING FUND LOAN PROGRAM

Bidder's Requirements

Davis-Bacon Act Wage Determination

The Loan Recipient must ensure the bidder is in compliance with the Davis-Bacon Act as outlined below. Additionally, ten (10) days prior to the scheduled bid opening date, the wage rates need to be checked to ensure they have not changed.

The Davis-Bacon Act as amended, requires that each contract over $2,000 to which the United States or the District of Columbia is a party for the construction, alteration, or repair of public buildings or public works shall contain a clause setting forth the minimum wages to be paid to various classes of laborers and mechanics employed under the contract. Under the provisions of the Act, contractors or their subcontractors are to pay workers employed directly upon the site of the work no less than the locally prevailing wages and fringe benefits paid on projects of a similar character. The Davis-Bacon Act directs the Secretary of Labor to determine such local prevailing wage rates.

The **wage determination** (including any additional **classifications** and **wage rates** conformed) **and** a Davis-Bacon poster (WH-1321) **must be posted on the work site at all times** by the contractor and its subcontractors in a prominent and accessible place where it can be easily seen. The WH-1321 poster **may be obtained at no charge** from offices of the Wage and Hour Division.

With each **pay estimate** submitted, the contractors **must submit** a certification stating that workers have been paid the current prevailing wage rates for each classification according to the Davis-Bacon wage rate schedule currently in effect for this project.

Wage Determinations

A "wage determination" is the listing of wage rates and fringe benefit rates for each classification of laborers and mechanics which the Administrator of the Wage and Hour Division of the U.S. Department of Labor has determined to be prevailing in a given area for a particular type of construction (e.g., building, heavy, highway, or residential).

Extensions of Wage Determinations

When a general wage determination has not been awarded within 90 days after bid opening, the head of the contracting/assisting agency may request an extension of the 90 day period from the Wage and Hour Administrator. When, due to unavoidable circumstances, a project wage determination expires before award but after bid opening, the head of the contracting/assisting agency may request an extension of the expiration date of the project wage determination in the bid specifications instead of issuing a new wage determination.

Extension requests should be supported by a written finding including a brief statement of the factual support, that extension of the expiration date of the determination is necessary and proper in the public interest to prevent injustice or undue hardship or to avoid serious impairment in the conduct of Government business.

The Administrator of the Wage and Hour Division of the U.S. Department of Labor will either grant or deny the request for an extension after consideration of all the circumstances, including an examination to determine if the previously issued rates remain prevailing. If a request for the extension of a project wage determination is denied, a new wage determination will be issued to replace an expired project wage determination.

Additional information concerning the Davis-Bacon Act and current wage rate determinations can be obtained at the following sites: www.gpo.gov/davisbacon/referencemat.html and www.wdol.gov/ .

Wage Rate Requirements Under FY 2010 Appropriations

3. Contract and Subcontract provisions.

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

(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 http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

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

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

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or

indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

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

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

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

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

(4) Apprentices and trainees--

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

apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency

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

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

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

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

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by 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 hat 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.

STATE REVOLVING FUND LOAN PROGRAM

Loan Recipient's Requirements

Davis-Bacon Act Wage Determination

The Loan Recipient must ensure the bidder is in compliance with the Davis-Bacon Act as outlined below. Additionally, ten (10) days prior to the scheduled bid opening date, the wage rates need to be checked to ensure they have not changed.

The Davis-Bacon Act as amended, requires that each contract over $2,000 to which the United States or the District of Columbia is a party for the construction, alteration, or repair of public buildings or public works shall contain a clause setting forth the minimum wages to be paid to various classes of laborers and mechanics employed under the contract. Under the provisions of the Act, contractors or their subcontractors are to pay workers employed directly upon the site of the work no less than the locally prevailing wages and fringe benefits paid on projects of a similar character. The Davis-Bacon Act directs the Secretary of Labor to determine such local prevailing wage rates.

The specifications must incorporate a clause stating that the current Davis-Bacon wage rate is required **(**with the Davis-Bacon links and information).

The Bid Advertisement **must include** a clause that the **Davis-Bacon wage rates** are a requirement. (Refer to the ADVERTISEMENT FOR BIDS EXAMPLE – DBE, ARRA)

If modifications to the existing **wage rates** occur **ten (10) days** prior to the Bid Opening Date, the Loan Recipient **must** incorporate the proper **wage rates** into the plans and specifications by Addendum. All Bidders **must** be informed that this addendum **must** be incorporated into the plans and specifications that they have received.

