



**TECHNICAL SPECIFICATIONS
for**

CITY OF WEST PALM BEACH, FLORIDA

Invitation to Bid - 10/11-19

Project No. 10993403

Automatic Water Level Control System for Aeration Basin No. 5

TECHNICAL SPECIFICATIONS AND DRAWINGS

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 LOCATION OF WORK

All of the work is located at the East Central Regional Water Reclamation Facility (ECRWRF) in the City of West Palm Beach, Palm Beach County, Florida, as shown on the Project Drawings.

1.02 SCOPE OF WORK

A. Contractor's Duties - Provide and pay for:

1. Labor, materials and equipment
2. Tools, construction equipment and fuel
3. Freight and sales tax

B. Project Description:

The Contractor shall furnish all labor, materials, equipment, tools, services and incidentals to complete all work required by the drawings and specifications. This Work summary is as follows:

1. Furnish and install motorized gate actuators for three existing slide gates at the Influent Structure for Aeration Basin No. 5 to provide an automatic water level control system to maintain a constant water level in Aeration Basin No. 5 based on a new ultrasonic water level transducer to be installed in Aeration Basin No. 5. The Work shall include demolition of the existing manual gate actuators, furnishing and installation of new motorized gate actuators and ultrasonic water level transducer, and power supply and instrumentation for the new gate actuators and ultrasonic level transducer as shown on the Drawings and as specified. The Contractor is solely responsible for determining the quantities of materials required based on the available information, which consists of the descriptions below, the information presented at the pre-bid meeting, the Drawings and specifications. No adjustments to the contract price will be allowed for the Contractor's failure to properly estimate the quantity of materials and labor required to complete the work.
2. The Contractor shall furnish and install motorized gate actuators as shown on the Drawings. Specific items of work shall include:
 - a. Demolition of three existing manual gate operators.
 - b. Confirm torque required for motorized actuation of the gates. The maximum torque required shall be measured prior to submitting actuator shop drawings.

- c. Furnish and install new motorized gate actuators as shown and specified on the Drawings. The actuators shall be Auma Model SAR 14.1 motorized gate actuators for modulating service with remote operating modules, or approved equal.
 - d. Furnish and install new power supply and control wiring for the gate actuators.
 - e. Furnish and install new ultrasonic level transducer. The ultrasonic level transducer shall be Siemens SITRANS Probe LU, or approved equal.
 - f. Testing of the completed work to ensure proper actuator performance.
3. The Contractor shall furnish and install ultrasonic water level transducer as shown on the Drawings. Specific items of work shall include:
- a. Furnish and install a new ultrasonic water level transducer in the location and as shown on the Drawings
 - b. Furnish and install new power supply and control wiring for the level indicator.
- C. The Work shall be complete, in place, ready for continuous service, and shall include any repairs, replacement and/or restoration required as a result of damages caused during this construction. Additionally, the Contractor shall perform applicable tests as stipulated elsewhere in these specifications.
- D. The Contractor shall furnish all materials, equipment and labor which is reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Contract Documents or not.

1.03 REFERENCES

- A. Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specifications or tentative specifications adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard. The following list of specifications is hereby made a part of the Contract, the same as if herein repeated in full. In the event of any conflict between any of these specifications, standards, codes or tentative specifications and the specifications, the latter shall govern. In the event that one of the following conflicts with another, the decision as to which shall govern will be decided by the Engineer-of-Record, whose judgment will be final.
- B. When no reference is made to a code, standard, or specification, the standard specifications of ASTM (American Society of Testing Materials), the ANSI (American National Standard Institute), the ASME (American Society of Mechanical Engineers), the IEEE (Institute of Electrical and Electronics Engineers, Inc.), or the NEMA (National Electrical Manufacturers Association) shall govern.
- C. The Work shall be complete, in place, ready for continuous service, and shall include any repairs, replacement and/or restoration required as a result of damages caused during this construction. Additionally, the Contractor shall perform applicable tests

as stipulated elsewhere in these specifications.

- D. The Contractor shall furnish all materials, equipment, and labor which is reasonably and properly inferable and necessary for the proper completion of the work, whether specifically indicated in the Contract Documents or not.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 BASIS FOR PAYMENTS

- A. The various major items of work will be paid for in lump sum or unit cost amounts listed in the Schedule of Bid Items. All bid items shall include all labor, equipment, material and testing as specified to construct the item, completed, tested and accepted. The lump sum amounts shall be further distributed in accordance with sub-values identified for the work listed in the Schedule of Bid Items (B1) and is not intended to be complete and all inclusive of the required work items. The work shall include all miscellaneous and ancillary items necessary to construct a complete and functional Project.