However, if these modifications occur **less than ten (10) days** prior to the Bid Opening Date, these modifications **shall be effective unless** the agency **finds** that there is not a reasonable time still available before the Bid Opening to notify bidders of the modifications. (A report of this **finding** shall be inserted in the contract file.)

The **wage determination** (including any additional **classifications** and **wage rates** conformed) **and** a Davis-Bacon poster (WH-1321) **must be posted on the work site at all times** by the contractor and its subcontractors in a prominent and accessible place where it can be easily seen. The WH-1321 poster **may be obtained at no charge** from offices of the Wage and Hour Division.

With each **pay estimate** submitted, the contractors **must** certify that workers have been paid the current prevailing wage rates for each classification according to the Davis-Bacon wage rate schedule currently in effect for this project.

The loan recipients **must keep a file** in which all documentation **must be filed** for the current classifications and wage rates (under the Davis-Bacon Act) for the construction of their projects. This file must be kept for three (3) years after the project is completed and **will** be subject to audit by the State of Tennessee and the Environmental Protection Agency (EPA).

Wage Determinations

A "wage determination" is the listing of wage rates and fringe benefit rates for each classification of laborers and mechanics which the Administrator of the Wage and Hour Division of the U.S. Department of Labor has determined to be prevailing in a given area for a particular type of construction (e.g., building, heavy, highway, or residential).

Extensions of Wage Determinations

When a general wage determination has not been awarded within 90 days after bid opening, the head of the contracting/assisting agency may request an extension of the 90 day period from the Wage and Hour Administrator. When, due to unavoidable circumstances, a project wage determination expires before award but after bid opening, the head of the contracting/assisting agency may request an extension of the expiration date of the project wage determination in the bid specifications instead of issuing a new wage determination.

Extension requests should be supported by a written finding including a brief statement of the factual support, that extension of the expiration date of the determination is necessary and proper in the public interest to prevent injustice or undue hardship or to avoid serious impairment in the conduct of Government business.

The Administrator of the Wage and Hour Division of the U.S. Department of Labor will either grant or deny the request for an extension after consideration of all the circumstances, including an examination to determine if the previously issued rates remain prevailing. If a request for the extension of a project wage determination is denied, a new wage determination will be issued to replace an expired project wage determination.

Additional information concerning the Davis-Bacon Act and current wage rate determinations can be obtained at the following sites: www.gpo.gov/davisbacon/referencemat.html and www.wdol.gov/ .

Wage Rate Requirements Under FY 2010 Appropriations

3. Contract and Subcontract provisions.

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

(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 http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

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

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

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

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

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

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

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

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or

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

apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by 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 hat 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.

STATE REVOLVING FUND LOAN PROGRAM

Loan Recipient's and Contractor's Guidance

FY2010 and After

Tracking and Reporting

For tracking and reporting purposes, the **Loan Recipient** is responsible for the following:

- Ensuring that the Contractor is in compliance with the Davis Bacon provisions of ARRA
- The loan recipients **must keep a file** in which all documentation **must be stored** for the current classifications and wage rates (under the Davis-Bacon Act) for the construction of their projects. This file must be kept for three (3) years after the project is completed and **will** be subject to audit by the State of Tennessee and the Environmental Protection Agency (EPA).
- Any additional tracking and reporting requirements from EPA

For tracking and reporting purposes, the **Contractor** is responsible for the following:

- Achieving and maintaining compliance with the Davis Bacon provisions of ARRA
- Submitting with each **pay estimate** a certification stating that workers have been paid the current prevailing wage rates for each classification according to the Davis-Bacon wage rate schedule currently in effect for this project
- Any additional tracking and reporting requirements from EPA

Please contact Dr. Bagher Sami, Administrative Section Manager for the SRF Loan Program, at 615-532-0501 or bagher.sami@tn.gov to obtain details.