1.02 SCHEDULE OF VALUES

- A. The descriptions below generally outline the scope of work required for those elements of the work to be paid for under each lump sum or unit cost item listed in the Schedule of Bid Items.

1.03 BREAKDOWN OF BASE BID

- A. Where the Schedule of Bid Items show quantities, these quantities are primarily shown for bid evaluation purposes, and are believed to be reasonably accurate.
- B. In the event that the actual quantity of material installed exceeds the quantity shown, the CONTRACTOR will be paid the unit price shown for the quantity of the value shown in the bid breakdown.
- C. A credit will be similarly provided to the City by the CONTRACTOR for quantities less the those shown on the bid breakdown.

1.04 PAYMENTS

- A. Shall be in accordance with the provisions of the GENERAL CONDITIONS

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 BID ITEM DESCRIPTIONS

A. BID ITEM NO. 1 – GENERAL CONDITIONS, BONDS, AND INDEMNIFICATION

This bid item shall include the costs to comply with all elements of the General Conditions of the Contract, including but not limited to: compliance with the requirements of the General Conditions, bonds, insurance, record keeping, safety and permitting, and indemnification. Payment shall be made at the Contract Lump Sum Price as identified on the BID FORM upon completion of work identified in the general conditions. Total cost of this item shall not exceed 5% of the total bid cost.

B. BID ITEM NO. 2 – MOBILIZATION/DEMOBILIZATION

This bid item shall include the costs for mobilization/demobilization. Payment shall be made at the Contract Lump Sum Price as identified on the BID FORM upon completion of work associated with mobilization/demobilization. This pay item includes work and operations in mobilizing and demobilizing for the work on the well sites, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to and from the project site, and for the establishment and removal of temporary offices, buildings, facilities, as required by these specifications, the special provisions, and State and local laws and regulations. Total cost of this item shall not exceed 2% of the total bid cost.

C. BID ITEM NO. 3 – DEMOLITION OF EXISTING MANUAL GATE ACTUATORS AND FURNISH AND INSTALL MOTORIZED GATE ACTUATORS

This bid item includes all equipment, materials, and labor necessary to furnish and install the motorized gate actuators as shown on the attached drawings and specifications. The motorized gate actuators shall be Auma Model SAR 14.1 for modulating service with remote operating modules, or approved equal. This item shall include the demolition of the existing manual actuator and accessories, modifications to the gate actuator mounting plate as necessary, and installation of a new actuator, supports, remote operating module, appurtenances, start-up, testing, OWNER training, and any all other necessary items to provide a complete and operating system.

D. BID ITEM NO. 4 - ELECTRICAL AND INSTRUMENTATION WORK

The work specified under this pay item all include all equipment, materials, and labor necessary to furnish and install electrical and instrumentation service to the gate actuators and ultrasonic level transducer as shown on the attached drawings. The ultrasonic level transducer shall be Siemens SITRANS Probe LU or approved equal. This item shall include all control panels, wire, conduit, grounding, lightning

protection, SCADA, ultrasonic level transducer, mounting equipment, and appurtenances as described in the plans.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. The types of submittals controlled by these general requirements include shop drawings, procedure manuals, samples and miscellaneous work-related submittals.

1.02 GENERAL SUBMITTAL REQUIREMENTS

- A. Coordination and Sequencing:

The Contractor shall coordinate preparation and processing of submittals with performance of the work so that the work will not be delayed by submittals. The Contractor shall coordinate and sequence different categories of submittals for the same work, and for interfacing units of work, so that one will not be delayed for coordination with another. No extension of time will be allowed because of failure to properly coordinate and sequence submittals.

- B. Preparation of Submittal:

Provide permanent marking on each submittal to identify project, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Each submittal shall clearly state where the item is to be installed. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through Contractor's office will be returned without action. All results of testing by independent labs or agencies shall be submitted to the Engineer. This shall include both passing and failing tests.