NOTICE

THIS ENTITY IS A RECIPIENT OF STATE AND FEDERAL FUNDS. IF YOU HAVE KNOWLEDGE OF ANY ACTIVITY WHICH YOU CONSIDER TO BE ILLEGAL, IMPROPER, OR WASTEFUL, PLEASE CALL THE STATE COMPTROLLER'S TOLL-FREE HOTLINE:

1-800-232-5454

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-891-8332 (TDEC)

Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharges from Construction Activities (TNR100000)

Site or Project Name:		**Existing NPDES Tracking Number: TNR**
Street Address or Location:		Start date:
		Estimated end date:
Site Activity Description:		Latitude (dd.dddd):
		Longitude (dd.dddd):
County(ies):	MS4 Jurisdiction:	Acres Disturbed:
		Total Acres:

Does a topographic map show dotted or solid blue lines ☐ and/or wetlands ☐ on or adjacent to the construction site?
If wetlands are located on-site and may be impacted, attach wetlands delineation report.
If an Aquatic Resource Alteration Permit has been obtained for this site, what is the permit number? ARAP permit No.:

Receiving waters:

Attach the SWPPP with the NOI ☐ SWPPP Attached	Attach a site location map ☐ Map Attached

Site Owner/Developer Entity (*Primary Permittee*)**:** (person, company, or legal entity that has operational or design control over construction plans and specifications):

Site Owner/Developer Signatory (V.P. level/higher - signs certification below): (individual responsible for site):		Signatory's Title or Position (V.P. level/higher - signs certification below):		
Mailing Address:		City:	State:	Zip:
Phone: ( )	Fax: ( )	E-mail:		

Optional Contact:		Title or Position:		
Mailing Address:		City:	State:	Zip:
Phone: ( )	Fax: ( )	E-mail:		

Owner or Developer Certification (must be signed by president, vice-president or equivalent, or ranking elected official) (Primary Permittee)

I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information 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. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Owner or Developer Name; (print or type)	Signature:	Date:

Contractor(s) Certification (must be signed by president, vice-president or equivalent, or ranking elected official) (Secondary Permittee)

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above and/or my inquiry of the person directly responsible for assembling this NOI and SWPPP, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated.

Contractor company name (print or type):

Contractor signatory (print/type): (V.P. level or higher)		Signature:		Date:
Mailing Address:		City:	State:	Zip:
Phone: ( )	Fax: ( )	E-mail:		

Other Contractor company name (print or type):				
Other Contractor signatory (print/type): (V.P. level or higher)		Signature:		Date:
Mailing Address:		City:	State:	Zip:
Phone: ( )	Fax: ( )	E-mail:		

OFFICIAL STATE USE ONLY

Received Date:	Reviewer:	Field Office:	Permit Number **TNR**	Exceptional TN Water:
Fee(s):	T & E Aquatic Flora and Fauna:		Impaired Receiving Stream:	Notice of Coverage Date:

Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharges from Construction Activities (TNR100000)

Purpose of this form A completed notice of intent (NOI) must be submitted to obtain coverage under the Tennessee General NPDES Permit for Discharges of Stormwater Associated with Construction Activity (permit). **Requesting coverage under this permit means that an applicant has obtained and examined a copy of this permit, and thereby acknowledges applicant's claim of ability to be in compliance with permit terms and conditions.** This permit is required for stormwater discharge(s) from construction activities including clearing, grading, filling and excavating (including borrow pits) of one or more acres of land. This form should be submitted at least 30 days prior to the commencement of land disturbing activities, or no later than 48 hours prior to when a new operator assumes operational control over site specifications or commences work at the site.

Permit fee (see table below) must accompany the NOI and is based on total acreage to be disturbed by an entire project, including any associated construction support activities (e.g. equipment staging yards, material storage areas, excavated material disposal areas, borrow or waste sites). There is no fee for sites less than 1 acre.

Acres Disturbed	= or > 150 acres	= or > 50 < 150 acres	= or > 5 < 50 acres	= or > 1 < 5 acres
Fee	$7,500	$4,000	$1,000	$250

Who must submit the NOI form? Per Section 2 of the permit, all site operators must submit an NOI form. "Operator" for the purpose of this permit and in the context of stormwater associated with construction activity means any person associated with a construction project who meets either or both of the following two criteria: (1) The person has operational or design control over construction plans and specifications, including the ability to make modifications to those plans and specifications. This person is typically the owner or developer of the project or a portion of the project (e.g. subsequent builder), or the person that is the current land owner of the construction site. This person is considered the primary permittee; or (2) The person has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions. This person is typically a contractor or a commercial builder who is hired by the primary permittee, and is considered a secondary permittee.