1.03 SHOP DRAWINGS AND SAMPLES

- A. As soon as practicable and within thirty (30) days after the date of execution of the Contract, the Contractor, in conformance with the conditions of the contract, shall submit to the Engineer for approval, three (3) copies (in addition to those copies necessary for his own requirements) of the shop drawings.
- B. Shop drawings submitted to the Engineer for his review, shall first be checked and approved by the Contractor, as indicated by a "Checked" stamp marked "Approved" on each copy of the shop drawing. Shop drawings received without the Contractor's "Checked and Approved" stamp will be returned without further action.
- C. Shop drawings shall be submitted, but not be limited to, the following:
 - 1. Motorized Gate Actuators
 - 2. Ultrasonic Level Transducer
 - 3. Remote Operating Modules

4. Remote Operating Modules Mounting Detail
5. Wire and Conduit
6. Electrical Panel

D. Product Data

1. 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. Maintain one set of product data for each submittal at the project site, available for reference by the Engineer. For purposes of this submittal, manufacturer's fabrication drawings shall be synonymous with shop drawings.
2. The Contractor shall not submit product data or allow its use on the project, until compliance with requirements of the Contract Documents has been confirmed. Submittal is for information and record only, unless otherwise indicated.

1.05 DOCUMENTS

- A. Maintain at the job site one copy of all drawings, specifications; addenda; approved shop drawings; change orders; field orders; other contract modifications; and other approved documents submitted by the Contractor in compliance with various sections of the specifications. Each of these Project Record Documents shall be clearly marked "Project Record Copy" and maintained in good condition; available at all times for review by the Engineer and not used for construction purposes.

1.06 BOND AND COMPLETED OPERATION INSURANCE

- A. Prior to final payment, the Contractor shall submit proof that bonds and completed operations insurance are in effect as required by the GENERAL CONDITIONS.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SECTION 01600

EQUIPMENT AND MATERIALS

PART 1- GENERAL

1.01 RELATED WORK

- A. SUBSTITUTIONS AND PRODUCT OPTIONS: Article 6.05 General Conditions.
- B. The contractor shall comply with the contract documents and the City's approved Product List (APL).
- C. SUBMITTALS: Section 01300.

1.02 DEFINITIONS

- A. Definitions used in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including such terms as "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms. Such terms are self-explanatory and have recognized meanings in the construction industry.
- B. PRODUCTS: Items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the Project or taken from the previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and other terms of similar intent.
- C. EQUIPMENT: A product with operational or non-operational parts, regardless of whether motorized, manually operated, or fixed. Equipment may require service connections such as wiring or piping.
- D. MATERIALS: Products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form parts of Work.

1.03 QUALITY ASSURANCE

- A. EQUIPMENT AND MATERIAL INCORPORATED INTO THE WORK: Provide products that comply with the requirements of the Contract Documents, undamaged, and unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for the intended use and effect.
- B. STANDARD PRODUCTS: Where they are available and comply with Specifications, provide standard products of types that have been produced and used successfully in similar situations on other projects.

- C. **CONTINUED AVAILABILITY:** Where, because of the nature of its application, the City is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard products for which the manufacturer has published assurances that the products and its parts are likely to be available to the City at a later date.
1. Conform to applicable Specifications, codes, standards, and regulatory agencies.
 2. Comply with size, make, type, and quality specified, or as specifically approved in writing by the Engineer.
 3. **Manufactured and Fabricated Products:**
 - a. Design, fabricate, and assemble in accordance with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - c. Equipment and Materials shall be suitable for service conditions intended.
 - d. Equipment capacities, sizes, and dimensions indicated or specified shall be adhered to unless variations are specifically approved in writing.
 - e. Provide labels and nameplates where required by regulatory agencies or to state identification and essential operating data.
 - f. Two or more items of the same kind shall be identical, supplied by the same manufacturer.
 4. Do not use equipment and material for any purpose other than that for which it is designed or is specified.
- D. **SOURCE LIMITATIONS** To the fullest extent possible, provide products of the same kind from a single source.
- E. **IDENTIFICATION:** Each item of equipment shall have permanently affixed to it a label or tag with its equipment number designated in this contract. Marker shall be stainless steel and shall be located so as to be easily visible.

1.04 TRANSPORTATION AND SHIPMENT

- A. **SHIPMENT PREPARATION:** Contractor shall require manufacturers and suppliers to prepare Equipment and Materials for shipment in a manner to facilitate unloading and

handling, and to protect against damage or unnecessary exposure in transit and storage, for contractor supplied equipment. Provisions for protection shall include the following:

1. Crates or other suitable packaging materials.
 2. Covers and other means to prevent corrosion, moisture damage, mechanical injury, and accumulation of dirt in motors, electrical equipment, and machinery.
 3. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel.
 4. Grease packing or oil lubrication in all bearings and similar items.
- B. MARKING: Each item of Equipment and Material shall be tagged or marked as identified in the delivery schedule or on Submittals. Complete packing lists and bills of material shall be included with each shipment. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked.

1.05 DELIVERY, STORAGE AND HANDLING

A. DELIVERY:

1. Arrange deliveries of Equipment and Materials in accordance with construction schedules, in ample time to facilitate inspection prior to installation, and to avoid delay of the Work.
2. Deliver, store and handle Equipment and Materials in accordance with manufacturer's recommendations using means and methods that will prevent damage, deterioration, and loss, including theft.
3. Control delivery schedules to minimize long term storage at the site and to prevent overcrowding of construction spaces. In particular, coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss.
4. Avoid conflict with Work of City or other contractors.
5. Deliver Equipment and Materials to the site in manufacturer's sealed containers or other packaging system with identifying labels and instructions for handling, storing, unpacking, protecting, and installing.
6. Mark deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units.

7. Immediately on delivery, inspect shipment to assure:
 - a. Product complies with requirements of Contract Documents and reviewed Submittals.
 - b. Quantities are correct.
 - c. Containers and packages are intact, labels are legible.
 - d. Equipment and Materials are properly protected and undamaged.

B. STORAGE:

1. Store Equipment and Materials immediately on delivery, and protect until completion of the Work. Store in accordance with manufacturer's instructions with seals and labels intact and legible.
2. Store Equipment and Materials in a manner that will not endanger the supporting construction.
3. Store Equipment and Materials that are subject to damage by elements in weather tight enclosures.
4. Maintain temperature and humidity within ranges required by manufacturer.
5. Protect motors, electrical equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter.
6. Protect exposed-machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds.
7. Protect bearings and similar items with grease packing or oil lubrication.
8. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation.
9. Exterior Storage:
 - a. Provide substantial platforms, blocking, or skids to support fabricated products aboveground; and to prevent soiling or staining. Cover products subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation.

- b. Store loose granular materials on solid surface areas to prevent mixing with foreign matter.
 - c. Provide surface drainage to prevent flow or ponding of rainwater.
10. Equipment and Materials shall not show any pitting, rust, decay, or other deleterious effects of storage prior to final acceptance of Work.
11. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

C. HANDLING:

- 1. Provide equipment and personnel necessary, to unload and handle Equipment and Materials, by methods to prevent damage or soiling to Equipment and Materials, or packaging.
- 2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points.
- 3. Provide additional protection to surrounding surfaces as necessary to prevent damage.

D. MAINTENANCE OF STORAGE:

- 1. Inspect stored Equipment and Materials on a scheduled basis.
- 2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained.
- 3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.
- 4. For mechanical and electrical equipment in long-term storage, provide manufacturers service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service Equipment on a regularly scheduled basis.

- E. PROTECTION AFTER INSTALLATION: Provide substantial coverings as necessary to protect installed Equipment and Materials from damage from subsequent construction operations. Remove when no longer needed or as specified.

1.06 EXISTING EQUIPMENT AND MATERIALS

- A. EQUIPMENT AND MATERIALS NOT TO BE REUSED: The following Equipment and Materials to be removed shall remain City's property and are not to be reused in the Work. Remove from its location, prepare for handling and storage, and deliver to City. Equipment and Materials designated to be removed but not reused or delivered to City, shall become the property of the Contractor and shall be removed from the site.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

- A. Specified in each applicable Section of Specifications, construction plans and the City's Approved Product List (APL.)

2.02 PRODUCT SELECTION AND SUBSTITUTIONS:

- A. Specified in Instructions to Bidders and General Conditions.

PART 3 – EXECUTION

3.01 MANUFACTURERS INSTRUCTIONS

A. INSTALLATION:

1. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions if not a part of Submittals, containers, or packaging to parties involved in the installation, including a copy to the City.
2. Maintain one complete set of instructions at the job site during installation and until completion.
3. Handle, install, connect, clean, condition, and adjust products in accordance with such instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
4. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents, or approved in writing by manufacturer and the City.
5. Accurately locate and align with other Work, and anchor Equipment and Materials securely in place except as required for proper movement and performance.