Owners, developers and all contractors that meet the definition of the operator in subsection 2.2 of the permit shall apply for permit coverage on the same NOI, insofar as possible. After permit coverage has been granted to the primary permittee, any subsequent NOI submittals must include the site's previously assigned permit tracking number and the project name. The comprehensive site-specific SWPPP shall be prepared in accordance with the requirements of part 3 of the permit and must be submitted with the NOI unless the NOI being submitted is to only add a contractor (secondary permittee) to an existing coverage.

Notice of Coverage The division will review the NOI for completeness and accuracy and prepare a notice of coverage (NOC). Stormwater discharge from the construction site is authorized as of the effective date of the NOC.

Complete the form Type or print clearly, using ink and not markers or pencil. Answer each item or enter "NA," for not applicable, if a particular item does not fit the circumstances or characteristics of your construction site or activity. If you need additional space, attach a separate piece of paper to the NOI form. **The NOI will be considered incomplete without a permit fee, a map, and the SWPPP.**

Describe and locate the project Use the legal or official name of the construction site. If a construction site lacks street name or route number, give the most accurate geographic information available to describe the location (reference to adjacent highways, roads and structures; e.g. intersection of state highways 70 and 100). Latitude and longitude (expressed in decimal degrees) of the center of the site can be located on USGS quadrangle maps. The quadrangle maps can be obtained at the USGS World Wide Web site: http://www.usgs.gov/; latitude and longitude information can be found at numerous other web sites. Attach a copy of a portion of a 7.5 minute quad map, showing location of site, with boundaries at least one mile outside the site boundaries. Provide estimated starting date of clearing activities and completion date of the project, and an estimate of the number of acres of the site on which soil will be disturbed, including borrow areas, fill areas, stockpiles and the total acres. For linear projects, give location at each end of the construction area.

MS4 Jurisdiction: If this construction site is located within a Municipal Separate Storm Sewer System (MS4), please list name of MS4. A current list of MS4s in Tennessee may be found at http://www.tn.gov/environment/wpc/stormh2o/docs/MS4s_Jan2012.pdf

Give name of the receiving waters Trace the route of stormwater runoff from the construction site and determine the name of the river(s), stream(s), creek(s), wetland(s), lake(s) or any other water course(s) into which the stormwater runoff drains. Note that the receiving water course may or may not be located on the construction site. If the first water body receiving construction site runoff is unnamed ("unnamed tributary"), determine the name of the water body that the unnamed tributary enters.

ARAP permit may be required **If your work will disturb or cause alterations of a stream or wetland, you must obtain an appropriate Aquatic Resource Alteration Permit (ARAP).** If you have a question about the ARAP program or permits, contact your local Environmental Field Office (EFO).

Submitting the form and obtaining more information Note that this form must be signed by the company President, Vice-President, or a ranking elected official in the case of a municipality, for details see subpart 2.5. For more information, contact your local EFO at the toll-free number 1-888-891-8332 (TDEC). Submit the completed NOI form (keep a copy for your records) to the appropriate EFO for the county(ies) where the construction activity is located, addressed to **Attention: Stormwater NOI Processing**.

EFO	**Street Address**	**Zip Code**	**EFO**	**Street Address**	**Zip Code**
Memphis	8383 Wolf Lake Drive, Bartlett	38133-4119	Cookeville	1221 South Willow Ave.	38506
Jackson	1625 Hollywood Drive	38305-4316	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	711 R S Gass Boulevard	37243	Knoxville	3711 Middlebrook Pike	37921
Columbia	1421 Hampshire Pike	38401	Johnson City	2305 Silverdale Road	37601

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (TDEC)
Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-891-TDEC (8332)

Notice of Termination (NOT) for General NPDES Permit for Stormwater Discharges from Construction Activities (CGP)

This form is required to be submitted when requesting termination of coverage from the CGP. The purpose of this form is to notify the TDEC that either all stormwater discharges associated with construction activity from the portion of the identified facility where you, as an operator, have ceased or have been eliminated; or you are no longer an operator at the construction site. Submission of this form shall in no way relieve the permittee of permit obligations required prior to submission of this form. Please submit this form to the local WPC Environmental Field Office (EFO) address (see table below). For more information, contact your local EFO at the toll-free number 1-888-891-8332 (TDEC).

Type or print clearly, using ink.