6. Clean and protect exposed surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
1. Project record document submittal.
2. Operation and maintenance manual submittal.
3. Submittal of warranties.
4. Final cleaning.
5. Contractor's Certification.

B. Related Work Specified Elsewhere:

1. Prerequisites to Substantial Completion and Final Acceptance: GENERAL CONDITIONS.
2. Submittals: SECTION 01300.

1.02 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following:

1. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
2. Obtain and submit releases enabling the City unrestricted use of the Work and access to services and utilities. Include operating certificates, and similar releases.
3. Submit record drawings, maintenance manuals, and similar record information.
4. Deliver tools, spare parts, extra stock, and similar items.

5. Make changeover of permanent locks and transmit keys to the City.
 6. Complete start-up testing of systems and instruction of the City's operation and maintenance personnel.
 7. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
 8. Complete final cleanup requirements, including touch up painting.
 9. Touch up and otherwise repair and restore marred, exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, the City will either proceed with inspection or advise the Contractor of unfilled requirements. The City will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of work that must be completed or corrected before the certificate will be issued.
1. The City will reschedule the inspection when in its opinion, the Work is substantially complete.

1.03 FINAL ACCEPTANCE

- A. Preliminary Procedures: Submit certification by Contractor that Work has been completed in accordance with the Contract Documents to the knowledge of the Contractor. Before requesting final inspection, complete the following.
1. Submit the final payment request with releases and supporting documentation. Include insurance certificates for products and completed operations where required.
 2. Submit a certified copy of the City's final inspection list of items to be completed or corrected. The certified copy of the list shall state that each item has been completed.
 3. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion.
 4. Submit consent of surety to final payment.
 5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 6. Release of Liens (from the Prime, and all Subcontractors, Vendors and Suppliers).
 7. Submit Maintenance Bond.

- B. Re-inspection Procedure: The City will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed.
 - 1. Upon completion of re-inspection, the City will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 - 2. If necessary, re-inspection will be repeated.

1.04 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the City's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Call attention to each entry by drawing a "cloud" around the areas affected.
- C. The City will make electronic copies of whatever electronic versions of the bid plans exist, available to the CONTRACTOR for Record Drawing purposes. CONTRACTOR must obtain the concurrence of the Engineer as to form and content of record information provided in electronic format prior to proceeding, but in general, information similar to that shown below needs to be similarly provided.
 - 1. Record information weekly concurrently with construction progress.
 - 2. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "PROJECT RECORD" in neat, large, printed letters.
 - 3. Mark new information that is important to the City but was not shown on Contract Drawings or Shop Drawings.
 - 4. Note related change-order numbers where applicable.
 - 5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 - 6. Include the following, as applicable:

- a. Depths of various elements of foundation in relation to finished grade datum.
- b. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements (vertical and horizontal location of buried or encased piping, raceways, cables, etc.).
- c. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of construction.
- d. Where Submittals (like shop drawings) are used for mark-up, record a cross-reference at corresponding location on Drawings.
- e. Field changes of dimension and detail.
- f. Changes made by Change Order or other Modifications.
- g. Details not on original Contract Drawings.
- h. Give particular attention to concealed elements that would be difficult or expensive to locate at a later date.

D. Record Specifications: Maintain one complete copy of the Contract Documents including addenda. Include with the Contract Documents one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

- 1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
- 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
- 3. Note related record drawing information and Product Data.
- 4. Upon completion of the Work, submit record Specifications to the City for the City's records.
- 5. Include the following:
 - a. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually installed, particularly optional and substitute items.

- b. Changes made by Addendum, Change Order, or other Modifications.
 - c. Related Submittal.
- E. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.
- 1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
 - 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 - 3. Upon completion of markup, submit complete set of record Product Data to the City for the City's records.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion (unless otherwise specified), complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the City for the City's records.
- G. Operation and Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size as specified in SECTION 01300.
- H. Warranties and Bonds: Specified in GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS and SECTION 01300.

PART 2 - PRODUCTS (Not Applicable.)

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: For equipment not covered elsewhere, arrange for each Installer of equipment that requires regular maintenance to meet with the City's personnel at Project site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
- 1. Operation and maintenance manuals.
 - 2. Record documents.
 - 3. Spare parts and materials.

4. Tools.
 5. Lubricants.
 6. Identification systems.
 7. Control sequences.
 8. Hazards, hazardous chemicals data sheets.
 9. Cleaning.
 10. Warranties and bonds.
 11. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up.
 2. Shutdown.
 3. Emergency operations.
 4. Noise and vibration adjustments.
 5. Safety procedures.
 6. Economy and efficiency adjustments.
 7. Effective energy utilization.

3.02 FINAL CLEANING

- A. General: The GENERAL CONDITIONS require general cleaning during construction.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances.
 - c. Clean the site of rubbish, litter, and other foreign substances. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
 - d. Remove temporary structures, tools, equipment, supplies, and surplus materials.
 - e. Remove temporary protection devices and facilities which were installed to protect previously completed Work.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the City's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the City's property. Dispose of these materials of no value to the City as directed by the Engineer.

E. Repairs:

1. Repair damaged protective coated surfaces.
2. Repair roads and other items damaged or deteriorated because of construction operations, including those which have been damaged, but are not located within the project limits.
3. Restore all ground areas affected by construction operations.

END OF SECTION

SECTION 01810

EQUIPMENT TESTING AND FACILITY STARTUP

PART 1- GENERAL

1.01 DEFINITIONS

- A. Facility: Entire project, or an agreed-upon portion of the project, including all of its unit processes.
- B. Functional Test: Test or tests in presence of the ENGINEER and the OWNER to demonstrate that installed equipment meets manufacturer's installation, calibration, and adjustment requirements and other requirements as specified.
- C. Performance Test: Test or tests performed after any required functional tests and in the presence of the ENGINEER and the OWNER to demonstrate and confirm individual equipment meets performance requirements specified in the individual specification sections.
- D. Unit Process: as used in this section, a unit process is a portion of the facility that performs a specific process function, such as pumping or treatment.
- E. Facility Performance Demonstration:
 - 1. A demonstration, conducted by the CONTRACTOR, with assistance of the OWNER, to demonstrate and document the performance of the entire operating facility, both manually automatically, if required, based on criteria developed in conjunction with the OWNER and as accepted by the ENGINEER.
 - 2. Such a demonstration is for the purposes of (i) verifying to the OWNER the entire project performs as a whole, and (ii) documenting performance characteristics of complete facility for OWNER's records. Neither the demonstration nor the evaluation is intended in any way to make performance of a unit process or entire facility the responsibility of the CONTRACTOR, unless such performance is otherwise specified.

1.02 SUBMITTALS

- A. Information Submittals:
 - 1. Facility startup and performance demonstration plan.
 - 2. Functional and performance test results.
 - 3. Completed unit process startup form for each unit process.
 - 4. Completed facility performance demonstration/certification form.

1.03 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

- A. Develop a written plan, in conjunction with the OWNER's operating personnel, to include the following:
1. Step-by-step instructions for startup of each unit process and the complete facility.
 2. Unit Process Startup Form (sample attached), to minimally include the following:
 - a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
 - b. Detailed procedure for startup of the unit process, including valves to be opened/closed, order of equipment startup, etc.
 - c. Startup requirements for each unit process, including water, power, chemicals, etc.
 - d. Space for evaluation comments.
 3. Facility Performance Demonstration/Certification Form (sample attached), to minimally include the following:
 - a. Description of unit processes included in the facility startup.
 - b. Sequence of unit process startup to achieve facility startup.
 - c. Description of computerized operations, if any, included in the facility.
 - d. CONTRACTOR certification that the facility is capable of performing its intended function(s), including fully automatic operations
 - e. Signature spaces for the CONTRACTOR and the ENGINEER.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION

3.01 GENERAL

- A. CONTRACTOR's Testing and Startup Representative:
 - 1. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.
 - 2. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.
- B. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required for testing and startup.
- C. Provide adequate subcontract and equipment manufacturer's staff to prevent delays. Schedule ongoing work so as not to interfere with or delay testing and startup.
- D. OWNER will:
 - 1. Provide water, power, chemicals, and other items as required for startup, unless otherwise indicated
 - 2. Operate process units and facility with support of CONTRACTOR.
 - 3. Provide labor and materials as required for laboratory analyses.

3.02 EQUIPMENT TESTING

- A. Preparation:
 - 1. Complete installation before testing.
 - 2. Furnish qualified manufacturer's representatives, when required by individual specification sections.
 - 3. Obtain and submit from equipment manufacturer's representative Manufacturer's Certification of Proper Installation Form.
 - 4. Equipment Test Report Form: Provide written test report for each item of equipment to be tested, to include the minimum information:
 - a. OWNER/Project name
 - b. Equipment or item tested.
 - c. Date and time of test.