Site or Project Name:	**NPDES Tracking Number: TNR**
Street Address or Location:	County(ies):

Name of Permittee Requesting Termination of Coverage:			
Permittee Contact Name:	Title or Position:		
Mailing Address:	City:	State:	Zip:
Phone: ( )	E-mail:		

Check the reason(s) for termination of permit coverage:

☐	Stormwater discharge associated with construction activity is no longer occurring and the permitted area has a uniform 70% permanent vegetative cover OR has equivalent measures such as rip rap or geotextiles, in areas not covered with impervious surfaces.
☐	You are no longer the operator at the construction site (i.e., termination of site-wide, primary or secondary permittee coverage).

Certification and Signature: (must be signed by president, vice-president or equivalent ranking elected official)

I certify under penalty of law that either: (a) all stormwater discharges associated with construction activity from the portion of the identified facility where I was an operator have ceased or have been eliminated or (b) I am no longer an operator at the construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge stormwater associated with construction activity under this general permit, and that discharging pollutants in stormwater associated with construction activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

For the purposes of this certification, elimination of stormwater discharges associated with construction activity means that all stormwater discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have been eliminated from the portion of the construction site where the operator had control. Specifically, this means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized, the temporary erosion and sediment control measures have been removed, and/or subsequent operators have obtained permit coverage for the site or portions of the site where the operator had control.

I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information 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. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Permittee name (print or type):	Signature:	Date:

EFO	**Street Address**	**Zip Code**	**EFO**	**Street Address**	**Zip Code**
Memphis	8383 Wolf Lake Drive, Bartlett, TN	38133	Cookeville	1221 South Willow Ave.	38506
Jackson	1625 Hollywood Drive	38305	Chattanooga	540 McCallie Avenue STE 550	37402
Nashville	711 R S Gass Boulevard	37243	Knoxville	3711 Middlebrook Pike	37921
Columbia	1421 Hampshire Pike	38401	Johnson City	2305 Silverdale Road	37601

DRINKING WATER STATE REVOLVING FUND

IDENTIFICATION SIGN

All plans and specifications for each project approved shall contain provisions for requiring the general contractor to provide identification signs. The signs shall conform to the following basic features:

1. The following diagram shall be used as a design:

SAFE DRINKING WATER FOR TENNESSEE

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

GOVERNOR
BILL HASLAM

COMMISSIONER
BOB MARTINEAU

CITY OF

MAYOR

STATE REVOLVING FUND PROJECT

DWSRF LOAN . . . $ _____

2. The sign shall be a 4'0" X 8'0" sheet of exterior grade plywood and shall be built so as to remain erected during the entire construction phase of the project.

3. The background of both sides shall be white. The lettering shall be black and shall be large enough to take advantage of the full size of the plywood. The stars shall be white set on a blue field and surrounded by a white ring placed inside a state map in red with a stripe of white and blue on the right side. The sign shall be bordered by a one-inch blue stripe.

Revised: January 20, 2011

STATE REVOLVING FUND LOAN PROGRAM

BID PACKAGE SUBMITTAL REQUIREMENTS

PRIOR TO FINAL CONTRACT AWARD by the State Revolving Fund (SRF) Loan Program, the Loan Recipient must prepare and submit a completed Bid Package to the SRF Loan Program for review and **written approval**. An **Authority-to-Award (ATA)** letter from the SRF Loan Program must be obtained prior to the final contract award and the initiation of construction activities.

A completed Bid Package submittal consists of the following:

1. A copy of the **Advertisement for Bids** appearing in a local or major regional newspaper or the Dodge Report (40 CFR 31.36 (d)(2)(ii)(A)). *The project must be advertised for a minimum of 14 days prior to the bid opening.*
2. An original copy of either the **Award Resolution or the minutes** from the meeting of the governing body (or a certified copy of either) that tentatively awards the contract(s) to the lowest, responsible, responsive bidder(s)
3. A **certified bid tabulation** stamped and signed by the consulting engineer reviewing the bids
4. A copy of the **signed Bid Proposal** of the apparent successful bidder
5. **Equal Employment Opportunity (EEO) documentation** signed by the apparent successful bidder
6. **Bid Bond with Power of Attorney** (40 CFR 31.36(h))
7. Signed and dated U.S. EPA (or other agency) **Contractor Debarment Form**, such as the U.S. Environmental Protection Agency Certification Regarding Debarment, Suspension and Other Responsibility Matters
8. An original, notarized certification of publication (**Publisher's Affidavit**) signed by the editor of the newspaper
9. Copies of a minimum of 10 **certified letters** and "**Return Receipt Requested"** forms sent to potential **Disadvantaged Business Enterprises (DBE)** subcontractors, supplies vendors, service providers, and/or equipment vendors
10. A copy of the current **Davis-Bacon** wage rates used on this project (Davis-Bacon Act)
11. A completed **Loan Recipient's Certification and Summary** of **DBE** Participation on SRF Projects **(**40 CFR 31.36 (e)(2)(i through vi))
12. If **DBE** participation was obtained,
    - **Prime Contractor's Notice Letter** for EPA Form 6100-2
    - **EPA Form 6100-3** completed by Prime Contractor and **DBE Subcontractor(s)**
    - **EPA Form 6100-4** completed by the Prime Contractor
13. If no **DBE** participation was obtained, a "**Good Faith Effort**" letter (See Good Faith Effort Steps at 40 CFR 31.36 (e)(2)(i through vi))
14. Reference documents:
    - **Loan Recipient's Requirements** for Solicitation and Documentation of **DBE** Participation on SRF Projects
    - **Bidder's Requirements** for Solicitation and Documentation of **DBE** Participation on SRF Projects
    - **Loan Recipient's Certification and Summary** of **DBE** Participation on SRF Loan-Funded Projects
    - **Guidance Document** for **DBE** Requirements for SRF loans
15. If applicable, documentation of the justification for not awarding the contract to the lowest bidder if the award is to be made to a bidder other than the low bidder. The justification must indicate why the low bidder is not responsive or responsible and include documentation of any negotiations leading to the determination.
16. Resume of the resident inspector(s)
17. Documentation of the extension of the bid proposal and bid bond expiration dates, if necessary

If the lowest bid received exceeds the amount budgeted for construction in the SRF-approved SRF Loan Budget, the loan recipient must choose only from the following options:

- **Re-allocate** SRF funds through a budget revision. A revised Budget/Re-budget Form must be submitted to the SRF for review and approval if the re-budgeting option is chosen.
- **Provide** additional funds needed to pay the contract from **local funds** or funding source(s) other than the SRF loan
- **Apply** for an **SRF loan increase**. Application for a loan increase will require re-evaluation of the loan recipient's user rates to determine if the anticipated revenues will be sufficient to repay the requested loan increase and fund the additional depreciation. **Principal forgiveness does not apply to loan increases.**
- **Reject** all bids and **re-bid the project**

Please contact Dr. Bagher Sami by telephone at (615) 532-0501 or by e-mail at bagher.sami@tn.gov if you have any questions concerning the contents of the Bid Package submittal for State Revolving Fund projects.

City Letter Head

Dr. Bagher Sami,
Administrative and Financial Section Manager
State Revolving Fund Loan Program
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 12th Floor
Nashville, Tennessee 37243-1102

RE: Property, Easements, Rights-of-Way Certification
City/County/UD/Authority (xxxx County or xxx and xxxx Counties), Tennessee
Loan No. SRF CWA CGA DWF DWA DGA 200x-xxx
Loan Description: xxxxxxxxx
Contract No. / Name 1 of 2—Contract Description
Contract No. / Name 2 of 2—Contract Description

Dear Dr. Sami:

This letter is to certify that all property, easements, and rights-of-way necessary to construct the projects included in the above-referenced contract are owned (or in the case of right-of-way permitted for the use) by the City/County/UD/Authority. And/or The plant improvements are to be constructed on the same site as our existing facility. Based upon this, no "Site Certificate" is required.

Sincerely,

Authorized Representative, Title

SITE CERTIFICATION

I certify that the applicant, the City of ???, ??? County, the ??? Utility District, the ??? Water/Wastewater/Energy Authority has acquired or has entered into condemnation proceedings for all real property including easements and rights-of-way that are or will be required for the construction (erection, extension, modification, addition), operation, and maintenance of the entire wastewater treatment works funded under loan number SRF/CWA/CGA/DWF/DWA/DGA 200?-???.

I certify that any deeds or documents required to be recorded in order to protect the title of the owner and the interest of the City of ???, ??? County, the ??? Utility District, the ??? Water/Wastewater/Energy Authority have been duly recorded and filed for record wherever necessary.

I further certify that real property including easements required for the entire wastewater treatment works project was acquired in accordance with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and EPA's regulation 40 CFR Part 4.

Dated this _____day of _____, 20___.

_____
Applicants' Authorized Representative

_____
Title (Mayor, City Manager, Commissioner, etc.)

_____
Attorney (Typed and Signed)