- d. Type of test performed (functional or performance)
 - e. Test method.
 - f. Test conditions.
 - g. Test results.
 - h. Signature spaces for CONTRACTOR and ENGINEER as witness.
5. Cleaning and Checking: Prior to beginning functional testing:
- a. Calibrate testing equipment in accordance with manufacturer's instructions.
 - b. Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
 - c. Lubricate equipment in accordance with manufacturer's instructions.
 - d. Turn rotating equipment by hand when possible to confirm that equipment is not bound.
 - e. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
 - f. Check power supply to electric-powered equipment for correct voltage.
 - g. Adjust clearances and torque.
 - h. Test piping for leaks.
6. Ready-to-test determination will be by ENGINEER based at least on the following:
- a. Acceptable Operation and Maintenance Data.
 - b. Notification by CONTRACTOR of equipment readiness for testing.
 - c. Receipt of Manufacturer's Certificate or Proper Installation.
 - d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested, including items to be furnished by the OWNER, if any.

- e. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
- f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
- g. Equipment and electrical tagging complete.
- h. Delivery of all spare parts and special tools.

B. Functional Testing:

- 1. Conduct as specified in individual Specification sections.
- 2. Notify OWNER and ENGINEER in writing at least 10 days prior to scheduled date of testing.
- 3. Prepare Equipment Test Report summarizing test method and results.
- 4. When, in ENGINEER's opinion, equipment meets functional requirements specified, such equipment will be accepted for purposes of advancing to performance testing phase, if so required by individual Specification sections. Such acceptance will be evidenced by ENGINEER/OWNER's signature as witness on Equipment Test Report.

C. Performance Testing:

- 1. Conduct as specified in individual Specification sections.
- 2. Notify ENGINEER and OWNER in writing at least 10 days prior to scheduled test date.
- 3. Performance testing shall not commence until equipment has been accepted by ENGINEER as having satisfied functional test requirements specified.
- 4. Type of fluid, gas, or solid for testing shall be as specified.
- 5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.
- 6. Prepare Equipment Test Report summarizing test method and results.
- 7. When, in ENGINEER's opinion, equipment meets performance requirements specified, such equipment will be accepted as to conforming to Contract requirements. Such acceptance will be evidenced by ENGINEER's signature on Equipment Test Report.

3.03 STARTUP OF UNIT PROCESSES

- A. Prior to unit process startup, equipment within unit processes shall be accepted by ENGINEER as having met functional and performance testing requirements specified.
- B. Startup sequencing of unit processes shall be as chosen by the CONTRACTOR to meet schedule requirements.
- C. Make adjustments, repairs, and corrections necessary to complete unit process startup.
- D. Startup shall be considered complete when, in the opinion of the ENGINEER, the unit process has operated in the manner intended for five continuous days without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.
- E. Significant Interruption: May include any of the following events:
 - 1. Failure of CONTRACTOR to provide and maintain qualified onsite startup personnel as scheduled.
 - 2. Failure to meet specified functional operation for more than two consecutive hours.
 - 3. Failure of any critical equipment or unit process that is not satisfactorily corrected within five hours after failure.
 - 4. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within eight hours after failure.
 - 5. As determined by the ENGINEER.
- F. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period to start from the beginning again.

3.04 FACILITY PERFORMANCE DEMONSTRATION

- A. When, in the opinion of the ENGINEER, startup of all unit processes has been achieved, sequence each unit process to the point that the facility is operational.
- B. Demonstrate proper operation of required interfaces within and between individual unit processes.
- C. After facility is operation, complete performance testing of equipment and system not previously tested.

- D. Document, as defined in the Facility Startup and Performance Demonstration plan, the performance of the facility, until all unit processes are operable and under control of the computer system.
- E. Certify on the Facility Performance Demonstration/Certification Form, that facility is capable of performing its intended function(s), including fully automatic and computerized operation as specified.

3.05 SUPPLEMENTS

- A. Supplements listed below are part of this specification:
 - 1. Unit Process Startup Form
 - 2. Facility Performance Demonstration/Certification Form.

END OF SECTION

UNIT PROCESS STARTUP FORM

OWNER: _____

PROJECT: _____

Unit Process Description (Include description and equipment number of all equipment and devices):

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

Startup Requirements (water, power, chemicals, etc.):

Evaluation Comments:



